Methodological Aspects of Iranian Archaeology

Past and Present

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Summary

This dissertation is the first overview of the history and present state of archaeology in Iran. Its aim is to consider the relevance of recent developments in Western archaeology, and their relevance to a Near Eastern Islamic State. The Palaeolithic of Iran is taken as a case study. The first concern of chapters (1) and (2), in this thesis is to evaluate the distinctively national characteristics of archaeology in Iran. Specifically the chapters consider the development of archaeology in Iran in the 1960s and 1970s in relation to the 'New Archaeology' in the USA. It is clear that these external influences had only a minimal impact on archaeology in Iran; the 'New Archaeology' which first developed in American circles more than thirty years ago, made a somewhat belated impact on Iranian archaeology in the seventies. Not all of its agenda has been adopted, and because it was pioneered by anthropologists on relatively recent and simple New World sites, it is not totally applicable to the long historical sequence of complex Iranian mounds. I argue that Iranian archaeology was simply left behind, "out of date" and generally atheoretical. I also stress that its traditional authority structure prevented discussion of new ideas. Chapter (3), emphasises that, despite a wide range of archaeological work in Iran, the blanks on the archaeological maps are far greater in extent than the small regions that have to some extent been filled in. On the other hand the unparalleled expansion of archaeology particularly the complexity and costs of fieldwork, will force us to determine priorities much more clearly. Thus in the future we will probably see fewer of the enormous ten-year excavations at *Tell-sites* such as characterised the 1960s and 1970s. We have to move to smaller projects deliberately designed to answer specific problems (i.e., excavation at one period sites; surface survey, and regional studies). Because the concept of surface surveying as a reliable method of data recovery has not been introduced into the archaeology of Iran, and archaeologists there are still not familiar with its methods and techniques, this chapter aims to emphasis the importance and productivity of this strategy and provides a general model of archaeological survey methodology for the future. The present thesis goes radically beyond the traditional cultural-historical paradigms of Iranian research orientation, and suggests, for instance that the study of Palaeolithic Archaeology (in new perspectives) is a fundamental period of human cultural progress, but one that has long been completely neglected in Iranian archaeology. The current issues of Palaeolithic Archaeology, the importance of environmental data, and the range of our understanding of Iranian Palaeolithic Archaeology are the subjects of Chapters (4) and (5). The political and ideological problems of the archaeology of Iran are discussed in chapter (6) where I argue that the concept of Archaeological Heritage Management is a matter of top priority for Iranian archaeology. This chapter discusses major disasters in Iranian cultural heritage (i.e., looting of sites due to a lack of legal protection, an adequate management system, as well as economic and social problems). I conclude in this thesis that there are major challenges for archaeology in Iran in the future; the older generation is almost gone, the new generation coming to the fore must face many tasks, among them the transition from a monolithic national school to a more subtle, many-sided approach to archaeological problems. It must salvage what it can of sites rapidly being destroyed by various factors. At the same time we will have to challenge the political and ideological constraints affecting archaeology in society. The new generation must envision a master-plan for the future archaeological development in this region, where economic development and prosperity still allows good opportunities and support for systematic archaeological research.

To My Family

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Introduction

It has long been recognised that archaeology has developed differently in various countries or regions of the world. As in other parts of the Near East the development of archaeology in Iran has been due to (1) in part the nature of the regional archaeological record and the resources available for archaeological research; (2) more fundamentally due to national or ethnic loyalties and adherence to political philosophies and cultural traditions; and (3) the crucial influence of eminent scholars. The goal of the present thesis is to examine and try to account for variations in the questions asked and in modes of analysing and explaining data employed by archaeologists in Iran. This thesis discusses the special factors affecting the development of archaeology in Iran, to see how far these can account for the features that distinguish the archaeology currently practised in Iran from that encountered elsewhere. For this, the first goal is to explain the present state of archaeology in Iran. To achieve this I also aim to delineate as clearly and dispassionately as possible the special characteristics, achievements, and the current problems of Iranian archaeological tradition.

Iranian archaeology today is characterised by an apparent absence of scientific methods and social science theory in archaeological approaches; the absence of multi-disciplinary research strategies; a lack of familiarity with the many branches of archaeology (e.g. environmental, landscape, and ethnoarchaeology); domination of art historians and traditional archaeologists; a neglect of prehistoric archaeology; an isolation of archaeology from the public sphere and from social and political debates; and an emphasis on merely reconstructing cultural history without regard to cultural process.

These features give the observer an impression of the World Archaeology of the early 1960s as a parallel for the state of Iranian archaeology at the present time. This situation is a product of several parallel and often conflicting traditions. These include a broadly-based antiquarianism and the socio-political climate which has dominated the evolution of Iranian archaeology since the 1930s. During the pre-Revolution period, the political ideology of the regime sometimes encouraged, but more often restricted, the development of archaeological research. As a result of severe restrictions an increasing number of archaeologists devoted their attention only to the refinement of typological definitions and chronological changes. As a result of the loss of contacts with colleagues abroad that began with the Revolution and continued for sometime thereafter, Iranian archaeologists still pursue their research in the directions set in the 1950s. During the sixties and seventies new trends were developed by the 'New Archaeologists' such as multi-disciplinary research, the questioning of diffusionary theories, and growing concern with problems of social structure, economic process, settlement pattern and urbanisation. While these developments were certainly welcome, they engaged the attention of relatively few archaeologists; in part, Iranian archaeologists, because of several restrictions, did not heed the voice of the 'New Archaeologists' such as Braidwood, for example, who was working in Iran at this time and who urged a change direction of research toward hypothesis testing, processual analysis, and injection of anthropological theories into archaeological research. Anthropology in the Anglo-Saxon tradition which laid strong emphasis on scientific methods and technical analysis, has not affected archaeological approaches in this country. Instead, a parallel tradition of archaeology as historical research dominated the indigenous antiquarian tradition. It was affirmed as an academic discipline in the pre-Revolution period by archaeologists and historians affiliated with the Imperial regime. The structure of Iranian academic institutions has always tended to perpetuate the research orientations that are familiar to those in positions of authority. As a result the dominant research paradigm has always been toward problems of sequence and chronology rather than concern with broader cultural issues and a social archaeology. This tradition has carried on scarcely unchanged in the post-Revolution period as well. Thus, what we see today results from an archaeological evolution that began with the past repressive regime in Iran.. I believe that archaeology in Iran will remain isolated from the main stream of World Archaeology, unless Iranian archaeologists redirect their energies toward updating archaeology through constructing a new organisation for it, and adopting new ideas. It is obvious that any new plan for archaeology in Iran should be based on a knowledge of its background, its development, and the most important factors affecting these processes. Unfortunately, Iranian archaeologists are not interested in the study of the history of archaeology (apart from a few descriptive articles), nor has there been any critical review of archaeology published. Thus researchers who need access to the archives encounter many difficulties due to deficiencies in the management system of archaeology, and a heavy bureaucracy dominates the whole administrative system of the country. However, since the Revolution the situation has changed; for instance, the appearance of a relatively good political and social context in Iranian society; the appearance of a younger generation of archaeologists; the availability of adequate financial resources; an increase in new archaeological departments in universities; and a growing attention of government to archaeology. Despite these, at present Iranian archaeology is in a virtual state of crisis (see chapter 2 for detail). The post-Revolution transformation has produced only a few changes and the most important features of the crisis (mostly inherited from the previous regime) and their main causes still remain unchanged. In this thesis I will try to explain the main causes of this crisis in the archaeology of Iran, and as mentioned at the beginning of this introduction to show why Iranian archaeology is so impervious to currents of thought in the rest of the world, especially technical and theoretical ones. I believe that the great gap between the archaeology of Iran and World Archaeology cannot be simply removed by carrying out empirical research in various fields, because the present structure of archaeology and its great deficiencies will prevent the contribution of such work from allowing further development. Therefore our first priority in doing archaeological research must be concerned with the way in which archaeology can be salvaged from its present pitfalls. Without a firm recognition of the circumstances under which archaeology operates, even the idea of modernising archaeology will be a meaningless matter.

In this short sketch, I will try throughout this thesis, to achieve two things: first, by looking backward, to see how we arrived where we are today; second, by looking ahead (however risky, in a rapidly developing field) in order to describe some goals mainly in theory and method. Here I might as well be bold and suggest what I think is an ideal programme for the future.

This dissertation is the first overview of the history and present state of archaeology in Iran. Its aim is to consider recent developments in Western archaeology, and their relevance to a Near Eastern Islamic State. The Palaeolithic of Iran is taken as a case study. The first concern of chapters (1) and (2) in this thesis is to evaluate the distinctively national characteristics of archaeology in Iran. Specifically the chapters consider the development of archaeology in Iran in the 1960s and 1970s in relation to the 'New Archaeology' in the USA. It is clear that these external influences had only a minimal impact on archaeology in Iran; the 'New Archaeology', which first developed in American circles more than thirty years ago, made a somewhat belated impact on Iranian archaeology in the seventies. Not all its agenda has been adopted, and because it was pioneered by anthropologists on relatively recent and simple New World sites, it is not totally applicable to the long historical sequences of complex Iranian mounds. I argue that Iranian archaeology was simply left behind, 'out of date', and generally atheoretical. I also stress that its traditional authority structure prevented discussion of new ideas. Chapter (3) demonstrates that, despite a wide range of archaeological work in Iran, the blanks on the archaeological maps are far greater in extent than the small regions that have to some extent been filled in. On the other hand the unparalleled expansion of archaeology, particularly the complexity and costs of fieldwork, will force us to determine priorities much more clearly. Thus in the future we will probably see fewer of the enormous ten-year excavations at *Tell-sites* such as characterised the 1960s and 1970s. We have to move to smaller projects deliberately designed to answer specific problems (e.g. excavation at one period sites; surface survey; and regional studies). Because the concept of surface surveying as a reliable method of data recovery has not been introduced into the archaeology of Iran, and archaeologists there are still not familiar with its methods and techniques, this chapter aims to emphasise the importance and productivity of this strategy and provides a general model of archaeological survey methodology for the future. The present thesis goes radically beyond the traditional cultural-historical paradigms of Iranian research orientation, and suggests, for instance, that the study of Palaeolithic Archaeology (in new perspectives) is a fundamental period of human cultural progress, but one that has long been completely neglected in Iranian archaeology. The current issues of Palaeolithic Archaeology, the importance of environmental data, and the range of our understanding of Iranian Palaeolithic Archaeology are the subjects of Chapters (4) and (5). The political and ideological problems of the archaeology of Iran are discussed in chapter (6) where I argue that the concept of Archaeological Heritage Management is a matter of top priority for Iranian archaeology. This chapter discusses major disasters in Iranian cultural heritage (e.g. looting of sites due to a lack of legal protection, the lack of an adequate management system, as well as economic and social problems). I conclude in this thesis that there are major challenges for archaeology in Iran in the future; the older generation is almost gone, the new generation coming to the fore must face many tasks, among them the transition from a monolithic national school to a more subtle, many-side approach to archaeological problems. It must salvage what it can of sites rapidly being destroyed by various factors. At the same time we will have to challenge the political and ideological constraints affecting archaeology in society. The new generation must envision a master-plan for the future archaeological development of this region, where economic development and prosperity still allows good opportunities and support for systematic archaeological research. Only a drastic change in the national policy of archaeology and education and much more co-operation with the archaeological institutions of the developed countries can reverse the present situation of archaeology in Iran.

Chapter 1

A Brief History of Archaeology and Archaeological Research in Iran

1. Introduction

The starting point of the Iranian archaeology was the same as for other Near Eastern archaeological research which relates to western scholarship interests, firstly to discovery the lost civilisation of the Bible Lands, then to display interesting objects in museums.

Up to 1927 the archaeology of Iran was exclusively under French control. All excavations were directed to the discovery of the visible ancient city of Susa; as a result much remarkable material found its way to the Louvre Museum.

Soon after 1928, though the termination of French monopoly opened the gates to all, the previous trend in museum interest collection remained dominant, with some transformation in ideas and techniques. Development of regional chronologies prevailed in the archaeological research; nevertheless, we should note that investigating a number of prehistoric sites formed the basic goal of this period of archaeological activities.

It was only at the beginning of the 1960s that the American 'New Archaeologists' started problem-oriented and hypothesis testing approaches, mainly in the Neolithic period. Such approaches initiated a new era in the archaeology of Iran. Advanced methods of stratigraphy and careful control over the context of material remains was widely used, and research designs to solve problems concerning the economic relationships of human communities received more attention rather than a more description of cultural material.

Doubtless the archaeology of Iran with more than 100 important excavation projects (see Negahban 1997: 482-505) has played a fundamental role and major contribution in the Near East through the 19th and 20th centuries. The main purpose of this chapter, through a concise review of its history, is to recognise the major factors affecting its developmental processes, in order to describe some prospects for its future development. It can be categorised in three stages, each of them with its own characteristics. It is necessary to note here that the fourth stage of archaeology in the post-Revolution period (started in 1979) is not reviewed here, because, firstly, the revolution brought all foreign excavations to an end, and, secondly, many changes occurred in the organisation of archaeology which has led to a 10 year cessation of work. Fortunately it has become active again by the parliament approving of new laws and a reorganisation of various archaeological centres under the 'Cultural Heritage Organisation' (CHO) in 1989. Though this organisation began immediately to reform and reorganise archaeological activities, nevertheless, the unfamiliarity of Iranian archaeologists with the new thoughts of the 'World Archaeology' and many deficiencies associated with the system of archaeology, means there are few immediate prospects for the development of a programme of archaeological excavation; for this we may have to wait for a long time.

2. The First Stage: from the beginning to 1927

The Near East has attracted travellers from the 17th century onwards for two main reasons: firstly, as the lands of the Bible; secondly because of its ancient visible remains. Both resulted in an ever increasingly attention paid by adventurers, travellers and scholars (Hilprecht 1903, Ceram 1951, Gabriel 1969, Daniel 1975, Fagan 1985, Trigger 1989, Stiebing 1993).

Iran however did not enjoy the same level of interest as some neighbouring countries, except Susa which Benjamin of Tudela, a Spanish Jew in the twelfth century identified as the location of the Biblical story of Daniel (Gabriel 1969: 46-54).

As early as the seventeenth century travellers such as Pietro Della Valle, an Italian nobleman, made journeys to Iran and took away a copy of the Persepolis inscription; it was the first example of cuneiform which reached Europe. It was after the 1600s that establishment of the East India Company and the rivalry between England and France put Iran in a strategic and favourable position to attract travellers, merchants and politicians. They were generally accompanied by artists which made it possible to make accurate drawing of outstanding monuments and inscriptions of Persepolis, for instance, by Herbert in 1626, Tavernier and his draughtsman de Slandes in 1631 and de Bruin in 1701 (Ceram 1970: 167-176). But it was not until 1765 that Karsten Niebuhr, a Danish scholar, took a great step towards the decipherment of the cuneiform by making wonderfully accurate and clear copies of them (Rajabi 1965: 110-15). This work formed the basis of the great breakthrough in the decipherment of the cuneiform inscriptions by Henry Rawlinson who as a military advisor to the Persian governor of Kurdistan in Iran from 1835. At Kermanshah he discovered a four hundred lines inscription engraved in 516 B.C. on the orders of Darius the Great. This trilingual (Old Persian, Elamite, and Babylonian) inscription is 122 metres above the ground on the face of the great rock of Biston near

Kermanshah. By the end of 1837 he had completely copied and translated two hundred lines of the Old Persian section of the inscription. His translation of the entire Old Persian text appeared in the *Journal of the Royal Asiatic Society* in 1846-47. This decipherment became a key to the unlocking of the early history of western Asia–see H. Rawlinson (1852), G. Rawlinson (1898), Ceram (1958).

By the middle of the last century the major sites of Egypt and Mesopotamia were being excavated to obtain valuable antiquities, especially in Mesopotamia under the joint diplomatic archaeological agreement between France and England (Stiebing 1993: 96); Botta and Layard excavated the most important ancient sites at Nimrud, Nineveh and Khorsabad during 1842-1852 (Lloyd 1976). At that time the existence of a state of war between Iran and Russia prevented any similar archaeological work in Iran. But the study of customs and cultures of Iranian tribes in order to understand their potential strength to confront Russian threats to India became an interest of many British political agents in the region. Layard was one of them, and he made a journey to Iran in 1840-42 to obtain "information to the British government to prevent the Russia intention to draw Persia away from the influence of England"(Layard 1887: 9). He observed many archaeological sites and accurately noted them for the first time in his travel account.

The first conventional excavation, like those of Mesopotamia, did not start in Iran until the 1850s when Luftos, a geologist in the Turko-Persian Frontier Commission for determining the border of Iran and the Ottoman Empire, and a politician interested in acquiring major finds for museum display (Lloyd 1980: 132), visited Susa, which was identified as the Biblical Shushan. He had already excavated at Warka, the Biblical Erech, as early as 1850 on his belief that "...from our childhood we have been led to regard this as the cradle of the human-race" (Daniel 1981: 78). The huge ruins on the Susa acropolis encouraged him to make an excavation on the central part of the mound. His campaign for the first time brought to light a columned hall of the Achaemenid period (Moghadam 1973: 3, 77).

In spite of the more sophisticated excavations in Mesopotamia during the second half of the nineteenth century under British directors such as Smith at Kuynjik in 1873, and Rassam at Tell Balavat in 1878-1882, French excavation under de Sarzec at Tello in 1877, and the American first expedition at Nippur in 1884 (Lloyd 1978), the archaeology of Iran did not develop as did that of Iraq. At the same time interest in buried treasure led to the digging of archaeological sites not only by the order of the Shah but also by regional governors. Etemad-Al-Saltaneh as the special advisor of King Naser Eddin and Dr. Feuvrier as his medical doctor wrote in their diary memoires, how the plundering of sites and the tragedy of 'Shah Archaeology' happened (Etemad-Al-saltaneh 1977, Eghbal 1947). An excavation technique that should be mentioned here was that observed by H. Schindler, a telegraph engineer in 1870, when he saw workmen who were digging for treasures at Tepe Hissar; his suggestion about obtaining the intact pottery vessels by using water to wash away the soil surrounding the artifacts led to the diversion of a canal through the site (Roushani 1968: 206).

The next step in the archaeology of Iran was taken by the French government and archaeologists on May 12 1895. According to a treaty the Shah, Nasser Eddin, gave the French exclusive excavation rights to all of Persia (Iran), providing that the sacred places such as mosques, shrines and the tomb of Daniel should not be touched; all gold and silver objects found should become the exclusive property of

His Majesty; all other objects discovered should be divided between the French Mission and Persia, and the French government, in return for His Majesty's generosity, should pay 10000 Toman to him. This contract was renewed and extended for sixty years with the new Shah, Mozaffar Eddin, three years later, giving all of the objects found in Susiana to France (Masoumi 1976: 4-6). According to this convention in 1897 de Morgan the famous Egyptologist, prehistorian, and mine engineer, was appointed as director of the *Delegation Française en Perse.* The delegation has been described as "probably the most important archaeological expedition that has left Europe" (Carlton 1939: 34).

The modern exploration of Iran began in 1897 when the French monopoly of archaeological excavation was established. During the succeeding decades a huge Achaemenid tell was excavated and the mapping and the identification of prehistoric and historical sites progressed rapidly. At the same time knowledge of archaeological method was promoted by the establishment of international schools throughout the Near East, and Petrie's innovation of tell stratigraphy. His technique appeared on the scene in 1890 at a mound in Palestine. Though the true nature of tells had formerly been recognised by Schliemann at Troy, Petrie developed the principal tools of later excavations: stratigraphy or the art of recognition of debris layers in a mound; and ceramic typology, the study of the change in pottery styles as a clue to chronology. During this period the French delegation locked the Iranian gate of archaeology to all. These early decades continued a formative period in archaeology in our field. The true nature of the tells, and how they were formed, were the fundamental questions. Archaeologists began to learn how to distinguish the successive strata and to date each by its contents, particularly the pottery. The task was more complex than first thought, but it yielded a rough outline of the history and culture of ancient Khuzistan in Iran. In each excavation pottery and objects were found in abundance but scarcely a single piece was reported in relation to a context. The result is that de Morgan's reports, like all pre World War I publications, were vast, but often useless in terms of information. It is clear that the primitive excavation technique obscured much evidence, some of it destroyed forever. In this first period archaeologists began to familiarise themselves with the characteristic materials of the mounds, but no description made on the economic, social and religious life of past cultures.

During the first season of his work he moved a total of 18000 cubic meters of earth with 1200 workmen. He began to dig a series of vertical shafts as used in industrial mining in order to establish a relatively accurate picture of the successive cultural phases of the historical and prehistoric periods, as well as to find intact structural remains buried under heaps of rubble. Then he turned his attention to the main acropolis of Susa, using a masive trench 25 meters wide by 100 meters long (de Morgan 1905: 50, 1906: 4). His special method, namely 'the exploration of the regular strata' needed to remove a wide range of archaeological layers, by using a large number of workmen, resulted in the destruction of a valuable part of the Achaemenian main platform and of Elamite architectural material (Steve and Gasch 1941: 45-6, Hole 1987: 41).

Excavations by the French delegation were not restricted just to Susa, but de Morgan extended them to the Caspian Sea shore when he excavated there on prehistoric sites in the last decade of the nineteenth century (de Morgan 1896). With the Gautier and Lamper excavations, under the same expedition, at the prehistoric Moussian in 1902-3, their realm reached to Luristan (Gautier and Lamper 1905).

Here we should note that the physical removal of debris and the demolition of supposedly worthless ancient walls to obtain valuable antiquities, were accepted by the French delegation (Parrot 1953: 39), but de Morgan and his successors brought to Iran the new idea of archaeology and a basic excavation method that had formerly been developed in Egypt and Mesopotamia.

A result of the French archaeological monopoly, imposed by royal edict, gave the French authorities absolute control of archaeology in Iran, so that no one was allowed to excavate, except with their sanction, until 1927.

3. The Second Stage: 1927 to 1960

A nationalism based on regional culture appeared throughout the Near Eastern countries when the Ottoman Empire collapsed after the First World War. This idea encouraged national identities to develop pan Turkism, pan Arabism and pan Iranism, at least in the eastern part of the Near East. Governments sought legitimation through the support of archaeology and historical research. A change in the policy of Reza Shah (who reigned in Iran from 1920 to 1941), following this new political doctrine, introduced the archaeology of Iran in the new state. In 1927 the French archaeological monopoly was cancelled by the Iranian parliament. It opened the locked gates of archaeology to all countries. This period in Iran coincided with advanced post-war archaeology in the Near East, in particular in Mesopotamia, a growing national feeling among various nations of the Near East, and events of the First World War resulted in changes in the antiquities laws in the most parts of the Near East, especially in Iraq. The new rules changed the position of foreign archaeological expeditions, and established national departments of antiquity and a national museum (David and Joan Oates 1981: 29). On the other hand new improved archaeological techniques were developed by archaeologists, who worked here for many years. An expedition organised by the Deutsche Orient-Gesellschaft to Iraq was more concerned with the recovery of information than the enrichment of museum collections. They produced new techniques of excavation that would be a 'prototype of all stratigraphical investigation in later time' (Lloyd 1978: 178). Development of pottery sequences devised by Petrie in the early 1900s, was successfully continued by Woolley (Stiebing 1993: 17) who in the 1930s undertook the excavation of magnificent tombs at Ur (Woolley 1934) comparable with Schliemann's discovery at Mycenae and Carter at Tutankhamun's tomb (Daniel 1975: 201). The American expedition at Khafaje in 1930 (Delougaz and Lloyd 1942), the British School of Archaeology's excavation by Mallowan at Tepe Arpachiya in 1933 (Mallowan and Rose 1935), and the British Museum expedition directed by Thompson and Mallowan at Kuynjik in 1931 (Thompson and Mallowan 1932), threw new light on aspects of early prehistoric Iraq that hitherto were unknown.

Two years after the annulling of the French monopoly and due to the encouragement of government of Iran, an antiquity department was established under A. Godard a French architect (Masoumi 1976: 9). This event resulted in the opening of archaeological excavation to all, especially to the American Institution of Archaeology, established in Iran in 1930. At that time excavation by large foreign expeditions was encouraged. The excavations carried out under these conditions are too numerous to list in full, but the monumental American excavations at Takht-e-

Jamshid were a landmark as was the French sponsored excavation at Sialk (below). Though the main interests of archaeologists were to recover evidence of ancient sites, it was at a series of much smaller mounds that Schmidt and Ghirshman really transformed archaeology from a large intuitive affair into a systematic (if not scientific) discipline. By the beginning of 1930 prehistoric archaeology began to appear on some small mounds and Ghirshman mastered the pottery and the stratigraphy. His chronological and terminological framework, worked out in the same year, remained basic for many years for archaeologists.

This phase in Iranian archaeology saw the development of real sophistications; as methods advanced, the field moved from enlightened treasure hunting to scholarly competence. According to improved methods in fieldwork and interpretation, a chronological sequence based on pottery styles was produced (for detailed explanation of the role of pottery as a key material in the chronology in Iran see: McCown 1942, 1954, Piggott 1943, Gordon 1947, Childe 1952, Young 1958, 1969, Dyson 1967, 1987, Henrickson 1985, Voigt 1987), and an outline of the political history of Iran emerged, complementing the literary accounts in the cuneiform texts and integrating the country into a large framework of events in the ancient Near East. Still, however, archaeology was better at answering such questions as 'what' 'where' and 'how', rather than 'why'. The following lists the number and location of excavations carried out in this period, and the individuals involved:

Wulsin at Turang Tepe in 1931 (Wulsin 1932); Schmidt at Tepe Hissar in 1931 (Schmidt 1937); Langsdorff at Tell Bacon (Langsdorff and McCown 1942); Ghirshman at Tepe Giyan in 1931 and Sialk 1933 (Contenau and Ghirshman 1935 Ghirshman 1938a, 1939); Arne at Shah Tepe in 1933 (Arne 1945); Schmidt at

Cheshme Ali in 1934 (Schmidt 1935); Schmidt at Persepolis 1934 and Istakhr 1935 (Schmidt 1953, 1936); and Ghirshman at Bishapour 1936 and at Susa 1946 (Ghirshman 1938b, 1952). Although during this period stratigraphy and control over the recovery of artifacts was developed, because of the predominance and emphasis on the enrichment of museum collections, some of the work such as Ghirshman's excavation at Giyan or the work of Schmidt at Hissar seem 'coarse by modern standards' and needs re-excavation (Dyson 1987: 648-652, Hole 1987: 51). Nevertheless during this period prehistoric archaeology could produce reliable enough evidence to establish a chronological framework for the prehistory of the Iranian Plateau, as McCown in his 'Comparative Stratigraphy of Early Iran' (McCown 1942) has described in detail. The chronology proposed by Schmidt and Ghirshman for historical and prehistoric Iran remained for a long time the basis for all comparative work. These were refined by new evidence found at Godin by Young in 1965 (Young 1965, 1969) and at Ali Kosh by Hole in 1977 (Hole 1987: 51, 1977a), and continue in use until the present.

The second phase of this period is accompanied by clandestine digging by treasure hunters, which has been as productive of finds as scientific excavation (Bacon 1960: 176). In 1928 the bronze objects of Luristan began to appear on the art market (Stark 1932) and twenty years later many hundreds of objects of gold, silver and bronze could still be purchased from antiquity dealers in Iran, Europe and the United States. These objects were obtained in an illegal excavation at Ziwiye (Y. Godard 1948; Muscarrella 1977) (for other plundered sites such as Khurvin and Zalu-Ab, see: Rad and Hakemi 1950; Vanden Berghe 1955; Godard 1933).

Each of them caused in turn the definition of archaeological problems, for instance, that of the Luristan Bronzes, which led the attention of field activity and research to the Luristan district. First of all Schmidt, on behalf of the Oriental Institute of Chicago University, conducted the Holm's Expedition to Luristan from 1935 to 1938 (Schmidt 1938). He made an aerial survey of this province (Schmidt 1940) which helped him to recognise the location of sites to be excavated. His work in the form of tunnelling defined the numerous sites in this area and yielded splendid and valuable artifacts .

At the same time Sir Aurel Stein, a British explorer, made his fourth journey to Iran, in particular to Luristan (for full account of his journeys see: Stein 1934; 1935; 1937; 1940). He visited and plotted the location of many sites and made trial excavations all along his route on any visible artificial mound (Stein 1940: 171-313). Though his elaborate description of sites and artifacts formed the basis for the Bronze Age of Iran, his extensive and primitive excavation technique was even more of a menace than the Luri treasure hunters (Goff 1980: 17) who were introduced to the value of antiquities through this sort of excavation.

The distinctive features of the Iranian Archaeology during these early years were: (1) the concentrated effort to recover a national history, particularly of the Achaemenid era; (2) archaeological organisation, resources, and technical facilities, such as only a local school can provide; (3) a preference for large scale exposure of architecture at virgin sites, rather than more careful soundings at small prehistoric or re-excavated sites; (4) an emphasis on building up a corpus of whole pottery found *in situ* rather than detailed analysis of sherds. These objectives to some extent were acceptable, but the isolation from developed techniques of analysis and interpretation elsewhere meant that the archaeology of Iran did not take full advantage of the stratigraphic revolution until late the 1960s. As a consequence, some of the architectural phasing was imprecise, and interpretations have remained controversial. Furthermore, as with the Iranian experiment in method, publication fell so far behind fieldwork that it is so difficult to judge the merits of the various methods employed and the results obtained

4. The Third Stage: 1960 to 1978

Changing political conditions in the post World War II years, helped maximise the involvement of foreign archaeologists to their peak and at the same time fostered the development of a national school of archaeology in Iran. This period also coincided with the greatest development in archaeological techniques, methodology and strategies in the Near East. The first development came from Kathleen Kenyon's introduction of stratigraphic methods, perfected later by Wheeler and others on Romano-British sites. She applied this method to the complex problems of Palestinian mounds in her excavation at Jericho in 1952-58 (Kenyon 1972). Here she dug in small squares within a grid, leaving intervening catwalks or balks, that were then used to see the deposits in section and to guide careful probing and stripping of the strata. Digging proceeded not only by architectural strata, rather than by artificial levels, but also, by following the natural stratification, separating soil layers by colour, texture and depositional character, etc. This system introduced both the third dimension and the element of control that made it possible to separate debris layers and the objects they contained with greater accuracy. Indeed at that time the system worked so well that various adaptations of the so-called Wheeler-

Kenyon field methods were employed on nearly all American and British excavations in Iran in the 1960s and 1970s.

The second development came from the 'New Archaeology', an archaeology which was revolutionised by natural science, social science, ethnography, and environmental studies in America in the late 1960s. The teamwork philosophy of this approach brought into field archaeology specialists who soon demonstrated that they could contribute much to the study of aspects of the material culture which had been neglected. By the late 1960s in both the Levant and Mesopotamia interest in prehistoric research shifted in emphasis from traditional historical and culture-historical approaches to a more detailed investigation of human life style. Hypothesis testing, especially questions concerning the origin of sedentary life, formed a major factor in the change in research direction which first began to appear with Braidwood's work in the hilly flanks of northern Mesopotamia. This kind of research required specialised geomorphologists, botanists, zoologists and chemists rather than archaeologists alone. The excavation techniques were altered from large scale horizontal to the small vertical ones using careful stratigraphy and control to recover plant and animal remains. The beginning of the 1960s saw a great change in archaeology in Iran under the problem oriented researches of Braidwood on the Neolithic, which led the way to the new generation of archaeologists. It is relevant to note here that, in view of the large amount of excavation undertaken, a brief summary of archaeological activities will be discussed period by period in this section.

4.1 Palaeolithic Archaeology

The beginning of Palaeolithic archaeology in the Near East was later than in Europe. The first Palaeolithic discovery was made by D. Garrod when she started an excavation at Mount Carmel, Palestine, in 1920, and then in northern Iraq at Hezar Mard cave in 1928 (Garrod 1930). The1940s saw new efforts to discover sites on both the west and east sides of the Zagros mountains located between Iran and Iraq. At this time R. Solecki excavated at Shanidar cave and distinguished four major archaeological levels (Mousterian, Baradostian, and Zarzian B2, B1) spanning the past 100,000 years (Solecki 1961). The second contemporary project was that of Coon, an American anthropologist. In 1949 he firstly dug in the hunters' cave at Bistun, at Tamtame cave near the Lake Urmia, and the Mesolithic occupation of the Belt cave on the Caspian foreshore. Then in 1951 he dug both Belt cave and the nearby Hotu cave (Coon1951, 1957). Iran, by this pioneering investigation, was shown to have been occupied in at least the middle Palaeolithic and Mesolithic periods. Other excavations and surveys have been made in Iran by various foreign prehistorians:

Field made several trenches in Luristan in 1950 (Field 1951); Braidwoods' group excavated several Palaeolithic sites at Kermanshah in 1959-60 (Braidwood 1960); and Hole and Flannery dug five sites in Luristan in 1965 (Hole and Flannery 1964). Smith was excavating at a cave in Bistun in 1965 (Young and Smith 1965), while at the same time McBurney (1964, 1968, 1970) excavated the Middle Palaeolithic cave of Ke-Aram I in Mazandaran in 1963, as well as undertaking Mesolithic investigations at Ali Tepe near Behshahr on the caspian in 1962 and 1964, and later (1969) investigated a Middle Palaeolithic cave in Luristan. There have also been a few Palaeolithic surveys and surface collections particularly in Azerbaijan by Solecki (Solecki 1969) and in Luristan by Mortensen (Mortensen 1974).

Palaeolithic archaeology in Iran, in comparison with the Bronze and Iron Ages, has not been sufficiently developed. The basic reason for this may lie in what Smith and Negahban have stressed (Smith 1986:40-42; Negahban 1981, 1982: 12).

They concluded that the relative remoteness of Iran for European scholars, the exclusive monopoly of excavation by the French archaeologists, the political state of Iran as a non-mandate country limiting easy access, and the lack of local scholarly interest, could be part of the explanation for the time lag in Palaeolithic research of Iran (see also chapter 5).

In spite of the sporadic excavations at Kunji cave and Ali Tepe, excavated by Hole, Flannery and Burney, whose data provides sufficient information to build up a regional chronological framework, the level of research on the whole still remains in an underdeveloped state.

Another weak point is the lack of analytical studies of stone artifacts. Though Hole and Flannery began to provide a typological model of the flint industry based on their small sample, and though this was continued by Baumler and Speth (Baumler and Speth 1993), because of the absence of comprehensive studies on previous work, and the unwillingness of Iranian scholars to involve themselves with the Palaeolithic period (see chapter 2), no great progress has been made.

4.2 Neolithic Archaeology:

Prior to 1960 there was little knowledge about Neolithic sites which were simply by-products of other excavations. The main reason for the slow development of interest in Neolithic Iran, as in Palaeolithic archaeology, lay in the political conditions and the French monopoly. The effect of Childe's hypothesis on the origin of agriculture that led archaeologists to the lowlands and to 'oases' to find traces relevant to beginning of the Neolithic is an additional factor.

Until the 1960s all our knowledge of Neolithic Iran was derived from the excavations carried out at Sialk, Tepe Hissar, Cheshme Ali, Giyan, and Khuzistan by both French and American expeditions during the first third of the present century. The earliest occupation was at Sialk I dated to 5500 B.C. (Ghirshman 1938, 1939). No other attempt was made until 1949 when Coon started his cave exploration at two caves on the Caspian foreshore. Unlike traditional approaches, he focused on the subsistence pattern of the inhabitants of the cave, whose seventeen layers showed the development from hunter gather to the later Neolithic and historical periods. His absolute dates using the newly developed Carbon14 method, pushed the Neolithic of Iran back to 6100 B.C. (Coon 1951). The archaeology of Iran received particular attention from 1960 onwards which has considerably altered the direction of research. The main reason was the genesis of new hypotheses concerning the transition from a Palaeolithic to an agricultural way of life. Here a short review will be made only of Childe's and Braidwood's hypotheses.

Childe introduced the term 'Neolithic Revolution' to describe the origin of food production and its consequences (Childe 1952: 23), making archaeologists aware of the importance of the transformation from hunting and gathering to food production. This revolution took place in the Near East during the post Pleistocene period from about 10,000 B.C. Childe formulated the 'oasis' or 'propinquity' hypothesis for the invention of agriculture centres. He believed that under the effects of a major climatic change much of the Near East began to dry up. The hunters, gathers and animals were forced to take refuge near the rivers and oases that had not dried up. Plants continued to grow only near sources of water. Because of the proximity of the plants, animals and humans, people had the opportunity to recognise their behaviour, and subsequently domesticated them (Childe 1952: 25). Mesopotamia and Palestine were the first places in the Near East where archaeologists began to excavate Neolithic sites to test the Childe hypothesis.

Two projects were conducted by Braidwood at Jarmo in Iraq and Kenyon at Jericho in Palestine; both were of special importance during the early post World War II period. Braidwood organised an archaeological expedition to seek evidence concerning the early stages of farming, partly in reaction to Childe (Braidwood et al. 1960:2-3). He gathered around him an interdisciplinary team of both archaeologists and natural scientists supported by the Oriental Institute of the Chicago University, establishing an approach that has since became standard. Braidwood was influenced by Peak and Fleure, who had formerly claimed wheat and barley must have been domesticated firstly in the 'Fertile Crescent' (Redman 1978:95).

Braidwood's excavations and additional site surveys in Iraq (1945-55) and Iran (1960) achieved significant results that led him to formulate his thoughts about the origins of agriculture, an hypothesis that has come to be known as the 'Natural Habitat Zone' or 'Nuclear Zone hypothesis'. In contrast to the Childe hypothesis he first concluded that there has not been significant climatic change in the past 12000 years (Braidwood and Howe 1960: 181; 1962: 142-3). He initially argued for a 'Nuclear Zone', a place where the animals and plants could have existed in the wild state. So the piedmont hills and lower intermontane valleys of the Zagros-Taurus arc of mountains was an ideal location for food producing (Braidwood 1958: 1426-

1429). For him the development of an agricultural way of life seems to have occurred as the 'culmination of the ever increasing cultural differentiation and specialisation of human communities'(Braidwood 1960a: 132). Around 8000 B.C. the inhabitants of the hills around the Fertile Crescent had come to know their habitat so well that they were beginning to domesticate the plants and animals they had previously been collecting and hunting. But, starting in 1962, because of the many excavations on the new sites and increasingly more accurate data supplied by natural scientists, he began to alter the geographic limits of the 'Nuclear Zone' to include the highland of Anatolia and the hilly region of Lebanon and Judaea (Wright 1971:457).

The second project testing the Childe hypothesis was undertaken by Kathleen M. Kenyon when she began to excavate at Jericho in 1952. Her description of 'brilliant green oases in the arid land' (Kenyon 1954: 121) of the Levant as the primary location of the agricultural revolution seemed to support Childe's position. During 1960 and later, different Neolithic sites were excavated in both the lowlands of the Levant and the foot hills of the Zagros; the majority of them fit into Braidwood's 'Nuclear Zone' whereas no one excavated in dry rivers or near oases (Redman 1978:97). It seems that the hypothesis of Braidwood was victorious over Childe's in the war of ideas .

During the two decades of the 1960s and 1970s additional excavations on sites of the Near East provided a major contribution to our knowledge of Neolithic culture: Mellaart carried out the extensive excavation projects at Hacilar and Çatal Huyuk in Turkey (Mellaart 1961; 1967). In Mesopotamia Tell-Essawan (Abu al Soof 1968) Chogha Mami (Oates 1969) and Yarim Tepe (Merpet and Munchaev 1973) were excavated. At the same time in southern Jordan and Syria the famous site of Beidha was excavated by Kirkbride (1966), de Cotenson (1971) excavated at Tell Ramad and Vanloon (1968) at a site near the Euphrates in Syria.

Such excavations on Neolithic sites did not appear in Iran until the 1960s when Braidwood's expedition under the Iranian Prehistoric Project came to seek for the world's first farmers in Persian Kurdistan (Braidwood 1960b). The initial aim of this project was 'the reclamation and interpretation of evidence for the earliest appearance of an effective food producing and village- farming communities way of life' (Braidwood et al. 1961: 2008). He started his work at two small mounds (Asiab and Sarab) in the western part of Iran :

Asiab was a small low mound, that was an encampment of intensive food collectors, whose flint industry was somewhat more developed than that of Karim Shahirian in Iraqi Kurdistan. The sounding also yielded items in stone and numerous small clay objects, including a few fragments of figurines. Other artifacts in the Asiab assemblage include beads and pendants. No evidence bearing on architecture was found expect one round shallow basin which was interpreted as a floor of some kind of semi-subterranean structure. Remarkable objects in Asiab were great quantities of coprolites, regarded as an invaluable clue to the diet of people who were hunter-gatherers. Braidwood suggested a date for Asiab of between 9000 and 7000 B.C. (Braidwood 1961: 3-7).

A further phase of the early food collecting culture is seen at Tepe Sarab. There no mud walled architecture was found, but the site contained the remains of pit dwellings. The 'Sarab Venus' and other forms of figurines were made of baked clay. Painted pottery, flint and obsidian objects could be compared to those of

Jarmo in Iraq. Sarab showed the presence of domesticated goats, but there was a great concentration on shells of a local land snail gathered for food. Sarab's position indicated that it may be an early village farming community (Braidwood et al. 1961: 2008-9).

In 1963 a major excavation project took place by F. Hole's team in the Zagros area. He conducted the most significant excavation at Ali Kosh, a Neolithic site in Luristan. Remains at Ali Kosh and an adjacent mound have been subdivided into seven phases; the three initial phases were occupied by Neolithic people: Bus Mordeh; Ali Kosh; and Mohammad Jafar. Bus Mordeh is the earliest phase and dates from 7500 to 6750 B.C. The diet was a combination of wild and domesticated resources both plants and animals. The settlement of the Ali Kosh phase from about 6750 to 6000 B.C. proved to be larger than the earlier phase, and the development of architecture, domestication of animals and plants, and artifacts suggested that the community of Ali Kosh was a permanent village. The last phase of occupation dates from 6000 to 5600 B.C., characterised with the innovation of substantial agricultural tools, the introduction of pottery, and new building techniques (Hole et al. 1969). The initial result of the Ali Kosh project took the Neolithic culture of Iran back to the eighth millennium B.C. and introduced to Iran modern archaeological techniques. The systematic excavation, using flotation and careful sieving, enabled excavators to obtain a large quantities of plant and animal remains. This material formed the basis for the reconstruction of the economy of Ali Kosh. Finally Hole and Flannery were able, on the basis of the results, to offer a model for the beginning of agriculture in the Near East.

Throughout the 1960s and 1970s several successive excavations brought more Neolithic sites to light, especially concentrated along the Zagros range:

Dyson and Young conducted an excavation at Hajifiruz in Azerbaijan in 1960 (Dyson and Young 1960), continued by Voigt in 1968 (Voigt 1983). At the same time when Burney was excavating at Yanik Tepe (Burney 1961), other sites in Luristan such as Tepe Guran (Mortensen 1963), Gang Dareh (Smith 1968) and Tepe Abdol Hossain (Pullar 1973) came under excavation.

The most important excavations outside of the Zagros range occurred in the south-eastern part of Iran directed by Lamberg Karlovsky at Tepe Yahya in 1967 (Lamberg Karlovsky 1969). Another site in a marginal plain of the central desert was Tepe Zaghe excavated by Tehran University (Malek Shahmirzadi 1977).

Among the various Neolithic sites, Gang Dareh has a important role, because the oldest settlement (Level E) at this site is so far without parallel. Carbon 14 dates suggested that the date of this settlement lies in the middle of the eight millennium B.C. making it the oldest Neolithic site in Iran, with the earliest pottery in the Near East (Hole 1987a: 49; Redman 1978: 169). Level D dated from 7500 to 7000 B.C. was characterised by long plano-convex bricks used in rectilinear buildings, that may have been constructed in two storeys. The evidence of this level showed the economy of people at this era was based on domesticated goats and plants (Smith 1972). Apart from the excavations mentioned above, this period is characterised also by substantial surface surveys, concerned with the Neolithic Iran. One was led by Wright to investigate the relationship between climatic change and the introduction of agriculture. He initiated research on pollen analysis, sampling Lake Zaribar in northwest Iran, producing a sequence dated from 21000 to 9000 B.C. He concluded that the climate of this region before 9000 B.C. was cooler and probably drier than today (Wright 1968, see also chapter 4 for detail). The second was made by Adams who surveyed the region of Khuzistan where the successive cultures are more easy to recognise than in other areas. He located about 130 new sites, some of them dated to the sixth millennium B.C. (Adams 1962).

These sophisticated researches concerning Neolithic Iran have indicated the significant role of this region, when Neolithic archaeology filled in a major gap of Near Eastern archaeology concerned with the introduction of agriculture. In comparison with the Levant and Mesopotamia we are still a long way from resolving the problems, and there are many gaps to be filled (Smith 1971: 13); however, archaeologists in Iran have produced large amounts of data that give a wider perspective of prehistoric life in the Near East, as well as providing the basis for hypotheses concerning the origins of the agricultural way of life. Perhaps it is relevant to note here that there are at least three hypotheses that have been formulated directly on data gathered from Iran:

Population Pressure Hypothesis proposed by Smith and Young (1982); Marginal Zone Hypothesis, suggested by Binford and refined by Flannery (1969); Neoclimatic Change Hypothesis formulated by Wright (1968; 1976). This brief study cannot deal them with detail.

4.3 Bronze Age Archaeology

As mentioned before, the appearance of the so-called 'Luristan Bronzes' on the art markets in the 1920s stimulated archaeologists to search for their origin. In the late 1930s major excavations were carried out for this end. Soon after the end of the Second World War, two important sites of this period, Tureng Tepe (Wulsine 1932) and Geoy Tepe (Burton-Brown 1951), were excavated and have appreciably increased our understanding of the third and second millennium B.C. occupation of Iran.

The most important excavations occurred for the first time in the south-eastern part of Iran such as those conducted by Caldwell at Tel-i-Iblis (Caldwell 1960); Tosi at Shahr-i-Sokhta (Tosi 1969); and Lamberg Karlovsky at Tepe Yahya (C. and Marta Lamberg Karlovsky 1972). At the same time comparable excavations were conducted in the western part of this country by Delougaz and Kantor at Chogamish (Delougaz and Kantor 1973); Vanden Berghe at various sites in Luristan (Vanden Berghe 1973); Negahban at Haft Tepe in Khusistan (Negahban 1969); and Sumner at Tepe Malyan (Sumner 1974).

The successive excavations in south-eastern Iran brought to light traces of many unknown cultures from the Neolithic to the Historical period and produced strong evidence for organised trade patterns, linking areas to the west (Mesopotamia), the east (Indus Valley), and the south (the Persian Gulf). It seems that the internationalism of the Elamite Empire (Lamberg Karlovsky and Kohl 1971: 21), and the growth of the political and economic power of their kingdom in the mid-third millennium B.C. onwards, forced Sumerian trade into new channels. These sites in south-eastern Iran specialised in the provision of specific resources: smelted copper objects at Iblis; steatite objects at Yahya; and Lapis Lazuli objects at Shahr-i-Sokhta; and they played a substantial role in regional exchange and controlling long distance trade routes between Mesopotamia and the Indus Valley. For further information see: Burney 1977:147; Herrmann 1968; Lamberg Karlovsky 1972; Kohl 1974.

Work on the Bronze Age period in the west part of Iran was complemented by extensive surveys. Sumner in his excellent excavation and survey in the Marvdasht plain concentrated his attention on population growth and the development of state organization (Sumner 1979) as well as the economic and political system of the Bronze Age community.

4.4 Iron Age Archaeology

Although the Iron Age in Iran is the shortest archaeological period (1250-550 B.C.), within this short span the amount of excavation carried out has been greater than for other periods. Over thirty Iron Age sites in Iran have been excavated, most of them after 1960. Research on the origin of the Iranian culture, its materials and dating and its appearance on the Iranian Plateau, was initiated by Ghirshman's work at Tepe Giyan in 1931 and then at Tepe Sialk in 1933. After the Second World War he also excavated the Persian Achaemenid village in Susa (Ghirshman 1954). The differences between strata, and the appearance of the new grey ware (grey black ware) enabled him to compare the various sites, and suggest when the Iranian culture reached the Plateau. He concluded that the first migration came from the Caucasus at the end of the second millennium, and the second migration at the beginning of the 1st millennium B.C. For a full account of his hypothesis see Ghirshman 1954; 1977. The next step, to solve the Iranian migration problem, was taken by Dyson in 1957, when he started a major programme, the so-called 'Hasanlu Project' that continued until 1977. The main aim of this project was to establish a basic chronology and to study the little-known pre-and protohistoric period of Azerbaijan in northwest Iran. A series of other settlements adjacent the main Hasanlu Tepe were excavated in order to confirm the sequence and to fill in gaps.

The extensive surface surveys undertaken by Young, as a member of the Hasanlu Project, and the following excavations, revealed Hasanlu as an 'anchor' and as the 'Iron Age par exellence' (Levine 1971: 40) in western Iran, a position that it still retains. For more information about the Hasanlu Project see Dyson 1961; 1964; 1972; Burney 1972. In 1962 Stronach began to excavate at Passargad as the final point of Iranian migration (Stronach 1978). An important excavation was organised by Young at Godin Tepe from 1965 to 1973 (Young 1967b). At the same time Stronach dug at Nushjan Tepe (Stronach and Roaf 1978), and Goff started to excavate at Babajan (Goff 1969), two important sites of the period of the Medes. At that time Vanden Berghe was also excavating at cemeteries of Pusht-i-Kuh, Luristan. While much work continued in the central and northern Zagros, other areas with Iron Age evidence excited attention and Iranian archaeologists for the first time conducted several expeditions independently, for instance, the excavation of Marlik Tepe (Negahban 1965) and the large Iron Age cemetery at Gheytaryeh (Kambakhshfard 1969).

Summarising: by the beginning of the seventies major archaeological excavation had started and succeeded in identifying the Iron Age of Iran, in particular in the northwest and western part of this country. The typology of pottery was the basis to classification and interpretation, specially the grey black ware, regarded to have been an indicator of the first Indo-Iranian tribes. Two hypotheses were formulated by Young and Dyson to establish the date and routes of the Iranian migration into the Plateau. Young divided the Iron Age period within three horizons, each characterised by a specific pottery technique: the early western grey ware horizon; the late western grey ware horizon; and a late buff ware horizon. He concluded that the changes in material culture in the strata prove the arrival of a new population. Then he proposed an east-west movement rather than a north-south one, as suggested by Ghirshman (Young 1965; 1967a). Although his conclusion on routes of migration is not the same as Ghirshman, their dating of the first migration in the last century of the second millennium (about 1300/1250 B.C.) was in agreement.

Dyson on the basis of the development of the material culture came to similar conclusions as Young but he replaced Young's ceramic horizons with the periods of Iron Age 1, 2, 3 (Dyson 1965). Though the division of the Iron Age Iran into three periods has been accepted by most researchers (Iron Age 1 approximately 1300/1250-1000; Iron Age 2 1000-800/750; Iron Age 3 750-550 B.C.), the debate about where the Indo-Iranian came from and how they migrated still remains unresolved.

4.5 Historical Archaeology

Until 1950 our knowledge about the Medes, the first Iranian dynasty (728-550 B.C.), was completely based on indirect and secondary, sometimes highly biased sources including the Assyrian and Babylonian texts and the later writings of Herodotus. In the early 1900s scholars such as Buckingham (1829) attempted to find the Golden City of the Medes in ancient Ekbatan on the basis of Herodotus' narrative. Throughout the nineteen century scholars such as Rawlinson (1865) used all those unreliable sources to synthesise the Median period. But the lack of Median written sources resulted in contradictory conclusions and major disagreement. Excavations conducted in the late 1950s and throughout the 1960s and 1970s in Azerbaijan shed new light on the Median period. The important excavations of the Hasanlu and Godin Projects, as well as the Nushijan and Babajan projects, yielded significant architectural data as well as pottery and iron objects. These data were able to contribute to the questions of Media as the origin of the first Iranian tribal migrations to the Iranian Plateau.

Unlike the Medes, Achaemenid archaeology was always a lively and controversial field from the early 1900s up to present. Magnificent architectural remains of their empire (550-331 B.C.), the fine glazed and unglazed tiles, and large inscribed reliefs were found at the Achaemenid capitals of Susa, Persepolis, and Passargad. Susa itself has been excavated continuously for about a century under French excavators. The Oriental Institute of Chicago University has explored Persepolis, while the British Institute of Persian Studies has excavated Passargad. These excavations were followed by Iranian archaeologists providing detailed information about Achaemenian art and history.

Despite extensive excavations, research and publication which have increased our understanding of the official and propagandistic art of the Achaemenid rulers, their empire was built upon the subjection and the suffering of many people (Nylander 1971: 51), but no research has yet been done to reveal the every day life of these commoners.

In the case of the Partho-Sassanian period (250 B.C.-642 A.D.) archaeologists were attracted to a brilliant art and architecture, when the publications of Ghirshman at Bishapur, Ivane Karkhe, Barde Neshandeh and others brought them to light. Although these early conventional and to some extent commercial works were enormously destructive to the archaeological record (Keal 1971: 56) they introduced this period to new practitioners, who developed new standards of excavation on Partho-Sassanian sites as early as 1960. Several occupation sites of this period in western and south-western Iran have been systematically excavated, including Jundishapur (Adams and Hansen 1968), Qasr-i-Abunasr (Fry ed. 1973), Qale Yazdigird (Keal 1967), Shahr-i-Qumis (Hansman and Stronach 1974).

Much of the archaeological evidence, in fact, came not from excavations, but from systematic regional surveys. Wenke (1987) used survey data to study the cultural complexity, and political and economic aspects of this period. In addition, the availability of extensive documentary sources such as inscriptions and early Islamic texts, besides archaeological evidence, enabled some archaeologists such as Vanden Berghe (1993) to reconstruct a outline of Partho-Sassanian culture history.

4.6 Islamic Archaeology

Up to 1960 the field activities concerning the Islamic period have been carried out by the French expedition at Susa, followed by the American expedition under the leadership of Schmidt at Estakhr and Ray, looking for pre-Islamic remains; the wealth of Islamic finds has only been reported in summary. These excavations were followed by those of another American team at Nishapur, northeastern Iran, from 1935 to 1947. This excavation though initially planned to recover valuable Sassanian artifacts, produced a large amount of artistic material as well as evidence of a flourishing urban settlement dating to the eleventh century. Although the classification of Nishapur pottery produced by Wilkinson (1973) has become a standard reference, the concentration on aesthetic aspects of art has meant that his work has not transcended simple description.

The first systematic excavation of an Islamic site did not take place until the late 1960s, when the British Institute of Persian Studies carried out extensive field work under Whitehouse at Siraf on the Persian Gulf from 1966 to 1974. This excavation exposed a number of interesting buildings, ceramics and small finds (Whitehouse 1970, 1971, 1972, 1975). There were also a few small scale excavations on the Islamic sites, such as excavation of Williamson at Tepe Dasht-i-deh (Williamson 1971), Bivar and Fehervari at Ghubaya (1972), and Bulliet at Nishapur (Bulliet 1976); none has been published in detail.

To sum up, the study of Islamic art and archaeology in Iran is primitive and undeveloped and certainly cannot be compared to the achievements of historical archaeology. A major reason for this is that Islamic archaeology has been never problem-oriented; it does not seek to resolve questions by excavation, though the innovative work at Siraf tended to solve certain problems of trade by demonstrating the distribution of trade objects (Whitehouse 1983) and focused on social differentiation in an Islamic urban community. But it will not succeed unless a large number of other sites can be excavated. The second reason lies in its novelty, which means its practitioners have been, and still are, remarkably few. The final reason comes from the lack of governmental encouragement in the pre-Revolution period, which directed research orientation to historical periods; no Islamic site has been subjected to complete excavation by Iranian archaeologists, but there have been very short term rescue excavations on many threatened sites. Today, despite the greater attention being paid to Islamic sciences, because of the overall deficiencies of archaeology in Iran (see discussions of following chapters), as in other fields of archaeology, no development can be seen in the archaeology of this period.

Chapter 2

A View of Theory in Contemporary Archaeology and the Iranian Perspective on Theoretical Archaeology

1. Introduction

The abundance of information available about the past, and the growth of unscientific interpretations by people outside academic archaeology, require careful thought by archaeologists. The building of theoretical frameworks remains a prerequisite of serious research. Some archaeologists still consider that they examine data objectively, and "let the facts speak for themselves". The majority now develop a conscious theoretical approach and collect data or explore existing information with an explicit theoretical framework in mind and a clear problem orientation. Theoretical frameworks are now developing rapidly, according to the advances of research. Unlike the 1960s and 1970s when the hottest area of debate was between traditional and "New Archaeology", discussion now centres upon the applicability of rival theoretical approaches. Many archaeologists (in Iran) especially those who are working in historical periods, still regard archaeological theory as a sub-discipline that may be ignored. Their mistake is to overlook the fact that all investigation of the past involves a theoretical perspective. We are products of a social environment that has conditioned our view on the world, and our view of the past is influenced by our perception of the present. In fact, our very choice of research topics probably reflects our personal options (Trigger 1989: 410). Awareness of archaeological theory allows us to acknowledge this problem, even if there is very little that we can do about it. It also help us to perceive our own points of view clearly, and to guard against an unthinking imposition of our own values and preoccupations on ancient societies. Since most branches of archaeological theory have their roots in philosophy or other disciplines such as sociology or anthropology, they offer the possibility of gaining new insights into familiar aspects of the past. Theory does not provide answers, but it suggests a wider range of interesting questions that revive existing data and encourage a search for new and better information. This chapter will not attempt to explain the current state of archaeological theory in general, but rather it is an analysis of the current state of theoretical archaeology in Iran, in order, on the one hand, to demonstrate the important reasons for such non-theoretical archaeology in Iran, and on the other hand to reflect the maturity of the subject and the principal ideas which Iranian archaeologists will inevitably need for their future development.

2. Development of theory and current issues in theoretical archaeology

After the Second World War archaeology was still a small field. By the fifties and the sixties it was expanding rapidly and taking a more scientific approach. At that time great advances were made in bringing science into archaeology, through new dating methods, a multi-disciplinary approach, experiments with the use of statistics, and devoting substantial attention to increasing the precision of artifact classification. In the United States as the birth place of the 'New Archaeology' there was an increasing emphasis on environment, other cultures, and people-oriented disciplines. Anthropology and archaeology grew markedly because of these trends, and archaeologists were urged to become concerned with sociological issues - the people behind the artifacts.

It was during these decades of rapid change that many of the main concepts of the 'New Archaeology' made by scholars such as Walter Taylor (1948), Julian Steward (1955), Leslie White (1959), and Albert Spaulding (1960) entered the literature. But the person who quickened the 'New Archaeology' movement was Lewis Binford who incorporated earlier lines of thinking with an explicit concern for scientific methods and field research design. He wrote a series of powerful methodological articles setting the guidelines for the 'New Archaeology' (1962, 1964, 1965, 1968). Through the work of Binford himself and his students, much of the 'New Archaeology' programme has survived and has become the mainstream of archaeology. Perhaps the most important impact of 'New Archaeology' is its demands for a clear archaeological methodology in formulating both research design for the field and analytical strategies for interpretation of results. There is now universal agreement that explicit questions have to be formulated and a research design established before archaeological work is carried out. Other characteristics of the 'New Archaeology' are the recognition of the diversity of material needed to support an interpretive proposition, the increasing use of sampling in many aspects of field and laboratory work, and the growing reliance on statistical procedures. The 'New Archaeology' offered a greater change to the methodology of archaeology by emphasising a systemic view, for example, of culture, as a series of interrelated subsystems affected by ecological phenomena. This relationship sought confirmation in examining the various data defined and sampled through extensive research designs. Emphasis on examining variability among data led scholars to devise special procedures for understanding artifact typologies and experimentation with artifact classes. The 'New Archaeology' has also had a considerable impact on the professional structure of archaeology. It caused the establishment of new departments of anthropology and archaeology in universities throughout the United States and resulted in opening the door for young scholars to make significant contributions to the field. Many of the people who trained professionally in the seventies during the 'New Archaeology' period, are now involved in public archaeology. Their methodological and philosophical focus has been on developing data recovery strategies and management principles. Its emphasis on research design and hypothesis testing is fundamental in much of public archaeology today (the following references give a detailed information about the concept and development of the 'New Archaeology', for example; Binford 1972, 1989, Clarke 1978, Renfrew and Bahn 1996, Trigger 1989, Watson et al. 1971, Willey and Sabloff 1993).

Further developments of the 'New Archaeology' have involved ethnoarchaeology, experimental studies and other ways of giving adequate meaning to the archaeological record, a series of approaches often called 'middle-range theory' (see Schiffer 1976). The study of the material of the archaeological record, chemical and physical analysis of material, combined with the objective of discovering behavioural patterns through various systematic analytical approaches, allowed for multiple steps of interpretive results. In terms of distribution studies, models and techniques taken from geographical and ecological science allowed a richer explanation of observed patterns.

Most of the elements of the 'New Archaeology' are contained in expressions such as process, system, explanation, laws, hypothesis, and testing. Systems theory provides a useful way of studying the interaction between various parts of a society and its environment. Hypothesis formulation and testing reflects an interest in scientific theory and the use of statistics. The greatest drawback in the 'New Archaeology' is the question of laws, and the assumption that such laws not only exist, but can be detected archaeologically, is fundamental to the tenets of the 'New Archaeology'. This grand goal led to a criticism and active debate among the "New Archaeologists" themselves about how realistic their objectives were (see for example, Clarke 1973, Flannery 1973, Hodder 1992, ch. 2). As Glyn Daniel has stressed, the hope of discovering laws of cultural dynamics in archaeology and anthropology is perhaps a vain one, doomed to failure (1981: 192).

The leading supporter of the 'New Archaeology' in Europe has been Colin Renfrew who has maintained the emphasis on generalisation and explanation (Renfrew 1982). He gave a clear exposition to systems theory as an explanatory method in his analysis of the growth of Aegean civilisation. The ideas of American neo-evolutionists such as Service (1962) with his schematic typology of band, tribe, chiefdom and state were introduced and applied to European case studies and opened up to a new model of archaeological research and writing. This model stressed the process of social and economic change within a systems theory framework, with a particular interest in exchange, ritual monuments, settlement patterns, and central places (Renfrew 1982) as the evidence for those processes in the archaeological record. The methodology used depended greatly on scientific techniques, on quantification, and on geographical and mathematical models

(Renfrew et al. 1982: 287-421). The kind of archaeology advocated by Renfrew from the late 1960s onwards has dominated the discipline of archaeology in Britain. This is the so-called 'Processual Archaeology' with its emphasis on social and economic processes, its systemic view of culture, and its acceptance of neo-evolutionary social typologies, employing a methodology containing all the new scientific, mathematical and geographical techniques.

Many archaeologists did not adopt completely all aspects of the Processual (New Archaeology) thought, and there was always certain amount of criticism. The volume and influence of criticism increased greatly in the 1980s, especially in Britain. The term 'Postprocessual' covers a variety of approaches that are different in many ways from Processual thought and practice. The most prominent of these critiques originates in the works of Ian Hodder (1982a, 1982b), who coined the term Postprocessual Archaeology, and his students at Cambridge. This theory grew up from larger discussions of poststructuralism and postmodernism in France and Britain. "Postprocessual Archaeology" argues that 'Processual Archaeology' has paid insufficient attention to the social context of archaeological research and has focused too much attention on method, ignoring meaning and progress, both in the past and in the present (Patterson 1990: 191). Three main strands in post-modern, Postprocessual theory, at least in Anglo-American debates (Patterson 1990, Champion 1991, Hodder 1991a, 1992, Preucel 1991, Trigger 1991a), are the radical post-structuralist works of Shanks and Tilley (1987a, 1987b, 1989, Tilley 1991, Shanks 1992), the work in the U.S.A. by Leone and others which draws upon critical theory (Leone 1986, Leone and Preucel 1992), and Hodder's emphasis on the social context of theory (Hodder 1986, 1988, 1989a, 1989b, 1991a, 1992). All three strands of Postprocessual theory ask archaeology to build a reflexive process into its practice and into the structure that formulates its interpretations. One of the major contributions to the debate has been the recognition that archaeological observations are laden with theory and embedded in society. This is why a politicised archaeology should recognise the diversity of interests in the past outside archaeology.

In general Postprocessualists identify four major problems arising from Processual approaches, including:

(1) bad practice in the use of formal techniques (e.g. computer and statistics), and a heavy emphasis on the results of statistical approaches;

(2) philosophical models used for theory and practice are now seen to be problematic;

(3) there was insufficient attention to the problems that arise in trying to connect archaeological observables with the entities that interesting theory is about;

(4) Processualists tended to adopt unsatisfactory socio-cultural theory (Cowgill 1993: 552-3, Hodder 1992, ch. 1, 7, Preucel and Hodder 1996a, ch. 1, Hodder 1982a).

Some of the objections to the basis of Processual Archaeology and the kinds of explanation of the past which it offers, concern its functionalist account of human cultural and social organisation, reducing a large amount of human experience to mere adaptation to environment. Material culture is more than just a tool for survival or an information system for efficiency of adaptation. The adoption of a systems theory approach to explanation has also denied the active role of the individual, who was largely neglected in the discussion of system and subsystem as the key explanatory units. Furthermore, it fails to describe the cause of social change within society; systems theory relies on factors such as environmental change and population growth, as external or independent variables not subject to social factors (Champion 1991: 134, Hodder 1992: 34).

'Postprocessual Archaeology' takes different elements from Structuralism, Phenomenology, Poststructuralism and Critical Theory as well as Marxist social thought. In Britain, the birthplace of Postprocessualism, it is Ian Hodder at Cambridge University who is the pioneer of the Postprocessualist studies just as Binford led 'New Archaeology'. Hodder's early contributions to archaeology were in quantitative methods and locational analysis (Hodder and Orton 1976). Hodder has said that he was led to a new way of thinking which differs from that of 'New Archaeology' as defined by Clarke. He was able to devise sophisticated quantitative methods to describe the distribution of archaeological artifacts or phenomena. He initially chose East Africa for an archaeological investigation of the spatial patterning of artifacts in relation to the ethnic boundaries. He then turned his attention to the study of material objects, symbol systems, and their contribution to archaeological interpretation. In examining ideas about spatial patterning of material culture, he found that his observations contradicted these ideas. For example, rather than more interaction between groups causing greater similarity of artifacts, he noted that the nature of the interaction and the degree of competition constitutes ethnic group distinction. He also found that the symbolic patterns and the cultural meanings of items such as spears carried by young unmarried men and the calabashes decorated by young married women determine the form and distribution of these items within and beyond a single society (Hodder 1982: ch. 4, 1991b: 101-119). Hodder's ideas are still leading in two directions: first, to investigate generalities about human existence; second, emphasis on ethnoarchaeological studies in order to put the objects being investigated into a richer context. He claims that (1991c) :

(1) the past interpenetrates the present and future;

(2) different parts of societies represent different ideas of the past because of the existence of the different conceptions of the past within society;

(3) discourses about the past reflect the relation of power and authority that exist within society;

(4) the archaeological record is an objective structure; it both shapes and constrains interpretation of its significance;

(5) the middle-range theories encouraged by Processual archaeologists are inadequate.

A second criticism to the 'New Archaeology' comes from the writings of Poststructuralists such as Shanks and Tilley (1987a, 1987b, Tilley 1991, Shanks 1992). They are arguing about a realistic past which implies that the observable is generated and partly explained by unobservable relationships or processes. They claim that:

(1) archaeology is an interpretive practice which takes place in the present and brings the past to present;

(2) there are various versions of archaeological understandings of the past which reflect present-day power relations;

(3) archaeology should use dialectical approaches to establish the grounds for inquiry in general, for communication, for inquiry into other societies and cultures

and investigation of objects. The dialectical approach is necessary not only to establish the relations of meaning, knowledge, and explanation, but also to address issues of power, ideology, structure and so on;

(4) by rationalising the discipline in terms of methodological procedures this will produce more objective views of the past than 'Processual Archaeology' which placed the practice of science outside the society in which it occurs;

(5) archaeologists should challenge the established social order and forms of power and knowledge, and they should also attempt to establish situations in which their expertise can be used to combat ideas of superiority.

The third 'Postprocessual Archaeology' was introduced by Leone and others (Leone et al. 1987, Leone and Preucel 1992). They argue that:

(1) archaeological practice and archaeology as ideology are part of the present and reveal the historically specific nature of concepts like rationality, analytical frameworks and knowledge;

(2) there is a need for critical assessment of both the analytical framework and knowledge;

(3) there is a need to examine ideology and forms of social categories which shaped human action in the past. They may not be directly visible from the social relations and the dialectical link between them and political economy;

(4) in order to understand the relationship between the past and present it is necessary to examine the history of ideology.

'Postprocessual Archaeology' differs from the Processual 'New Archaeology' over a number of issues:

One point concerns methodological objectivity. Some Postprocessualists believe that there is a little chance of obtaining an objective view of the past with present approaches, because archaeological excavation is destructive of contextual relationships. If we do not have an effective method for understanding these relationships, it could be argued that all excavation should stop (e.g. Miller and Tilley 1984). On the other hand, as they argue, belief in the lack of objective reality is often diminished once an archaeologist spends substantial time doing fieldwork, and that it sometimes can lead to delusions in the other direction. This encourages the viewpoint that if we expect objective work, precise measurements should be used during fieldwork and laboratory analysis. Despite this claim, the consistency of much of the material which has been systematically collected during fieldwork and reported in recent decades, has led most archaeologists to accept it as a sufficiently objective set of data to serve as the basis for interpretation and further research (Renfrew and Bahn 1996: 43).

Second, Postprocessualists say that it is essential to put archaeological objects in the context of ancient meaning. They have made some interesting new contributions in this area by seeking contextual relations. Though this was a primary concern of the 'New Archaeology' to see objects, features, and sites within their systemic and ecological contexts, many examples of their work in this respect reflected a simple materialist-functional viewpoint. The main contribution of Postprocessualists is to expand the definition of context to include wider symbolic and social contexts (Hodder 1992, ch. 7, Preucel and Hodder 1996b: 300-307).

Third, an important drawback of the 'New Archaeology' is its over-emphasis on validation and efforts to be objective (Shanks and Tilley 1989, Hodder 1987). This approach requires that knowledge comes from a dialogue between subject (investigator) and object (the archaeological record), and accepts the existence of a set of methods for determining truth, rationality or reality. They seek objectivity by applying the same methods, observational techniques, standards of evidence and criteria of validity, as are used in the natural sciences. The Postprocessualists encourage the more realistic view which asserts the necessity of understanding and explaining the unobservable relationship and processes that produce what is observed.

Fourth, the approach to the role of material culture in 'Processual Archaeology' has not been properly recognised. Processualists have regarded evidence consisting of material culture items as the passive remains of past behaviour, and the main goals of archaeologists were to find methods of translating these surviving remains into past behaviour. Despite many studies on the social and physical processes relating present material to the past (e.g. Schiffer 1976), the basic role of material culture as the passive remains of the past was not seen as a critical problem. Hodder (1982b) through his ethnographic study has argued that material culture should be seen as having symbolic meaning and as active, creating social relationships; clothing, for example, performs not just a functional need of providing protection against the environment, but also has a symbolic meaning and is part of an active social strategy; thus the emphasis should be on the meaning, not the function of material culture, and that meaning will be specific to the social and historical context of usage. In this respect the archaeological record is not a passive reflection of past behaviour, but it creates a meaningful part of past social behaviour. In order to understand it, it is necessary to find ways of interpreting the meaning of past cultures.

An approach to solve this problem comes also from the contribution of Miller and Tilley (1984) by their emphasis on the concept of ideology and of symbolic meaning. They argued that ideology is an important part of social reality and a part of the principles in terms of which individuals organised their lives and their actions and therefore it becomes an integral part of the past which archaeologists should be seeking. In this methodology they tried to link the interpretation of the symbolic meaning of material culture with explanations of social organisation and change.

Hodder's contextual approach (1986, 1992) is another way to address this problem. He distinguishes a contextual meaning for material culture where it derives at least part of its meaning from its context and preceding contexts. In this approach (which seems to be useful in dealing with historical societies rather than the more remote past), Hodder uses the kind of historical explanation derived from a historical approach. He regards the archaeological record not as evidence to make inferences but as a text which has to be read. An archaeological record contains some sort of objective account of the past, if we have the correct means of decoding it; we should think of the evidence of the past as a text to which archaeologists as readers give meaning (Hodder 1988, 1989a, Tilley 1990). In the historical period, because of the availability of non-material forms of evidence as sources of meaning, reading such material may be possible, but is impossible for remains from the distant past. Barrett (1988) showed the impossibility of this approach and has argued that we may understand how types of material culture were used by past societies and their roles in social relationships, but we cannot gain a real access to the actual meaning which past societies would have attached to their material objects.

Fifth, there are different views of the Processualists and Postprocessualists on the concept of culture. As early as the mid twenties Taylor, an American anthropologist, proposed a radical view of culture. He argued that culture is a mental phenomenon consisting of the contents of minds, not material objects or observable behaviour (Taylor 1948: 96, see also Dunnell 1986: 36). In his view cultural heritage consists of mental constructs, and its physical form is a property of the world of physics and not of culture. Material culture, according to Taylor, is not culture and is in fact two removes from the real thing: the locus of culture is mental, ideas in people's minds. Artifacts and architecture are the results of behaviour, which itself derives from mental activity. For Taylor culture (the first order phenomenon) is unobservable and non-material; behaviour (second order phenomenon) is observable but non-material; and only with third-order phenomena resulting from behaviour do we come to artifacts, architecture and other materials making up the archaeological record. This third-order consists only of objectification of culture and does not constitutes culture itself (Taylor 1948:100).

In 1962 Binford published an account of culture quite different from that of Taylor. For Binford, culture is "man's extrasomatic means of adaptation" (Binford 1962) to support human in a wide range of physical environments in space and time. For Binford culture documents the interplay of climatic, topographic, floral, faunal, geological, and other natural factors with hunter-gatherer-forager subsistence and technology. By this definition he attacked the traditional anthropological culture concept because it was not appropriate to his goals and practice as an archaeologist.

He tended to show little interest in the meanings of archaeological materials, and mentalist-idealist concept of culture. He viewed artifacts and associated non-artifactual ecofactual information as the essential means to interpret the dynamics of palaeoenvironment and human palaeoeconomies.

In contrast to Binford, Hodder began with the mentalist concept of culture. For him culture is mental (symbolic) material, social behavioural and the recursive relations among all three. For Hodder artifacts play an important role, and characterise human social encounters (Hodder 1991b, 1991c). Unlike Binford he is not interested in the subsistence patterns of prehistoric societies, rather he is interested in the meanings associated with artifacts and the role which they play in complex social actions and interactions. He believes that symbol systems are what distinguishes the human primate from all other species; symbol systems include and are shaped by material objects and architectural forms (Hodder 1982b).

In recent years there have been attempts by some scholars, particularly from the North America, to build a bridge between the basic themes of the Processual and Postprocessual archaeological theory and practice, to improve our understanding of the past. Redman is one of them, and he believes that though both approaches are obviously complementary, it is unlikely that there will be significant integration. He makes the suggestion that an ideal combination of the best of the two approaches is the best way we can expect, and recommends that (1991:304) "we encourage serious scholars to do what they are best at doing and to co-ordinate diverse thinking to form a loose, but lasting alliance for new knowledge of the past and present".

A similar discussion in this respect was published by Trigger (1991b) who characterises 'Processual Archaeology' as neo-evolutionism and ecological determinism, and 'Postprocessual Archaeology' as dealing the psychological and mental aspects of human experience. In his view the confrontation between the two ideas is in fact that between reason and culture. He argues that ecological, technological, and economic factors are external constraints on human behaviour, while cultural traditions are internal constraints. Because cultures are historical phenomena, the innovation of new concepts is strongly affected by earlier concepts and their history. The best means archaeologists have to get at the cultural meanings of historically related archaeological evidence is to develop a direct historical approach. On the other hand, he encourages archaeologists to study cultural traditions as well as their interactions with ecological or other external constraints imposed on human behaviour. Therefore he synthesises the ecological determinism of 'Processual Archaeology' with the psychologically oriented 'Postprocessual Archaeology'.

3. The impact of the 'New Archaeology' on the archaeology of Iran

The discussion that follows aims to characterise the methodological and theoretical aspects of the work carried out by American 'New Archaeologists' in Iran during the 1960s and 1970s. The question of why this trend has not led to a fundamental change in the traditional orientation of Iranian archaeology will be discussed later in this chapter.

Firstly an important point should be mentioned here, that Iranian archaeology from its origins in the French tradition up to the present time (about 150 years) has always been pragmatic, so that nowhere in the literature can one find a general definition of archaeology or a body of archaeological theory. This is in sharp contrast to American anthropological archaeology which has generated a large number of theoretical works (for theoretical themes of American archaeology, see Willey and Sabloff 1974, 1980, 1993, Binford 1977).

The American 'New Archaeologists' introduced the following approaches to Iran: (a) a multi-disciplinary approach; (b) the consideration of environmental factors; (c) the consideration of the values of ethnoarchaeology; (d) the employment of general systems theory (a systemic view of culture) with its quantitative methodology; (e) the concept of an explicit scientific method with hypothesis testing. These were the fundamental directions of the 'New Archaeology' of the 1960s in America (Willey and Sabloff 1974: 183-197) and at the same time in the Near East (Redman 1978) and Iran (for the case of Iran, see the bibliography cited in chapter 1).

In methodology the innovations of the 'New Archaeology' in Iran followed from contemporary theory in American archaeology. However, because of the typical characteristics of the archaeological approach of Iranian archaeologists (pragmatic rather than conceptual) emphasis on methodology prevailed over the development of theory. Before the arrival of the 'New Archaeology', traditional explanations of cultural change in Iran were based usually on (according to the Ghirshman school) factors such as art, religion, politics, history and typology. The 'New Archaeology' in contrast placed an emphasis on the environment and technology (such as the work carried out by Braidwood and his colleagues in Iranian Kurdistan, and by Hole at Ali Kosh). They applied sophisticated methods of recovery and scientific analysis. Such methods enabled them to recognise important evidence of environmental adaptations, subsistence systems, trade, and the like. In their interpretation of processes by which human society evolved over time 'New Archaeologists' focused on explanation instead of simply description.

The environmental approach with its concern for ecofacts and artifacts, and its goals of reconstructing past culture as part of the ecosystem concentrated on regional surface survey, especially simpler one-period sites, and settlement pattern studies. In excavation a large multi-disciplinary staff of environmental archaeologists such as ethnobotanists and zoologists attempted total recovery of floral and faunal remains through improved methods of sieving and flotation of excavated areas in order to analyse the food production economy (Hole et al. 1968). Palynologists attempted to determine the degree of climatic change (see chapter 4 for detailed information and bibliography). Urban geographers sought through 'central place' analysis to estimate population size for the region and to build models of exchange and distribution of products (e.g. H.T. Wright 1975).

The appreciation of the value of ethnography was relatively new. A general lack of anthropological training has prevented Iranian archaeologists from equipping themselves for ethnographic observations. Furthermore, the wealth of historical texts leads them generally to comparative methods which focus largely on a direct historical approach (see Flannery 1967 for a similar explanation). The first step of using ethnography as a tool of archaeology was taken by the 'New Archaeologists'. Their studies compared models of anthropology and prehistory with analogies drawn from the study of modern societies. Kramer (1982) studied a modern village in Western Iran to understand socio-economic change of the region in the prehistoric period.

The adoption of general systems theory (a systemic view of culture and focusing attention on various sub-systems by studying the nature and the extent of archaeological record as well as archaeological patterning as a reflection of human behaviour) has not been as widespread in Iran as it has been in contemporary American archaeology. In method this approach used the techniques of sampling, retrieval techniques (noted above) and multi-variate statistical analysis (for a general discussion on systems theory see Flannery 1968, 1976; Binford and Binford 1968; Clarke 1978). Such analysis only becomes feasible as computers are fully applied to the manipulation of archaeological data. Iranian archaeology has not used computers even simply as a mechanical tool to record basic information from field records. The initial computer programming of excavated material including pottery and other artifacts was employed by Lamberg-Karlovsky at Tepe-Yahya from 1971, but there has been little testing of results and no published reports of further developments (Lamberg-Karlovsky and Beale, eds., 1986, ch. 1).

An explicitly scientific method was a basic trend in the current American orientation. It assumed that the testing of general "covering laws" and the explanation of cultural patterning in the scientific sense should be the major objective of archaeology (Watson et al. 1971; Renfrew 1973). This viewpoint has not been adopted by the archaeology of Iran. An important reason for this failure may be the historical orientation of Iranian research that is not amenable to scientific (deductive) methods (see below). However, the general influence of this idea is seen in the development of research design, in the emphasis of problem solving strategies, and in the testing of hypotheses that increasingly characterised some American projects in Iran in the 1970s. These projects used natural sciences in areas such as radiocarbon dating, geological analysis of sediments, and the like, but other contemporary scientific methods such as the thermoluminescence and neutron-activation analysis capable of dating and studying the exact source of ceramics, for instance, have never been introduced into Iranian archaeology.

In summary, it may be said that perhaps the single most important contribution of the 'New Archaeology' to our field in Iran, is that it has raised the right questions. It has focused on the potential of archaeology for understanding cultural change in general, rather than emphasising on a direct historical approach. It has also brought to light mass of new evidence for the elucidation of a spatial-temporal range and succession of material culture in Iran. Despite this, there are some critical questions concerning the methodological and theoretical aspects of this approach for one who at the end of this century (after about 25 years after its application in Iran) reviews this important enterprise.

The first question concerns the 'New Archaeology's' uncritical application of method derived from New World sites to the stratified *Tells* of Iran (and in the Near East in general). It should be stressed here that much of the 'New Archaeology' in America was developed on single period sites in the arid Southwest. There the shallow and relatively simple deposits allowed a representative exposure, and produced stratified material. Interestingly, many of these sites were simply abandoned rather than looted and destroyed. They preserved *in situ* a large quantity of material even on the living surfaces. Finally, the cultures represented there were relatively recent, so that ethnographic approaches were capable of identifying relevant behavioural patterns between past and present. Indeed, few of these conditions are present at the Iranian *Tell* sites. It should be mentioned here that the *Tell* (a basic element of Near Eastern archaeology) is unique and remains the most determinative factor in shaping archaeological methodologies, and their application in this branch of archaeology.

Was the 'New Archaeology' applicable to large *Tell* sites with more complex stratification? And if so, what modifications were necessary? What is the nature of the archaeological record in the stratified mounds of Iran? What is preserved and why? What is significant for the cultural process in the formation and long history of *Tells*? Furthermore, it must be asked how much usable material can be rescued from a badly preserved, frequently destroyed and poorly stratified mound. How can the logical problems of exploring, excavating, and recording material throughout successive layers be solved? How representative is this material? Does it reflect cultural patterning? Most importantly, in a *Tell* excavation, what constitutes a statistically valid database? Lloyds (1963) and G.E. Wright (1975), addressed these questions, but they met with little understanding from New World colleagues (see also Hole and Heizer 1973: 66-77).

The above questions were not adequately addressed in the literature of the 'New Archaeology' in Iran. They also have not been sought by Iranian archaeologists, which was especially unfortunate because their resultant failure to adapt newer methods critically, has always prevented them from proper testing and further experimentation.

Unresolved philosophical issues raise certain questions about the 'New Archaeology', some of which were mentioned earlier at the beginning of this chapter. Much of the philosophy of the 'New Archaeology' is based on the postulates of positivist philosophers of science like Hempel and others, for whom the objective is scientific explanation. The use of the Hypothetico-deductive method (method of testing hypotheses) is an attempt to formulate general covering laws (Watson 1991: 227).

Many American archaeologists (e.g. Redman 1991) would insist that such laws are the legitimate and the exclusive goal of archaeology. But is there any consensus among philosophers and scientists on the nature of scientific reasoning? Is it applicable to archaeology either as history or as a study of the human cultural process? Is archaeological investigation by nature a deductive or inductive inquiry, or both? Can archaeology be scientific and should it? If so, where does that leave all the practitioners of Iranian archaeology from the early beginnings until the present? And many other questions. Clearly these basic questions must be addressed in Iranian archaeology if the 'New Archaeology' is to have an important impact upon it.

Another issue is the lack of a significant body of general archaeological theory at the time concerned. During the 1960s and 1970s 'New Archaeologists' attempted to solve this problem in a variety of ways. One major type of solution has been to turn to other scientific disciplines. Such borrowing of theory from disciplines such as ecology has offered a greater success for archaeological theory building (much of the work of the 'New Archaeologists' in Iran at this time indicates its influence). But as important as this approach is, it does not provide the ultimate answer to the problem of archaeological theory; as Gumerman and Philips (1978) have pointed out this approach, if consistently applied, could lead to the loss of archaeology's disciplinary identity. But even if such identity were to be retained, another serious problem remains. In this respect Binford (1981:23) has concluded that "many other sciences may be concerned with the various aspects of human behaviour, history and socio-cultural change in which the phenomena studied are events, behaviour, or patterning in communicated thought. The basic phenomena with which we work are static, material, untranslated into symbols or clues to human thoughts. No other science addresses such phenomena".

A fundamental question was, and still is, whether the archaeology of Iran should be historically or anthropologically oriented, or both. Most American 'New Archaeologists' believe the statement of Willey and Philips (1958: 2) that "archaeology is anthropology or it is nothing". On the contrary the archaeology of Iran is history or it is nothing. History as an inductive science is generally concerned with chronology, individual events, and attempts to reconstruct human history, while archaeology today is generalising and deductive, and concerned with the timeless change of cultural process and universal human behaviour. Archaeology attempts to explain such change through an explicitly scientific approach. Much of the 'New Archaeology' in the West went beyond general anthropological theory to the specific adaptations of the 'Processualist' school. While today we can only applaud the notion that archaeology is not exclusively antiquarianism; though the ultimate aim of the archaeology is the fuller understanding of human nature, thought, and action, questions of specific application remain. Such questions may include: do there exist universal laws governing cultural change? Can human behaviour past or present, really be explained? If so, to what extent do the remains brought to light by archaeology preserve adequate evidence for this task, and will the materialistic-deterministic scheme constitute a satisfactory explanatory framework (see also questions raised by 'Postprocessual Archaeology').

What we need now at the very least is an application of anthropological archaeology drawn largely from prehistory, which must be examined and applied both critically and selectively to the archaeology of Iran (which is history based) both on the artifactual remains and on the abundance of documentary resources going back 3000 years.

4. The Iranian perspective on theoretical archaeology

Dealing with the historical formation of the body of beliefs and ideas that constitute Iranian archaeology requires much more extensive treatment and documentation of the impact of the political history of Iran on the position of Iranian archaeology. It requires also a survey of the degree to which different groups of individuals accepted the dominant interpretation of the past and an evaluation of the reliability of the dominant ideology. Because there has never been an attempt to provide a critical evaluation of archaeology of Iran, the mechanisms of the various political, social, and economic factors constituting the formation of archaeology are completely unknown.

Archaeology in Iran from its beginning has always been used as an ideological link with national patriotic aspirations. It was a tradition which not only affected Iran and all the Near Eastern countries to highlight their past in order to add the necessary colour to the dominant ideology, but also, as the post-Napoleonic period has witnessed, a marked increase in nationalistic trends backed by romanticism prevailed throughout Europe at the time (Trigger 1984: 358). Renfrew (1980) distinguished this great tradition of archaeology in the Mediterranean lands and the

Near East as one which regarded the principles of archaeology as simple and self evident, and archaeology forms one element in the characterisation of a nation's cultural superiority. Thus, archaeology very quickly entered into the service of the glorification of the past, and a very definite patriotic content was included. In the Near East this ideological use of the past had two aspects: one is the encouragement of nationalistic feelings which focused interest on archaeological ruins and history and a complete set of cultural phenomena, the other, is an active international concern for the discovery of biblical monuments reflecting the interest of European narratives. As a consequence very little attention was paid to any original approach which might escape this imposed position. Cultural history and history of art became the main research goals and at the same time there was no particular encouragement for Iranian archaeology to follow contemporary Western theoretical orientation. Human history as a central issue in countries like England with a leading international political role at that time (Trigger 1984: 304) was of no concern to Iranian history. The archaeological aspects of the debated issues such as the idea of progress of archaeology and its relation, for example, to social structure (Trigger 1989), social evolutionism, the environmental determinism of Ratzel (Earle and Preucel 1987), the historical particularism of Boas (Harris 1968), which were all of particular interest among scholars at the time, left the archaeology of Iran completely unaffected.

One of the main effects on archaeological thought in Iran during the pre-Revolution period has been the country's political situation under the regime headed by the Pahlavi Dynasty (1921-1978). Certain attitudes were oriented by authorities who blocked the introduction of theories and the development of models opposed to the official ideology. Related to this political environment, the system of universities and archaeological centres favoured certain kinds of traditional research rather than theoretical innovations of rational and methodological archaeology. Archaeology was classified among the humanities which isolated it from the influences of natural sciences. Furthermore, at a time when the trend in other parts of the world was for prehistoric studies to seek inspiration from anthropology and the natural sciences, the subject of prehistory attracted little attention or was even completely ignored. Other factors encouraging traditional archaeology have included economic limitations in the field of education and research on the prehistoric period. A partiality to some foreign researchers and their fashions prevented the genesis of an indigenous alternative. As we have seen, the concept of the 'New Archaeology' was introduced to the archaeology of Iran by Braidwood's interdisciplinary approach which was continued by the work of Hole and Flannery. They applied their theories, methods, and programmes to the quantitatively and qualitatively rich archaeological material available in Iran, and so tested them against the theories and methods of previous traditions, e.g. testing Childe's hypothesis concerning the beginning of agriculture in the Near East (see chapter 1 for detailed discussion). Despite the presence of a great number of Iranian archaeologists working with those teams, and their familiarity with the application of physical, chemical, biological, and mathematical techniques, such a tradition did not take root in Iran and anti-theoretical traditions continued to be dominant. The general position of archaeology in the country through time can be outlined as following:

(a) a lack of suitable organisation and research structure; (b) a lack of any coherent programme of research; (c) a complete lack of theoretical and methodological orientation; (d) the dominance of traditional and descriptive archaeology; (e) deficient consideration of environmental factors; (f) the absence of interdisciplinary and multi-disciplinary studies.

There are a number of possible reasons responsible for the neglect of theoretical phenomena in the archaeology of Iran, possible explanations include:

(1) the academic system of Iran was until recently isolated and always had difficulties in renewing itself or accepting innovations of any kind. Archaeological departments have not been affected by theoretical considerations. Art historians were, and still are, dominant in all departments. There are no courses emphasising generalised approaches, or the teaching of the methodology, epistemology and philosophy of archaeology, as well as environmental archaeology, computing or quantitative methods. In general, archaeological courses do not reflect the major advances in archaeological knowledge or methods, and they do not consider excavation techniques and some basic concepts such as typology and stratigraphy. It is typical that university textbooks which refer to modern archaeological literature have not appeared in Iran, and still make no specific mention of the work of the pioneering archaeologists. The attitudes of the leading archaeologists as well as their work are completely unknown through academic training courses. The inadequacy of training programmes along with the limited employment of professional archaeologists in the archaeological services prevent the infusion of new ideas into the profession. Furthermore, as I have mentioned earlier (see also chapters 6 from a different perspective) the ideological and nationalistic character of the discipline in Iran offers perhaps a much more acceptable explanation for the underdevelopment of theoretical archaeology in Iran. Selecting between changing

paradigms was never a question of academic choice and archaeologists from their limited social position have a limited potential for affecting this historically formed ideological structure;

(2) organisational factors; this is a major general drawback of archaeology in Iran. The division of the archaeological community into two separate branches, CHO and universities, without any common platform for discussion and exchange of ideas;

(3) the specific concentration of Iranian archaeologists on huge excavation projects mainly in relation to State aspirations. These enormous projects have always diverted archaeologists' attention from the theoretical questions (now as before, there are extensive projects being undertaken but no priority is given to archaeological field research and theoretical issues);

(4) the theoretical discussions in archaeology have mainly been developed by scholars concerned with the prehistoric period. In Iran, in the absence of any conscious tendency by archaeologists to study this period, the theoretical debates focusing on questions about the nature of explanation and the explanation of the processes of social change have been completely ignored. On the other hand, the archaeologists of the historical period are more interested in the historically documented materials, and do not feel such concerns to be relevant to their field;

(5) it can be argued that the wealth of data and availability of archaeological material may be responsible for the limitation of theoretical thinking in Iran. Everywhere a great number of finds appear. Unlike some countries (e.g. America) where a lack of archaeological finds can result in a major theoretical development, in Iran archaeologists have been usually more inclined to become antiquarians and art historians;

(6) the isolation of Iranian archaeology from the external influences in the both pre and post Revolution periods can be a major reason for the lack of theoretical consideration in archaeology. This problem was increased under the political and economic crisis of the country after the Revolution which made access to new literature and archaeological sciences more difficult and sometimes impossible. Another reason is the difficulty many Iranian students of archaeology have in reading complicated English theoretical texts with any certainty of understanding them properly. It should be mentioned here that the important theoretical works such as those by the 'New Archaeologists' in America or by Clarke in Britain have never been translated into the Iranian language, or seriously and critically presented and discussed in the archaeological literature. The recent Postprocessual trends in British theoretical debate are also completely unknown, and Feminist and Gender perspectives have not yet found their way into archaeological research and publication in this country;

(7) as it has been suggested, some ideologies such as Marxism have played an important role in generating theoretical discussions in archaeology (e.g. Hodder 1991). Marxism in Iran has never been an effective alternative to the dominant ideology especially at a public level (because of deeply held Islamic beliefs), although its influences on academic approaches may be considerable. After the Second World War the Communist Party, loyal to Russian political and ideological strategies, formed a minority group. An awareness of Marxism in society and in science has been advocated by intellectuals in the realms of sociology, but not in archaeology. Among a large range of Marxist literature which has been translated

into the Iranian language, only one work of Childe (Man Makes Himself) has been translated and published.

It is for these reasons that archaeology is treated within a historical framework leading to essentially descriptive research. A survey of Iranian archaeological journals published since 1965 (Art and Public; Archaeology; Journal of Historical Studies) and two important journals published since the Revolution (Athar; Journal of Iranian Archaeology and History) shows that all articles are merely descriptive (reports of archaeological material recovered from excavations, or studies of collections or individual objects), with no attempt at widening the analysis beyond a few typological series. The articles reporting excavation show a total lack of theoretical consideration. The cultural historical viewpoints (the interpretation of archaeological data within a historical or culture-history framework) means that archaeology is traditionally used to illustrate historical research on ancient Iranian cultures, confining archaeological research to establishing chronologies, or defining typological and stylistic variations.

Sometimes a small movement towards the new ideas in archaeology has been started by a minority group which is active and influential wherever the younger generation has attained posts of responsibility as researchers or lecturers. Their initial interest has been less towards adaptive and evolutional theories and more towards scientific methods. Thus, one cannot talk of theoretical debate in Iran, or of the development of ideas through propositions, critiques, and replies; at least it does not appear in the published record. The reasons for this situation relate to the non-theoretical structure of the Iranian archaeology, the political and ideological conditions of society, and the lack of a general awareness in understanding the potential of theoretical thinking in the development of archaeology. This brief discussion shows that the lack of theory in Iranian archaeology is not simply the result of the isolation of Iran from the centres of theoretical innovations; it is also the result of historical processes that from an early date tied the reconstruction of the past to a specific political idea. What can be said from this discussion is that the work archaeologists do in Iran is generally identified with political ideological purposes, denying archaeology as a discipline, its real explanatory potential and of its ability to make a contribution to social developments. It will be only within this social context that one can envisage a reaction against the traditional paradigms and overcome the lack of influence of the 'New Archaeology' in Iran.

5. The culture history paradigm in Iranian archaeology

In Iranian archaeology, the main areas of interest have always been chronology, typology, and cultural history, for the purpose of establishing the continuity of Iranian history, and the origins of ethnic groups, and their culture, and the definition of the influences and contacts between them. While such considerations have a theoretical basis, the theory is completely tacit. In this paradigm discussion about methodological questions is generally concerned with traditional problems such as the nature of typological change, the definition of traditional archaeological entities (e.g. culture groups), and the reconstruction of relative sequences. Archaeologists in Iran still continue to work within this paradigm, even to the present day. They are in fact antiquarians, representatives of an archaeology which emphasises a direct approach to objects, and analyses of monuments outside their contexts. They were, and are still, not generally interested in ecofacts and the natural properties of artifactual entities. Though the radiocarbon dating method was extensively used in

Iran by foreign expeditions, it is rarely used by Iranians for such purposes. Yet the methods of probabilistic sampling and planning of excavation as well as using scientific prospecting methods (e.g. geochemical and geophysical) have not taken root in Iranian archaeology. Under such circumstances Iranian archaeology has missed opportunities for applying new methodologies by which new questions may arise and help to undermine the culture historical paradigm.

Of the many foreign archaeologists who have worked in Iran between the two World Wars, Ghirshman, a French archaeologist who carried out a large number of excavations throughout the country, has had a considerable impact on Iranian history (Ghirshman 1954). He wished to turn the study of monuments into a specific means of acquiring knowledge about the past, and to establish stylistic rules which would permit each object to be attributed to a period and to a place. His publications concentrate primarily on aesthetic interpretations of antiquities. His theoretical approach did not simply stop at diffusionist interpretations to explain the "Indo-Iranian" phenomenon (a prime interest of the Iranian Court) but tried to demonstrate the superiority of their civilisations in contrast to indigenous cultures (see discussion in chapter 1, under 'historical archaeology in Iran' and relevant bibliography).

The typological method in the antiquarian school of Ghirshman was based on several fundamental assumptions:

(a) distinctive artifact types may be used to identify cultures; (b) the distributions of such artifact types reflect cultural domains; (c) cultural domains reflect the presence of tribal or ethnic groups. He distinguished many types of distinctive artifacts as characteristic of cultures throughout Iran and divided them into indigenous and invader categories. His model did not try to equate languages and ethnic groups with specific archaeological culture groups or even with individual types of artifacts. What he attempted was to identify, on the basis of a detailed knowledge of the past cultures, periods of continuous development and periods of discontinuity. This school and its Iranian followers, however, made many attempts at solving particular problems within the 'Indo-Iranian' question by concentrating on the origins and later displacements of various tribes. Solutions proposed were mostly based on the consideration of art styles, religious belief (mainly grave rituals), and artifact typology. The archaeological interpretation of this school in terms of diffusion and migration, seems to be derived to some extent from Kossinna's approach which after the First World War had a profound influence on German archaeology (Trigger 1989: 163-167).

An important question here is the differences in the archaeological material between various types of grave goods, and their possible associations with different population groups (e.g. the identification of social strata and groups). Questions of this type are based on specific artifact types, and on the definition of symbols, rank, and power in a given period. Such analyses never questioned whether material culture is suitable for reconstructing social stratification. Archaeology in Iran has always attempted to clarify social questions on the basis of the archaeological material (e.g. interpreting social position in a given period according to data on inscriptions) rather than a detailed examination of the entire material culture.

Despite a recent reassessment (e.g. Renfrew 1987) of the 'Indo-European' question which suggests that the solution to this question is certainly not to be found in archaeology alone, but will require collaboration between archaeologists, linguists, ethnologists, and mythologists to develop new theoretical models, the bias in favour of diffusionism is still evident in the present day archaeology of Iran.

The culture-history paradigm has continued without any change in all fields of archaeology until recently. Neolithic archaeology which was oriented by Braidwood to the new ideas of the early 1960s, has reverted to traditional ways. Iranian archaeologists of the Neolithic period are often well aware of the work done by Hole and Flannery, but their own projects are carried out with a minimum of theory or more often no theory at all. Other fields of archaeology such as the Bronze Age and Iron Age have continued in the same way as laid down by the Ghirshman antiquarian school (see bibliography in chapter 1). Some of the results are the pursuit of typology and chronology as an end in itself, and an overemphasis on the rich burials. There is no model building or theoretical interpretation in this field. Protohistoric archaeology has its share of traditional antiquarian approaches, but on the whole it presents a varied picture. Much of this is due to the influences of scholars such as Dyson and Young, who started wide ranging projects involving protohistoric archaeology in Iran during the 1960s and 1970s. They produced a cultural historical interpretation of chronological and spatial patterns of artifacts discovered (see chapter 1, for bibliography). From a theoretical point of view, Dyson's socio-political interpretations of protohistoric patterns in Northern Iran, were more important because he tried to use historical and anthropological concepts to overcome the limitations of the traditional definition of an archaeological culture. Such attempts have never been continued after they left Iran.

Historical and Islamic archaeology have close links with historical, linguistic and documented subjects. They present a fragmented picture which makes it difficult to speak of historical or Islamic archaeology. These fields of archaeology were, and still are, dominated by art-historical approaches, which set them apart from all other branches of archaeology. A problem of historical studies is the uncritical use of historical and written sources for the interpretations of evidence. Both fields are concerned with the material remains of the full historical period. Also there has been no development of approaches to an analysis or interpretation of evidence, or theories or methodology to overcome the limitations of the different types of evidence available. Historical archaeology in Iran seems to be more conservative; its main focus has always been on the sophisticated palaces and architectural remains and has neglected the people who lived around such areas.

In general, historical archaeology in Iran is seen as subsidiary to history, and descriptions are written within a framework of historical context. Some productive research strategies have been conducted in this field, such as Whitehouse's excavation at Siraf (see chapter 1), for example. At the time these were something of a reaction to the architectural and art historical approaches to the surviving material of the historical period, to the exclusion of other parts of the archaeological record. Their impact on Iranian archaeological approaches seems to have been negligible, and there has no been continuation of this area of archaeological interest. Finally, the statement of Clarke (1972: 18) that the historical periods could offer an important testing ground for theories of interpretation, since archaeological data could be set alongside independent sources of information, has never been considered by Iranian historical archaeologists.

6. Conclusions and Prospects

There are many possibilities for developing a radical discourse; economic priorities still lead most archaeological activities; although Iran has important ecological problems, environmental studies are still descriptive in approach, and no socio-economic ecological perspective has been developed; the cultural heritage and the problem of what to do with it, has not been considered from a alternative position; neither has a programme of the role of archaeology in education. After the Revolution there has been an increase in the number of excavations, but the results and the specific process of research remain under the control of traditional archaeologists. Most importantly, one should mention the absence of communication between archaeology and the rest of society; archaeology has no role in the social, economic, and political debates in society. The archaeological community generally remains more interested in the maintenance of its isolated elitist position, rather than offering a critical view of the past in relation to the present.

The remedy for the archaeology of Iran should be considered in two directions; first, upgrading field methods as already mentioned. It is a fact that Iranian archaeology has not experienced each of the four competing paradigms or approaches that Clarke saw in the archaeological scene of 1972 (Clarke 1972: 43). They have included the morphological, the anthropological, the ecological, and the geographical paradigms. Some aspects of such paradigms were brought to Iran by the 'New Archaeology' but caused no changes in the thinking of Iranian archaeologists. For the future, archaeologists should be expanding the application of scientific techniques, rather than concentrating on the recovery of objects and architectural structures. The new methods mainly concern the analysis of organic material, metal objects, stone implements, the recording of intrasite distribution patterns and systematic field surveying. It should be mentioned, however, that these new archaeological techniques must be used in a critical way and should be related to specific questions or some theoretical framework for the reconstructing of past societies. At the same time, specific research programmes should be prepared with explicit hypotheses on the environment, economy and society, as well as social theories of historical change and the discussion of specific aspects within archaeological theories.

Second, turning to theoretical archaeology; archaeology itself at the end of the present century has become a particularistic, historical, quantitative and artifact-based discipline (some aspects were predicted by Clarke in 1972). It is also subjective, and anti-positivist, multi-paradigmatic and pluralistic, more politically, and ideologically conscious, both as a humanistic and a social science (Hodder 1985, Shanks and Tilley 1987). This trend needs collaboration with other disciplines such as philosophy, social anthropology, sociology, history, ethnology, etc. A glance at the bibliography of the archaeological literature in Iran shows the gap between Iranian social thought in other disciplines and archaeological researches undertaken. The adoption of such an archaeology (from a theoretical point of view) requires the following necessary developments:

(1) in an initial stage of development of archaeological theory, one of the central questions will be to find an adequate definition of the subject and its object of study. As we have already seen, the main goal of the 'New Archaeology' was to define archaeology as the science studying the material remains which societies in all times

and places have created for their existence. In this respect, the objects of study of archaeology are the material remains themselves. Since all archaeological materials are not of the same order and therefore cannot be grouped into the same type of categories, this implies that each material has a special meaning in itself. The problem that arises is that one object may posses more than one cultural meaning. Only the contextual relations of the objects can help to replace them in a cultural structure. The object conceived as a message would consist of a semantic value, which implies a direct meaning (e.g. flakes, bones, etc), and an associated value which arises from its contextual relations. Thus the aim of the theoretical discursive analysis, should be to define the dimensions of structural complexities, in order to reveal their structural function. The definition of structural categories will allow us to provide an economic and social meaning. The knowledge of archaeology in Iran must refer to the meaning and the structural and contextual positions of the material objects. This can only be achieved through the building of a scientific archaeology, which means a discipline with a particular theoretical framework. Its aim should be to formulate the logical representations of past social and cultural facts, and the real object of study of archaeology should be to propose coherent representations which by validating theories and with empirical support, explain the historical meaning of the nature, properties and presence of archaeological materials. In order to achieve this true scientific knowledge, archaeology will need a specific paradigm. This paradigm is urgently needed in Iran where the archaeological object is still admired and inductivist position is still dominant;

(2) Iranian archaeologists should be aware of the recognition of the political and social context of the practice of archaeology and assess the implications of such a

recognition. Shanks and Tilley (1987a, 1987b), through their critical discussion of contemporary European archaeology, have provided a specific answer to the above problem. In their view contemporary archaeology with its various characteristics and claims (i.e. its separation of theory from practice, its divorcing of the past from the present), is an element in the structure of power and knowledge by which the capitalist economies of Europe have come to dominance. In contrast, archaeology should be a means of exposing these ideologies, of reassessing the role of the past in the discourse of the present, and engaging in a critique of modern society; archaeology is nothing if it is not critique (Shanks and Tilley 1987b: 213). To facilitate our attempts to attain our objectives we have to discuss the problem of having a political ideology-based archaeology, and the political facts should not distract us from the problems of theoretical archaeology. Archaeological research should reflect the political aspects of Iranian society, aiming at demonstrating how the archaeological past influences present-day society, and how present ideologies form our constructions of the past. On the other hand, archaeologists also must be more aware of their political and ideological influences in modern society, and must explicitly analyse and express the fundamentals of their scientific goals and research. Fortunately, in Iran in recent years, there have been debates (among the younger generation of archaeologists) leading towards a critical reassessment of current attitudes of archaeology. Such debates should provide the way for a reappraisal of the state and aims of traditional Iranian archaeology, and to challenge the political misuse of archaeology. At the same time the ideological nature of ethnic studies which have deep roots in Iranian archaeology and are still very much alive, should be exposed and criticised;

(3) this sense of creating a modern archaeology finds expression in the universities, but this leads to the question of the potential of archaeology in society. The theoretical and methodological foundations of the discipline should be discussed with the aim of developing a modern framework in which a more scientific and socially relevant archaeology can be undertaken. The creation of a number of posts and departments of archaeology in universities will open the possibility of institutionalising the concept of theory, and this will give it a firm basis in the country. Some archaeological courses at universities should incorporate several areas of the theoretical knowledge needed to devise a new framework, such as the basics of philosophy, economics, general sociological and anthropological theories, and a new set of questions produced by these theories. The increase in publications and conferences on theory will help the development of the concept;

(4) this needs to be seen against the background of the political boundaries of the Near East which were drawn up after the First World War, and which do not coincide with archaeological ethnic boundaries. This problem has generally given rise to the chauvinistic political views which often employ historical and archaeological data in order to prove their particular propositions. The revival of this trend today among some Central Asian countries (see, for example, Kohl and Tsetskhladze 1995 ch. 10) with strong governmental support, may force Iranian archaeology to take part in a pointless competition, with its political consequences. To avoid this, as far as the ethnic groups of Iran are concerned, we have to demonstrate that only after detailed studies can the problem of ethnic attributions be revised, and only then can the tentative steps be taken from specific archaeological

problems towards the important issues of correlation between archaeological cultures, assemblages, languages, and ethnic groups;

(5) finally, one cannot overlook the fact that from about the 1980s, there have been a wide range of programmatic announcements drawn up in the Iranian literature presenting paradigms for the humanities according to Islamic philosophy (it has deeply affected the circulation of some academic research particularly in sociology). The influence of this philosophy is more complex, and yet what is stated in Islamic syllabuses is not in fact incorporated in the research practice of archaeologists. Nevertheless, the attempts to define the aims of archaeology as an independent discipline, and evaluations of Islamic ideas and their impact on theoretical questions, should be a major obligation of archaeologists.

In summary, it has been shown that there is a limited range of archaeological theories and research directions in Iranian archaeology, and also that theoretical ideas from the 'New Archaeology' and from the international literature have made no serious impact on the archaeology of Iran. The basic questions which remain to be answered are why they have not generated theoretical debates and why the work of Iranian archaeologists does not reflect them. Obviously the interdisciplinary approach, which played an important role in the 'New Archaeology's' research (and also in modern archaeology) has not found its place in Iranian archaeology. It should be remembered that the background to the development of archaeology in Iran is historical research, and archaeology here is considered part of the humanities. The last and current generation of Iranian archaeologists has been trained in this tradition (even those who were trained in the U.S.A. in the 1970s), and in fact many of them devote much of their time to studies in history, historical geography, and art history. The anthropological approach with its quantitative analysis of metrical attributes, which forms the basis of the 'New Archaeology' has yet never influenced conventional archaeology in Iran. Furthermore, the role of the Iranian archaeologists in joint archaeological research with western projects has not been scientific, rather it has been an executive role, or, in some exceptional cases, their unfamiliarity with the characteristics of contemporary archaeological research, and also language barrier, have affected the quality of their scientific contributions. In addition, political and ideological constraints have always played an important role in this respect. During most of the period considered in this chapter, these constraints remained fundamental because ideology has always been part of the institutionalised section of the political system. This circumstance has threatened archaeology in many ways; the ambiguity of its place (as pure humanistic science or as experimental science) within the academic system of Iran, is still a major problem for archaeology, resulting in many limitations for archaeologists either in attracting funding for research and high quality students to study archaeology (in comparison to the other subjects, archaeologists are generally dissatisfied from their job). Needless to say, without a multilateral reformation of archaeology in this country, the present organisation of archaeology with only a few archaeologists, trained mainly in the old fashion, cannot offer much change in research directions.

However, we are optimistically now looking forward to social and political change in Iranian society. At the moment many areas of public and intellectual life are become more highly politicised than ever before, an atmosphere within which even school children are more interested in, and running, critical debates. At the same time, compulsory educational programmes are being encouraged to reach even the remotest parts of the country. The potential of science and technology to explain the world and improve it are appreciated. There is a growing tendency to recognise the ability of science to solve the problems of the world. Innovation in technology attracts major support as the basis of economic development and general public welfare. These attitudes gradually change the social and intellectual climate of society and will provide a suitable social context for developing radical theoretical debates.

The expansion of universities in the post-Revolution period are giving rise to a new generation of archaeologists, who have been heavily influenced by the democratic sense of this period, and by contemporary social and political debates. Unfortunately the Iranian university system from a early date has always been conservative, authoritarian, and dominated professionally and politically. These have prevented innovative intellectual climates, academic progress and individual freedom to choose the particular orientation for a discipline. Despite many reforms in recent years no great change can yet be seen; it is, however, part of the responsibility of the new generation to engage in such discussion of university problems.

In more general terms, the future expansion of archaeology in Iran can be expected as one aspect of the economic development, causing massive programmes of urban development, engineering, agricultural, and industrial projects. These lead to growth of rescue excavations and eventually a public awareness of archaeology. Finally we hope that the current political and economic development in Iran awakens the responsible organisations to understand the importance of Archaeological Heritage Management, which in turn will offer the opportunity to consider theoretical matters such as the presentation of the past and construction of meaning.

Given the present situation with increasing opportunities for international contacts (e.g. sending students of archaeology to Western countries) we will undoubtedly see the growing impact of foreign research which will certainly lead to a development in methodological and theoretical debates. We hope the ensuing debates will encourage further research, but only if the most basic issues and questions can also be subjected to discussion without any kind of restrictions. As already mentioned, a new generation of archaeologists is coming on to the scene; they will not accept the traditional phenomenon of archaeology as the increase of tangible finds; they prefer the refinement of observation that will enrich Iranian archaeology and its perception of the past.

Now, we have to wait and see if Iranian archaeologists will actually change their previous positions. We must first deal with the debate which has gone on in American, British, and Scandinavian archaeology since the 1960s. We can then move in other directions; making extensive use of our own domestic philosophy to originate particular hypotheses for our regional problems. Thus the outcome may be rather different from the American 'New Archaeology' and the British 'Postprocessual Archaeology'.

Chapter 3

Archaeological Survey: An Efficient Means of Data Recovery in the Regional Archaeological Approach

1. Introduction

Field survey consists of a range of techniques designed to collect information concerning the nature, variability, and organisation and distribution of artifacts and settlements across a landscape. It is a legitimate and productive research tool responsible for the discovery and documentation of cultural remains on the modern surface. It has been also regarded as a principal source of delineating a large amount of information about archaeological sites. Survey also within a methodological framework is defined as a method to provide a estimation of the general or specific parameters of the study area in response to the target parameters which is determined by problem orientation (Ammerman 1981; Cherry 1983; Dunnell and Dancey 1983; Dancey 1974; Flannery 1976; Johnson 1977; Lewarch and O'Brien 1981; Plog et al. 1978; Renfrew and Bahn 1991; Renfrew and Wagstaff 1982; Schiffer et al.1978; Struever 1971) .

From the 1970s it has been promoted under the conservation archaeology of the United States with extended large scale survey strategies to study regional settlement patterns in advance of land modification projects, and to facilitate long-term management of public resources (Schiffer and Gumerman ed. 1977). This kind of research particularly in the American Southwest where field conditions are optimal for survey work, has created much of the standard literature of survey methodology and technique such as probability sampling (e.g. Redman 1974; see also relevant section).

For many reasons data obtained through survey have been viewed as equally important as data obtained by excavation, sometimes even of greater utility. Important reasons are :

(1) obtaining survey data is easier than those from excavation especially, where logistical and economic factors are concerned (Cherry 1983; Dunnell and Dancey1983);

(2) survey data represent a wide range perspective of regional patterns (Cherry 1983, 1984; Dunnell and Dancey 1983);

and (3) survey does not destroy archaeological sites as excavation, and results can be replicated (Cherry 1983).

As with other areas of archaeological discipline, the potential of archaeological survey also in turn has been criticised. Although some problems now have been dismissed, some are not insignificant. For the problem of the integrity of surface remains as against buried remains, see Ammerman 1978, 1981, 1983; Cherry 1984; Dunnell and Dancey 1983; Hope-Simpson 1983, 1984; Shaar 1983. For the problem of the quality of the survey results a considerable discussion can be found in Cowgill 1986, 1989, 1990. Pioneering work by Plog et al. 1978 and Schiffer et al. 1978 and recent work of Cherry et al. 1991 represent efforts to develop a methodological basis for surface survey by examining the factors that affect the accuracy and consistency of survey results. Related studies have demonstrated the effects of different sampling procedures and survey intensity on survey results (Cherry et al. 1978; Cowgill 1990; Judge 1981; Mueller 1975; Plog 1976; Plog et al. 1978; Redman 1974). Foley (1981) and Gallant (1986) have addressed some kind of biases that affected survey results in their experience in two region of Kenya and the Greek Islands. Finally a large amount of information about survey methodology can be found through case studies carried out over the last 30 years in different parts of the world. These experiences have produced a highly sophisticated methodology for regional archaeological survey. Results of such experiences today can provide a detailed picture of past human life over the world. See, for example, Adams 1981; Baker and Lloyd 1991; Dyson 1982; Keller and Rupp 1983; McIntosh and McIntosh 1980; Macready and Thompson 1985; Postgate 1982; Renfrew and Wagstaff 1982; Whallon 1979.

The main goal of research in this chapter is on the one hand to explore the potential of a methodologically well-defined framework of regional archaeological survey while on the other hand emphasising the productivity of this strategy as an archaeological approach particularly where problem orientation researches are planned. Both are intended to be adopted in future Iranian archaeological activities through producing a general model of archaeological survey methodology. What should be stressed here is that many archaeological sites in Iran are being continuously threated by illegal excavations, large scale development projects, and natural disasters. These factors will affect the techniques of systematic surface survey as a major archaeological approach to the archaeology of Iran. In fact, during the last decades this approach has not been developed either by foreign or by Iranian archaeologists. Furthermore, Iranian archaeologists are not familiar yet with the methodological and technical aspects of archaeological survey. Most importantly, in the lack of recognition of the potential of other technical approaches, the notion of excavation as the only means of data recovery is still advocated. These problems make survey a top priority for scientific archaeology in Iran.

2. Background of the technique

From the 1960s the theoretical dimensions of archaeology have grown and changed rapidly, as new theoretical viewpoints of archaeologists have changed their approach to the character of human culture from a static to a dynamic one. This has in practice resulted in a shift in attention from the settlement as a unit of analysis to the region as the analytical unit. Willey's pioneering study of settlement patterns in the Viru Valley of Peru (1953) turned archaeologists' attention to settlement archaeology. At the same time Binford (1962) proposed human culture as an organisational system by which people interact with other cultural and natural systems in their environment. He argued that cultural systems and processes operated over the entire region rather than on a single site, and the region must be considered as the analytical unit. Other attempts were made to clarify this issue by identifying the nature of archaeological material and sites on the one hand, and formulating principles of archaeological survey techniques on the other hand. Thus archaeological sites were assumed to represent the spatially differentiated activity loci of a cultural system, whereas a single archaeological site cannot reflect all of the activity patterns of a particular system (Juge et al. 1975: 82; Cherry and Shennan 1978: 101). Thus, if the explanation of a cultural system and of its structuring and functioning is sought, the examination of the total range of types of component sites and distribution of archaeological material over the whole area becomes as essential part of the research strategy. The scope of such research may encompass thousands of square kilometres. Since examining the nature and variability of all archaeological material existing in a given area is practically and economically impossible, probability sampling techniques were developed to provide representative data (see below).

At the same time problem oriented approaches were conducted in various regions leading to substantial developments. The large-scale survey projects in the Basin of Mexico (Sanders et al. 1979), Mesopotamia (Adams 1965, 1981), and different areas of the Southwestern United States approached by SARG (Southwestern Anthropological Research Group), not only produced much empirical data, but also led to increased attention to formulating research questions in regional terms. The difference between such major projects and more traditional ones lie in their research specific questions, their expectations from survey data, and the approaches used. In all three cases fieldwork was conducted over a substantial number of years. The main goal of research in all cases has been the understanding of cultural processes by focusing on the variability of the spatial distribution of the settlement patterns, the human locational behaviour characteristics (Plog and Hill 1971), the processes contributing to cultural evolution, variability in natural environment and contemporary agricultural systems, changes in population size and cultural complexity (Adams 1981; Sanders et al. 1979), and the relationship between population growth and economic growth. These questions necessitated appropriate methods both in fieldwork and analysis. Most attention was paid to population estimation on the basis of density of surface material and site function through obtaining reliable quantitative information. To this end the introduction of new sampling strategies proved most productive. Survey techniques such as a standard system for recording sites, classifying sites on the basis of site size, and extensive field walking strategies to locate sites over large areas were developed through these projects. In fact, the real advance in archaeological survey methodology took place when SARG proposed a research programme to solve big problems of cultural processes in 1971. In this group more than 30 archaeologists were co-operating. Their concept of archaeology as a science and dealing with questions concerning entire human cultural systems characterised them as a different class of archaeologist. In their view archaeology was a means to respond to the big problems of cultural process such as change and stability in societies and cultural mechanisms by which societies adapt to change in their natural and social environment. To solve such problems requires programmes of long-term fieldwork and analysis, and interdisciplinary and multi-stage research. For tackling the general question of "why are sites located where they are?" besides other ancillary questions, SARG has formulated a more productive research design covering the following points (see: Gumerman 1971, 1973)

(1) planning an intensive, probabilistic regional survey; (2) planning a multi-stage approach to refine variables and measurements in the course of field work and analysis; (3) specifying in detail the various characteristics of archaeological materials and existing variables; (4) standardising sampling strategy (a stratified sampling design in terms of natural variability was argued to be the best procedure) and intensity of field work; and (5) use of a computer data bank to control survey information and to allow statistical analysis. This model proved to be most

advantageous, and some archaeologists (e.g. Cherry 1978) suggested it should be applied in other countries.

In summary, since 1970 a variety of the key elements led to the rapid developments in modern archaeological survey:

(1) in terms of methodology it was affected by insights of the 'New Archaeology' especially those initiated by Binford (1964, 1965) where the great emphasis was concentrated on explaining cultural processes, and social and economic change of past societies. This kind of research required explicitly well-defined research designs, formulating hypotheses and constructing models.

(2) exploring the entire range of a region rather a single site, since human behaviour tends to be regionally circumscribed. Settlement and land use in one part of a region tends to be closely tied with settlement and land use in other parts of the same region. Such ties are not static but change through time, and the study of the changing interrelationship between different parts of a region is a crucial guide to understanding processes of culture. At the same time environmental approaches started to recognise the interaction between man and his associated environment and the position of archaeological sites and material to each other. It involved spatial archaeology which adopted mathematical methods and statistical techniques. This procedure had been developed by geographers to elucidate modern patterns on the surface, and mathematical approaches were used to examine many kinds of information derived from regional studies. One basic element in such studies was to examine archaeological distribution patterns and interrelationships between settlements.

(3) defining adequate terms and the theoretical basis for archaeological terms was much debated. The definition of an archaeological 'site' for example, is still a controversial matter for archaeologists. Few archaeologists would find any difficulty in defining finds on the surface, but what exactly is a site, what are its limits and how should it be recognised from the artifacts or features surviving on the surface, have been debated for a long time. As Dunnell (1992: 22) has pointed out, the term 'site' is an artificial concept invented in the present with no meaning in the past. It is only with the growth of fieldwork in the present century that functional words like 'monument', 'camp' and ' village' began to be replaced by the more objective term 'site'. On the other hand some studies of hunter gather societies suggested that individual 'sites' are meaningless if they are not viewed in terms of the shifting patterns of activities that make up the overall manner of subsistence (Smith 1992: 11-26), or cannot be related to a past system (Binford:1992: 56). Another problem emerged when archaeologists came to reconstruct the full human use of the landscape. They realised that there were very faint scatters that might not qualify as sites, but which represent significant human activity. This phenomenon can be seen in areas especially where mobile societies have left sparse archaeological remains. For such phenomena archaeologists used the term 'non-site' or 'off-site', but these require special methodology to locate and record such artifactual finds (Dunnell and Dancey 1983; see also relevant section in text).

(4) the most important factor in developing archaeological survey particularly in recent years, relates to the extensive use of new technical approaches and special instruments, not only for the discovery of sites, but more crucially for recording

them, interpreting them, and monitoring change in them through time. Among them aerial photography has long been used, while some others have been devised recently. For the incorporation of such technical approaches in archaeological survey see for example; Aerial Photography (Riley 1984; Wilson 1982), Geological Surveying (Spoerry 1992), Magnetic Surveying (Clark 1990), Metal Detectors (Stead 1991), Soil Analysis (Courty et al., ed. 1990), GIS-Geographical Information Systems (Allen 1990).

There is also an increasing awareness of statistical methods in discovery and analysis. Thus, probability sampling has been integrated into archaeological survey. Sophisticated quantitative procedures such as multivariate analyses, for example, have been used commonly. This procedure can be designed to look for significant relationships or contrast between elements to define groups, thus bringing greater order into data. Multivariate statistics notably cluster analysis and factor analysis can produce significant results where typological classification of artifacts or seriation of assemblage are sought. For more detail see Fletcher and Lock 1991 .

3. Methodology of archaeological survey

The completeness and consistency of a survey strategy depends directly on :

(1) evaluating characteristics of the surface archaeological material (archaeological records) and (2) documenting these characteristics accurately.

Archaeologists who document the archaeological record, need to realise the differences between the surface archaeological record and the document. The archaeological record is defined as "the empirical reality of the surface archaeological deposits" (Wandsnider and Camilli 1992: 170). They equated it with well known "physical consequence population" or "potential finds population" as Cowgill (1970: 162) has pointed out, while the archaeological document is identified according to Cowgill (1970: 163) as the "physical finds population". The distinction between 'record' and 'document' is important because what is exposed for discovery on the surface is not necessarily what is actually discovered, or, in other words what can be found and what is found; 'record' denotes what exists on the surface and 'document' denotes what is found in any single inspection of the surface (according to Wandsinder and Camilli's usage which can be equated with Cowgill's terminology); for the nature and degree of these differences see: Wandsnider and Camilli 1992; also Ebert 1992. These populations in part can be affected by the method and practice being used. As Cowgill has demonstrated, some physical traces of an activity may survive, but be undetectable with the methods and instruments available (1970: 163). This is important to his conclusion that, "the physical find population" is the only kind of population which we are ordinarily really able to sample. A surface record can be characterised archaeologically by properties such as abundance (the number of artifacts on the surface), composition (the number or relative frequency of specimens in various classes in the surface record), and distribution (the arrangement of those specimens across the surface) (Shott 1995: 477). These properties may be generally correlated; there are empirical examples to show how these properties co-vary, arguing that abundance of record increases as distribution tends to be more clustered, and that composition in regard to artifact size classes varies with abundance (Dunnell 1988: 34; Schofield 1991: 124-126; Wandsnider and Camilli 1992: 174). But the co-variation can be a product of the methods used to measure the surface record, and does not relate to the essence of the record itself. The archaeological document can be affected by our observations made on the surface and varies according to the methods we use to characterise archaeological records. Variation between surface documents, however, can be the result of the various methods we use. The relationship between the archaeological record and document varies according to the various factors existing in the study area such as site obtrusiveness, density, clusteredness and so on. Variability between surface record and document can be measured by means of accuracy, precision, reliability and validity. All survey work is assumed to be high level in these respects, but see Plog (1986). Documenting the surface archaeological record in the light of these qualities has been an objective of archaeologists (e.g. Nance 1988). He made a distinction between the direct measurement which can be made of objects, and indirect measurements which can be made of the past behaviour. He assessed the validity of the relationship between faunal remains and prehistoric diet. **Validity** is a term concerned with the quality of indirect measurement (e.g. past behaviour) while the objective materials on the surface (e.g. content and configuration of an archaeological record) do need direct measurement in terms of precision, reliability and accuracy. These qualities relate to both the measuring instruments and the direct measurements that can be made by those instruments. **Precision** refers to the comprehensiveness of the measurement instruments, for example, choosing the appropriate level of survey intensity. **Reliability** refers to the quality of measurements made between similar variables with a small amount of error. In the course of site survey, if different frequencies of material obtained under different procedures from the same area tend to be similar, the procedure and result should be reliable. **Accuracy** is the level of accurate measuring, the deviation between actual and measured phenomenon; the smaller the deviation the higher the level of precision. Survey which has these qualities provides a faithful representation of archaeological records (Cowgill 1990; Wandsnider and Camilli 1992; for measurement of these qualities in statistical terms, see also Plog 1976). Specific characteristics of archaeological records should be accurately and reliably defined by survey procedures; this will depend upon the desired level of precision that one is asking from the archaeological record. All levels of precision need accurate information of frequencies and state of discovered materials. The main purpose of sampling strategy within the context of archaeological survey is to represent these two characteristics of materials as accurately as possible.

Another aspect of the archaeological record relates to the spatial relationship between materials. In such cases all distributional patterns and nature of structures need to be known beforehand. Some archaeologists suggest a full coverage of the survey area and recording all materials (e.g. articles contributed to Fish and Kowalewski 1990). It enables archaeologists to find out a full picture of spatial relationship between those materials. With such a picture, the spatial distribution of materials and structural patterns can be revealed.

Documenting the archaeological record to estimate population parameters is the principal goal of any survey research, but there are factors that affect our observation and eventually correct estimation. Some factors relating to the archaeological and environmental characteristics of the study area cannot be directly controlled by archaeologists such as natural processes of deposition or visibility (Ebert 1992: 40-43; Redman 1982: 377; Schiffer et al. 1978; Schiffer and Wells

1982; Schiffer 1987: 141-262; Shennan 1985: 35-42; Terrenato and Ammerman 1996). There are other controllable factors that influence our results, for instance, survey techniques and probability sampling strategy (Schiffer et al. 1978: 4). Other factors such as survey intensity (inspecting the survey area by crew members), obtrusiveness of materials, abundance, and distribution of the surface record have considerable effects on results (Barker 1991: 3; Cherry 1983, Cherry et al. 1991: 18-19; Plog et al. 1978, Redman 1982, Schiffer et al. 1978, Schiffer and Wells 1982; Shennan 1985, Wandsnider and Camilli 1992).

3.1 Abundance and clustering

Abundance relates to site or artifact density, and indicates the frequency of site or artifact type in a study area, while clustering is the spatial aggregation of archaeological material in the same area (Read 1986; Schiffer et al. 1978: 5). If the frequency of archaeological material (artifacts or sites) is high and not highly clustered, the total frequency of this material can be estimated from an accurate and reliable survey of a relatively small area. Here the spatial relationship between material cannot be estimated by sample. Thus in such areas even the crudest method of sampling technique can produce useable data for parameter estimation but in the areas where abundance (frequency) falls or materials tend to be more clustered, an accurate and precise parameter estimation or discovery requires a large sample size to be taken; thus, in this respect probability sampling tends to be more cost-effective. Again, in the areas where the extreme values of rare types or clustering are sought, sample survey becomes a less reliable way of documenting the character of archaeological surface distribution, since survey within the sample units may, or may not, encounter archaeological remains (Schiffer et al. 1978: 4, Wandsnider and Camilli 1992: 171). Instead, a purposive sampling technique would be appropriate. In terms of purposive technique, particularly when it incorporates interview data (obtained from local inhabitants), aerial photos, soil survey and topographic maps can lead to a complete inventory of sites. Furthermore, a variety of predictive models can be used as the basis for the purposive techniques, such as those that demonstrate relationships between environment variables and the occurrence of site and artifact types. Location of clustered material such as the hydrological pattern or specialised areas at which particular activities took place can be revealed through purposive technique (Schiffer et al. 1978: 5).. Another productive way in a purposive technique to recognise site location can be to make use of ethnographic data and well documented historical sources. In some areas local inhabitants are the most useful source of information, while in other areas remote sensing or disproportionate sampling of areas where high density of rare material exists can increase the discovery of clustered materials. However, it is true that the information derived from purposive techniques are highly biased. An alternative way to increase precision and reliability of such techniques would be micro-stratification, in which the study area is divided up into small spaces of micro strata; each unit would contain a certain number of sites and artifacts, and when searched systematically can produce acceptable parameter estimation.

3.2 Obtrusiveness

Obtrusiveness relates to various characteristics of the archaeological record (sites and artifact type) such as size, surface morphology, and their physical and biological pattern. Obtrusiveness is the degree of possibility of detecting archaeological material using a particular technique. Thus, obtrusiveness depends upon characteristics of the archaeological record on the one hand, and specific technique on the other hand (Schiffer et al. 1978: 6, Schiffer and Wells 1982: 347). Obtrusiveness of the archaeological record affects the rate of material being discovered, if, for instance, a region contains large surface or architectural remains and mounds which can be found by even a simple inspection technique, whereas a hunter-gather activity area will need more specialised techniques of discovery. Obtrusiveness of the archaeological record can be measured by intensity of survey effort. Thus, the obtrusiveness of high density artifact scatters with a diameter of 30m is high if the survey transect spacing is 15m or less (Cowgill 1990: 252-256, Redman 1982: 377), while the obtrusiveness of the same phenomenon will be reduced as intervals of transect spacing increase. Correlation between obtrusiveness and survey intensity affect discovery probability, as Schiffer and Wells pointed out (1982: 347); discovery probability is 1.0 only when obtrusiveness is equal to or greater than crew spacing interval.

3.3 Visibility

Visibility is the measure of detecting the archaeological record within the environmental variabilities of a study area (Schiffer et al. 1978: 8, Schiffer and Wells 1982: 348). One of the key issues in survey methodology is the relationship between surface visibility and the discovery of archaeological sites in the landscape. It is clear from experience that all archaeological material on the landscape does not have an equal chance of being discovered, due to the differences in environmental characteristics existing in the various parts of a region. A growing crop, for example, will affect the visibility of sites or scatters of artifacts. In such an area the difficulty of observation of the ground surface offers a low expectation of site discovery. Some recent studies in the Aegean Island of Keos and at Cecina in Italy, for example, measured in quantitative terms the scale of impact of visibility on site discovery. The authors found evidence that could document a clear pattern of association between surface visibility and site discovery and a strong relationship between them (Cherry et al. 1991, Terrenato and Ammerman 1996).

The most important factors that have a significant effect on material discovery are: (1) the intensity of past and present land use (e.g. ploughing, for assessing degree of effect by ploughing see: Ammerman 1985); (2) surface soil formation processes (Schiffer 1987); (3) the characteristics of the archaeological record; and (4) the environmental characteristics and geomorphological pattern of the study area (Ammerman and Schaffer 1981).

Environmental characteristics of an area such as recent alluvial deposition, precipitation and seasonal changes in vegetation affect visibility of site locations, that is, an arid area offers visibility of sites more than forested and waterlogged areas. Techniques to be used in such areas are dependent on the nature of visibility. Because a study area may consist of various environmental characteristics, dividing up the area into zones according to their different visibility helps to emphasise the differences and to justify the specific technique to be used in each zone. Thus a wide range of techniques is available to apply in each area to increase the chance of discovery. In areas with an extended and visible surface such as cultivated fields, or with sparse vegetation, field walking can be productive, if factors that obscure or reduce visibility of sites or isolated material can be controlled (Schiffer et al. 1978:

8, Cherry 1983). A way out of the problem of visibility particularly in the area where isolated materials are abundant, is the intensification of field coverage, since the landscape is covered more intensively and more attention is paid to lighter scatters of material on its surface (Cherry 1983). Aerial remote sensing is a useful technique in identifying large sites and revealing hydrolic activity, architectural and vegetational patterns. In areas where exposure of the ground surface is obscured by low vegetation or geological deposition, systematic use of shovel pits can be useful, while sites buried at a greater depth can be detected by auguring or coring tools (e.g. McManamon 1984, Shott 1985). But such approaches are applicable to small areas not to a region (Terrenato and Ammerman 1996: 92).

It is obvious that a correct estimation of parameters depends heavily on consideration of all the archaeological records in the study area. Failure to do this can introduce a large amount of bias into estimation of parameters and eventually affects our reconstruction of the human past. To overcome such biases, and before designing any survey, there is a need to collect complete information of vegetation, topography, geological history, hydrology and soils. This information can aid the stratification on the basis of material visibility; appropriate techniques can then be applied into each stratum.

3.4 Accessibility

Accessibility is the possibility of making observations at a particular place (Schiffer et al. 1978, Schiffer and Gumerman 1977a: 186-187, Schiffer and Wells 1982: 349). This factor also affects the discovery rate when adverse factors are encountered which can reduce the efficiency of the crew, for instance, when heavy rain makes surfaces wet and slippery and muddy, affecting team morale. Besides climatic factors there is a variety of adverse factors such as dense forest and jungle marshy land, and rugged or mountainous terrain that affect crew mobility and transportation. They may also inhibit survey work by affecting shape and size of collection units or the direction of field survey (for results of a quantitative measurement of accessibility, see Schiffer and Wells 1982: 348). There is also a problem of accessibility that archaeologists are facing with reference to the land ownership pattern in some countries. Access to private land needs permission but it may be refused by the land owner. In such a circumstances indirect procedures of data collecting and site discovery such as remote sensing, predictive models and interviews can replace direct access (Schiffer et al. 1978: 9).

4. Site definition

The question of what is a site has always been a problem. In the traditional view of archaeological data a site has consisted of a specific class of archaeological material or a large amount of visible artifacts, or outstanding architectural structures, whereas small sites, activity areas and simple artifact scatters were outside of interest (Hole and Heizer 1973: 111; see also Dunnell and Dancey 1983). Many archaeological sites were excluded by such an interpretation. This may originate from (1) a conscious omission on the basis of the research objective or (2) unconsciously on the basis of how methodologically a site is defined. Plog et al. (1978: 386) published the result of two surveys carried out in Chaco Canyon National Monument (52km^2) and in the Star Lake area of Mexico (60km^2). Although, both surveys were similar in the intensity of investigation, density of archaeological material and range of topography and vegetation, the former survey had overlooked a large number of pre-ceramic sites: 109 sites found in the latter survey, against only 15 sites found in the former, due to the difficulty of perceiving sparse lithic scatters as sites in the first survey. Difficulties in operationalising the site concept forced archaeologists to provide an explicit definition of archaeological sites. A further step in response to this problem has been taken by archaeologists such as Schiffer et al. (1978: 14) by defining a site as: artifacts in the study area occur in a cluster representing natural observation units called 'sites'. Two more such definitions include: a site is "defined as any location characterised by the deposition of the remains of human activity" (SARG.1974: 110) and "any place where there are traces of human activity is a site" (Schaar 1983: 26). Each of these is technically correct but of little operational value in the field specially in an area where spatially continuous or highly dispersed distribution of cultural remains exist across the region. For example, as Gallant (1986: 408) has shown from his experience, only 1.6% of the one hectare sample unit was completely devoid of surface artifacts. An alternative was a formalised approach that established density-based criteria for site definition such as that produced by SARG: "a site is any locus of cultural material, artifacts or facilities with a density of material of at least five artifacts per square meter" (Plog and Hill 1971: 8). Another is that of the Arizona State Museum Research Group which proposed a three part definition: "a site (1) it must have spatial limits; (2) it must have multiple activity loci; and (3) in the lack of (1) and (2) it must have an artifact density greater than five artifacts per square meter (Doelle 1977: 202). The density-based definitions have potentially greater utility but have been criticised by field experiments: (1) a standardised density of 5 artifacts per square meter is the exception rather than rule; (2) revealing multiple activity loci and spatial limits in certain type of sites, such as non-sedentary sites where their population has left low density scatters, can be difficult; and (3) these criteria would undoubtedly exclude the vast majority of artifacts in many survey areas (Cherry 1983: 394-396, Gallant 1986: 408, Plog et al. 1978: 386-387).

At the same time there have been other attempts to solve the problem. One made by Plog et al. is more incisive (1978: 388-389); in this definition a site is "a discrete and potentially interpretable locus of material". By discrete they meant "spatially bounded with those boundaries marked by at least relative changes in artifact densities". They also emphasised the value of the "trailing edge of the archaeological site spectrum", that is those loci of cultural material where artifact material distribution is sparse and diffuse. Of great importance in response to the problem of site definition has been to shift the orientation of research away from the traditional site. A growing awareness of low density diffuse distribution of cultural material has led to the suggestion that, in certain areas or for the investigation of certain classes of material, the site concept has to be replaced with a recording system where the location of a single cultural item becomes the basic unit of discovery. This research strategy is called siteless, 'non-site' or 'off-site' survey. In such a procedure in regional survey the elementary unit of observation and analysis is the artifact (Dunnell 1993, Dunnell and Dancey 1983: 272, Ebert 1992: 62, Foley1981). This procedure offers several advantages : (1) it provides situations in which many sites can be detected; (2) it provides a recognition of the variability of densities of sites by concentrating on fine gradation in the intensity of human activity and moveable cultural items of such activity; and (3) it is helpful in trying to explain quantitatively variation in the surface densities of cultural materials (Cherry 1983: 396).

This procedure is very labour intensive and requires rigorous models of sampling strategy that may be regarded as a disadvantage of this system. However besides more attempts to operationalise the 'non-site' concept, Doelle (1977) has made a critical argument in which 'sites' and 'non-sites' cannot both be recorded during a single survey of an area. He recommended a combined procedure termed "wide-spaced, rapid-paced" to provide a reliable inventory of visible large-site as well as non-site manifestations.

A further step toward a operational definition of a site has been taken by Gallant (1986: 409); he argued that a site would be a combination of the concept of the spatial distribution of the artifact as a continuum on a regional scale and of a high density scatter or site as only one end of that continuum. On the basis of the definition of Plog et al. he concluded a site can only be defined in relation to overall regional artifact density which in turn will be affected by visibility.

In the end, it seems more reasonable here to use Cherry's computerised model of site concept. This concept is basically based on several assumptions: (1) the archaeological record consists of a virtually continuous spatial distribution of material over the landscape; (2) distribution is extremely variable in density; and (3) a distribution may consists of two variable components, of domestic or structural remains, and of background noise (very low density of material scattered across the field). The discrimination between the two kinds of scatters should be well defined (Cherry 1982, Cherry and Shennan 1978, see also Dunnell and Dancey 1883: 272-273). Cherry developed his model when he was working on Melos. In his computer-drawn topographic relief model the peaks do not indicate natural topography but rather indicate areas where the density of material can be expected to be high. This area is usually termed a 'site'. The great importance of this model is its application to deal with every stage of density level (e.g. slicing through the model at any density level makes it possible to retain at one extreme only the tops of the highest peaks, at the other the entire configuration of the density of the landscape); thus it is a process in which data/material can be retained or discarded. If the selection is the case, the question of site definition proves to be tied with sampling process. As Cherry pointed out, the concept of a site within the population of archaeological material in a regional scale would depend upon: (1) specific characteristics of the distribution; (2) the resource available; and (3) the importance of certain classes of archaeological data.

A point to be stressed here is that, despite development in the ontological and theoretical concept of the archaeological 'site' over last 30 years, some archaeologists are now thinking of the development of a new and accurate terminology. This assumption is based on the fact that, as Shott notes (1995: 470), since the archaeological record is continuous in distribution and not discrete as assumed by the 'site' approach, a continuous term would be necessary to describe better the "high density modes in continuous archaeological record".

5. Survey intensity

This affects fundamentally the probability of material discovery and parameter estimation; the degree of the intensity of the survey is one of the most basic decisions in conducting any survey project (Cherry et al. 1991, Cowgill 1990, Schiffer et al. 1978).

Intensity can be measured by the amount of distance separating members of a survey team or by the number of person-days spent in surveying a particular area (Plog et al. 1978: 390, Schiffer and Wells 1982). The level of intensity depends directly on a variety of conditions and factors existing in the area such as time and resources available as well as local conditions such as ease of access and transportation. It has been suggested that only with a high level of intensity will many sites be found. The hypothesis that "The higher the intensity, the larger will be the number of sites found" was examined by Plog et al. (1978) on 12 previously surveyed areas of the American Southwest. The result illustrated a positive correlation between person-day per square unit and site discovery (a survey intensity of 20 person-days per square mile could produce a density of slightly more than 10 sites, whereas with 80 person-days approximately 65 sites were discovered). The pattern is that spending more days per unit area produces more sites per unit area. Their experiment also indicated that only a greater level of intensity would detect more archaeological sites while Schiffer et al. (1978: 9, 13) and Schiffer and Wells (1982: 370) have concluded that the greater level of intensity may still overlook material with low obtrusiveness. They proposed three kinds of intensity levels: the large spaced intervals (at 100m) for areas with more obtrusive materials, close spaced intervals (at a few metres) for isolated materials, and intermediate spaced intervals (at 10-75m). Similar experiments by Redman (1982: 378) show that the large spaced intervals (e.g. transects at 1 km intervals) can locate all large obtrusive sites(e.g. 200m in diameter) but that only 15% of the surface scatters (e.g. 50m in diameter) while transects at 200m intervals would increase the probability of discovering low obtrusive sites (e.g. 100m in diameter) to 100% and surface scatters to 75%. The conclusion from both Schiffer et al. and Redman (see also Cherry 1983, Cherry et al. 1991) is that increasing survey intensity and expending more time per unit area will provide more sites of low obtrusiveness and isolated artifacts.

A point to be emphasised here concerns the appropriateness of intensive and extensive survey methods. What sort of techniques should be chosen and which level of intensity can be productive will depend on a number of factors, including project goal, the state of existing knowledge, the environmental characteristics of the study area and the resource available. If the research is aimed at estimation rather than overall regional patterns, a selective, intensive survey based on probability principles is the most productive approach (Cherry 1983: 391-2). But where a multi-stage research cycle is in progress specific questions will be posed at each stage of research as the survey project progresses, and there is a need to complement intensive and extensive survey methods.

6. Sampling Strategy

Archaeologists have long recognised that inferences about past human behaviour are in fact based upon small samples. The concept of representativeness of samples and using sampling method to collect artifacts was an important issue in New World archaeology in the first quarter of the present century (e.g. works carried out by Spier in 1917 and Gladvin in 1928, see Chenhall 1975: 3). Somewhat later, on the basis of both the Viru Valley and the Lower Mississippi Alluvial Valley survey projects (Philips et al. 1951, Ford and Willey 1949), Ford discussed sampling procedure in more detail. Although these early works concerned the validity of their samples, there was not a firm understanding of the principles of statistical random sampling.

During the 1950s sampling strategy attracted more attention from archaeologists and adopted the developed mathematically based framework of sampling technique known as random sampling. But it was not until the 1960s that Binford (1964) proposed a research design in which probability sampling (random sampling) was assumed as an integral part of a comprehensive research design and the best means of obtaining representative and reliable data. In his view sampling is one of the most important exercises in development of research design through which one can examine statistically the project's research goals, the data requirement, and the best method for collecting the required data.

From 1960 a growing number of American archaeologists was interested in the potential of sampling techniques in archaeology. As Mueller has pointed out (Mueller 1975: x) this was due to: (1) the increasing costs of performing field work; (2) the decreasing availability of research funds; (3) the huge amount of artifactual and non artifactual data; and (4) the abundance of regions, sites and assemblages to be searched. These factors led archaeologists to explicit application of sampling theory in the survey of a region, excavation of a site and analysis of an assemblage.

A clear portrait of sampling concept, can be found in the Flannery's introduction to an article written by Plog (Flannery 1976: 131-135). In this introduction through a dialogue he tried to demonstrate a brief account of sampling procedure and its great importance in the regional level survey. As he has pointed out, the greatest Mesoamericanists such as Sander and MacNeish have surveyed entire regions field by field and metre by metre with expenditure of more money and time. He has argued that the "real Mesoamerican archaeologists" have not applied probability sampling; their reasons were (1) sampling is a waste of energy; (2) is too time consuming; (3) is not reliable; and (4) is not applicable to complex societies. They also added: "a 20% sampling design has missed Teotihuacan the largest pre-Columbian city in the new world". Here Flannery, to defend sampling validity, has referred to the excellent work of Binford and replied : "probability sampling is not a discovery technique to find lots of cities, but it is just the best way to get representative sample of sites if you cannot go for the whole universe..." He has concluded that the full coverage of an entire region to find a rare type of site may waste more time than preparing a 20% sample, since there may be more time spent "pushing the jeep out of the mud". Flannery in his argument has tried to provide a good understanding between the two contradictory opinions: one group defending traditional survey techniques claimed that probability sampling would not find lost cities or " The Pyramid of the Sun", others relied heavily on probability sampling as the best archaeological approach. In the end, his two suggestions seem to clarify simply the purpose of sampling: "first, if you can survey entire region meter by meter, do so in preference to sampling. Second, otherwise...do a 20% sample...by using some kind of probability sampling..., believe it does not take more time than you were already planning to spend... Although this sampling may fail to find the 8 sq km city of Monte Alban, but it is unique".

From the 1960s onwards probability sampling has always held a central position in the archaeological research and literature. A wide range of information concerning sampling theory and method can be found through the following references :

Binford 1964, Cherry 1983, Cherry and Shenan 1978, various papers in Cherry et al. eds., 1978, Cowgill 1964, 1970, 1990, Flannery 1976, Hole 1980, Juge 1981, various papers in Mueller ed., 1975, Nance 1981, 1983,1988, Plog 1978, Read 1986, Redman 1974, 1987.

The concept of utilising a probability sampling strategy in modern survey now has a central position in the discipline. As has commonly been stressed in the archaeological literature, decision making on probability sampling is based on fundamental assumptions:

(1) archaeologists are not able to investigate completely all existing materials;

(2) a limited amount of material selected through a valid procedure reflects accurately the parameters of the total population;

(3) investigating all of the materials may be impossible or need a huge amount of money and time. These limited resources impose only the investigation of a small portion of total materials;

(4) the pattern of cultural remains reflects the nature of patterns of past behaviour. Sampling only a portion of the surface remains through a systematic procedure allows us to make inferences from that sample of the entire pattern of the past.

The objective of probabilistic sampling is to obtain a representative sample from which estimates can be made of total population parameters or as a tool to aid archaeologists in selecting a unit of investigation. In planning a sampling design there are four major steps for consideration : (1) statement of objective (research question); (2) definition of the population to be sampled; (3) choice of sample size and sampling unit; and (4) selection of sampling technique (Peacock 1978: 183).

The objective of sampling strategy in archaeological survey varies from the relatively simple task of estimating the average density of cultural remains in a region to sampling an area to estimate the meaningful parameters of those remains. The expectation from the sampling strategy may not be satisfied unless decisions are made on utilising an effective sampling method of discovery and an efficient sampling method of estimation (Nance 1983: 291).

Sampling methods are concerned with the attempt to infer the quantitative relationship between a large entity (population) and a sample of that population. In this procedure basic attention needs to be paid to the representativeness of samples, sample estimates and statistical theory. In contrast to the sampling method of discovery which relates to the process of location of cultural phenomena, sampling methods of estimation concern the best estimation of general characteristics of phenomena. However, for the purpose of the proper implementation of sampling procedures in archaeological survey work in terms of sampling strategy, there are several variables that have to be identified and the relationship between them must be understood beforehand. **Population**: is a larger entity about which some kinds of information is required. **Elements**: are the individual members of a population. **Population parameter**: is the property of interest in a population, which is derived from values of all members of the population. **Sample estimate**: is the information of population parameter obtained from observation of sample elements. **Sample size**: is the number of elements appearing in the sample. **Sample fraction**: is the proportion of population that is selected for examination.

6.1 Sampling design

Sampling design is the procedure by which sampling units are selected. There are four type of sampling design useable in archaeology that have been defined by geographers (Haggett et al. 1977).

6.1.1 Simple random sampling design : the study area in this method is gridded into squares. The two axes of the area are numbered and a location is chosen according to a random numbers table or by a pair of random co-ordinates. The advantages of this method are: (1) different sampling units have a equal chance of being chosen; (2) this method reduces observation biases. But there are some disadvantages: (1) it needs site boundaries before randomisation and these are not always known with certainty; (2) the great draw back of this method is that, in the area where high density of materials tend to be clustered, randomly selection of sampling units may miss more clustered units to be tested (Redman 1974, Redman and Watson 1970, Plog 1976, Plog et al. 1978). The best example of using this method can be seen from work of Marcus Winter at the small formative period study of Tierras Largas in the Oaxaca-Mexico.

6.1.2 stratified sampling design : the study area is divided into natural segments, and samples are drawn independently from each segment. Within each segment the location of the point is determined by the same randomisation procedure as in simple random sampling. In areas where the archaeological materials are evenly distributed, subdividing the area into homogeneous strata of equal size will be most effective. But the sizes of stratified units are not always equal. Because in some cases when the distribution of variables is not equal over the study area, the strata with more variables actually need more observation than strata with less variables

(Plog et al. 1978: 403). Effective stratification would reduce sampling standard deviation. Reducing this factor increases sampling precision and produces better estimation within each strata (Nance 1983: 308).

6.1.3 systematic sampling design : is based on the selection of the first sampling unit to be sampled by some random method. After the first unit has been selected then, all subsequent sample units are selected at a specified interval. Systematic sampling reduces the risk of missing any unique portion of the site which could happen in random sampling. For a valuable example of application systematic sampling, see regional survey on Melos (Cherry 1982).

6.1.4 stratified systematic unaligned design : it is a more satisfactory method to use which combines the main elements of all three random, stratified and systematic designs. In this method the study area is divided systematically into a regular checkerboard of the sub-areas. A point I is determined by random numbers in the corner of the sub-area. The X-axis and Y-axis of the sub-area are numbered between zero and nine. A random number between zero and ninety-nine gives a co-ordinate position with respect to both axes. The X co-ordinate is kept constant all along the row but the Y co-ordinate is varied by using a random numbers table. As these numbers are drawn the points move up and down with respect to the Y-axis, but remains in the same position with respect to the X-axis. When both the first row and column are completed a new corner point must be generated point II... This process continues until all rows and columns are full. This method provides a unbiased set of samples over the whole area. Redman and Watson (1970) used this method for collecting surface material at a large mound of Girik-i-Haciyan in Turkey.

The efficiency and preference of each sampling design described above has been tested by Plog (1976) on some samples taken from major surveys in the Valley of Mexico. In a comparative study he tried to assess the efficiency of each design at predicting the total number of sites from a 10% sample. He concluded that systematic and stratified systematic sampling were slightly more efficient than the simple stratified random sampling design. But there are no significant differences between the more complex and simplest designs. Therefore, in most circumstances such as surveying unknown areas, the simplest sampling design would be the most practical

6.2 Sampling unit

Statistical sampling in archaeological survey entails the construction of a grid over the area to be sampled. These are generally quadrats, transects or other arbitrary units. An investigator must select unit of particular size and shape from which to draw a sample. A number of studies illustrated the effect of size and shape of sampling units; on discovery probability. See: Cherry 1983, Plog et al. 1978, Redman 1974, Schiffer et al. 1978.

6.2.1 Unit size

The choice is typically between large and small sampling units. Basically large units have several advantages: (1) the edge effect that causes overestimating the total number of sites in a sampling area is reduced for large areas (Plog et al. 1978: 399, Schiffer et al. 1978, Schiffer and Wells 1982: 350). The hypothetical or effective coverage of a real sampling unit is greater than their actual surface area. For instance four square sampling units that are $0.25km^2$ each and cover a total area of

$1.00km^2$ will hypothetically cover a area of $1.44km^2$, whereas two squares sampling units that are $0.50km^2$ each and cover a total area of $1.00km^2$ will hypothetically cover an area of only $1.30km^2$; (2) large units generally tend to reveal spatial clustering, patterns of association and intersite relationship; (3) costs are lower and moving crews between large units are easy; and (4) site count in such units will be greater. Also the use of smaller units increases problems associated with skewness of the population distribution (Nance 1983: 308, Redman 1974: 19); using large units reduces these problems. In contrast: (1) as Plog's experiences have demonstrated, owing to the greater area of hypothetical coverage of smaller sampling units, smaller units would offer the likelihood of finding more sites than larger units. For example in the Valley of Oaxaca for discovering the Noriega site quadrates each 0.5km x 0.5km or $25km^2$ were selected randomly. In order to discover part of Noriega, $13.5km^2$ or 25% of the total quadrates had to be surveyed. When the side of quadrates were doubled to $1km^2$ the total area to be surveyed became $18km^2$ or 33% of survey quadrates. But conversely experience showed that when the size of each quadrate decreases to only $0.25km^2$ the total area expected to be surveyed decreases to only $6.0km^2$ or 11.1% of the survey quadrates (see other examples in Plog et al. 1978: 395-398); (2) one way to reduce the effect of aggregation is to use smaller sampling units. As Plog (1976: 157) has demonstrated, reduction in the sample unit size increases precision. However, there will be a problem of increasing costs of examining large numbers of small sampling units; (3) because of the large number of the smaller units in the study area they would yield improved parameter estimate (Plog et al. 1978: 40, Schiffer et al. 1978: 11).

Sampling unit size is affected by many factors such as logistics, funding, target parameters and distribution of relevant archaeological material. If money is available and the intention is to look at intersite relationships, stratigraphic correlation and spatial analysis, large units can be employed. On the other hand when funds are low and the research goal is the estimation of overall site density, or a total inventory of common objects (Redman 1987: 260), intermediate and small size units may be chosen. The decision on the unit size should be relevant to the problem orientation (project specific); if the aim of research is to deal with multiple target parameters, choosing various size of units would be appropriate.

6.2.2 Unit shape

As with unit size, choosing the shape of sampling units (transect, quadrat) also needs some consideration. Although the results of several studies on the unit shape are not conclusive, there are considerable indications that transects (a large rectangle) are effective from a statistical perspective (e.g. Cherry 1983, Plog 1976, Plog et al. 1978, Schiffer et al. 1978) since: (1) transects hypothetically cover a larger area than quadrats, and thus can be expected to discover a greater percentage of sites (examples can be found in Plog et al. (1978: 401) based on their experience in the Valley of Oaxaca showing that in six cases transect samples have found a greater number of sites than other choices); (2) transects are easier to handle and to cover long distances; (3) transects can be designed to record artifact densities across the landscape and would meet a variety of topographic and environmental elements; thus transects are ideal to estimate site variability and general population parameters (Judge et al. 1975: 88, Schiffer et al. 1978: 12); (4) transects have long edges so intersect more sites resulting in more information where a regional or intrasite survey is intended (Schiffer and Wells 1982: 376). In contrast: (1) a number of regularly placed quadrats would produce twice as much edge exposure as transects. Thus they would have a larger sample area than transects. For finding individual things or particular sites, a large accumulation of activity loci and distributional patterns, they are supposed to be equally as effective as transects (Cherry and Shennan 1978: 30, Redman 197: 20); (2) quadrats have less edge effect (hypothetical coverage) than transects. For example a square that is 300m on a side covering an area of 0.09km^2, will hypothetically cover an area of 0.16km^2, whereas a rectangle that is 900 by 100m, also covering an area of 0.09km^2 will hypothetically cover an area of 0.20km^2 (Plog et al. 1978: 399). Thus potentially transects find more sites but it is more likely that the estimation will be biased with over-representation of the total number of site in a sampling area; (3) sampling error in quadrat units may be lower than transect units (Cherry and Shennan 1978: 30). Although applying transect sampling units seems to be advantageous, the unit size, and shape of units chosen will also depend on research orientation and specific problems.

7. Surface artifact collection strategy

The common goal of all investigators in material collection is to obtain a sample of surface material that can be representative of the whole material from a site or region. Traditionally, surface artifacts have long been used to locate sites, establish regional culture history, and to determine where to excavate within a site (Hole and Heizer 1973). In recent years increasing application of surface collection in cultural resource management (CRM) and basic research projects have expanded the traditional role of surface collection to a research problem (Dunnell and Dancey 1983, Plog et al. 1978, Redman and Watson 1970, Schiffer et al. 1978) and to a recognition of the effects of formation processes on surface phenomena (Schiffer 1976, Schiffer 1987). Today the systematic collection of material from a site surface forms a considerable part of archaeological survey design. A method of controlled surface collecting yields data that makes a regional survey more efficient and productive. Basically, the concept of surface collection is based on two assumptions :

(1) in any archaeological site, there is a meaningful relationship between material distributed on the surface and underground distribution. From surface data, the condition of the subsurface can be predicted (Binford et al. 1970) regarding a 1:1 correspondence between surface and subsurface (see Redman and Watson 1970);

(2) the superficial distribution of artifacts constitutes an appropriate source of archaeological data independent of surface remains (Dunnell and Dancey1983: 270, Lewarch and O'Brien 1981: 300). The question of the validity of surface collection is critical both concerning the composition of surface deposits and the relationship between surface and sub-surface material. The questions that may be asked here are: (1) what is the role of formation processes (cultural and natural) that create contemporary surface materials; (2) how is the contemporary surface different from the past surface, sub-surface deposit or other modern surfaces. This question is derived from the fact that in many cases different artifact class frequencies can be observed either between surface and sub-surface or on the surface at various time of collection (Terrenato and Ammerman 1996). Thus,

modern surfaces are not the same as past surfaces and they differ from one another. As has been demonstrated in the archaeological literature these differences can be due to modern land modification processes or to geomorphological processes (Lewarch and O'Brien 1981: 300). Cultural and natural transformational processes are disturbing the sites and causing surface material to be moved farther away from its original contexts or old and new material to be mixed together. Identifying the relationship between surface and sub-surface in such areas (e.g. ploughed zone or cultivated area) is more complex, since artifacts in such an area are undergoing a high rate of damage and disturbance by ploughing. It can cause varied densities of artifacts on the surface; the problem is that, since ploughing permanently breaks up body sherds, the densities of diagnostic sherds does not have a meaningful relationship with cultural and behavioural processes. In such cases the results may be biased because low density materials may be overlooked. Another problem arises from a widespread scatter of sherds visible on the site caused by manuring practices on the cultivated area or mixed with refuse from the daily life of habitation areas. Rupp (1983: 67) has witnessed this problem by representing an example of the early North American occupants that they threw their refuse out of their living areas so that there was little material found within the foundation of structures. Thus in such areas we can quantify artifact densities, but it is confusing if one is interested in identifying the patterns of activity areas in relation to high density of artifacts, since artifact densities cannot necessarily define activity areas other than in the case of refuse deposits.

In the archaeological literature there have been a variety of studies specifically to evaluate the degree to which formation processes create surface materials. Various attempts have been made to understand the impact of depositional, erosional and cultural processes through examining the surface class frequencies in a site or region (e.g. Hanson and Schiffer 1975, Hesse 1971). Effects of alluvial deposition on surface sherd frequencies have been examined by Kirkby and Kirkby (1976). They developed a series of probability equations for recovering surface materials based on original population size, average accumulation rates and time since deposition. They determined that after 100 years 37% of the original sherds in the deposit will be detected on the surface. But recovery probabilities drop sharply with time so that, after 1000 years only, 0.004% of the original sherd population will be exposed as surface materials. The hypothesis that distribution of surface materials reflect underground conditions was tested by Redman and Watson (1970) at the two prehistoric sites of Cayonu and Girik-i-Hacian in Turkey. They obtained a significant correlation between surface and sub surface by measuring the ratio of artifact categories obtained from the surface and the sub-surface. They also concluded that, with increasing depth, correlation of surface to sub-surface artifact class frequencies will decrease. In general, correlation dropped significantly below a 50cm depth from the surface, although, some test squares showed high correlation below 1m. depth (Redman and Watson 1970, see also Redman 1973). The effect of cultural transformational processes such as ploughing, has been an area of interest in the archaeological literature (e.g. Ammerman 1985, Clark and Schofield 1991). Ploughing can be viewed as a large scale formation process that is unique to the modern surface. This factor causes lateral and vertical displacement of artifacts and changes artifact class frequencies over the surface, eventually resulting in serious disturbance to the archaeological patterns. The nature of the plough zone and the effect of ploughing on the archaeological record have been an important research area in which attempts on the one hand have been made to define its character in terms of formation processes (e.g. Schiffer 1975, 1987), and on the other hand to quantify changes in artifact size and weight class ratios in order to estimate reliable population parameters. The plough zone surface contains an amount (sample) of the underlying plough zone artifact population, which is affected by artifact size, cultivation method and other factors. Discovery rate on such a surface depends heavily on the density of exposed artifacts, visibility conditions and survey intensity (Ammerman 1985). One most important problem in the plough zone concerns the density of artifacts appearing on the surface. A number of studies have showed that on average between a minimum of 0.3% and a maximum of 16.6% of plough zone artifacts can appear on the surface (references can be found in Shott 1995: 478). Terrenato and Ammerman (1996: 93-95) have tried experimentally to illustrate the exposure rate and stochastic variation of artifacts by simulating the circulation of material in the plough zone. Their experiment was carried out by trials using samples of 10, 30, 100, 300 and 500 fragments. Results showed that, in the case of 10 fragments, only in two out of 10 trials did one piece make its appearance on the surface, while at the level of 300 pieces a fair number of pieces made their appearance on the surface (9 pieces in any one trial). This means that when the number of pieces in the plough zone is comparatively small (less than 10 pieces) this stochasticity expressed itself in the presence or absence of material on the surface. Because of varying density values from one trial to the next (from one year to the next year), this issue in turn can cause problems such as: (1) we can have little confidence in interpretations made on the basis of spatial distribution of such light scatters; (2) defining sites and off-sites will be more problematic since a site defined in one trial (year) may be off-site in the next year; (3) single inspection of such a site overlooks lighter scatters, producing biased and unrepresentative samples of the artifact population. To overcome this Ammerman and Feldman (1978) have proposed successive and replicated collection of surface material.

Despite many sophisticated quantitative studies that have shown an independent behaviour to spatial patterning of surface materials even under plough disturbance (Binford et al. 1970, Dunnell and Lewarch 1974, Redman and Watson 1970), there have been other attempts trying to show that superficial patterning can only be the reflection of sub surface ones (Ammerman 1983, Voorrips et al. 1978, Shaar 1983, for more discussion see also Lewarch and O'Brien 1981, Cherry 1983). It means that the only legitimate way to obtain archaeological data will be by excavation rather than by surface collection. It is a critical area in archaeological research that can be solved with a good understanding of formation processes. Nevertheless, Lewarch and O'Brien in their comparative study (1981) have tried to provide a general state of knowledge about how formation processes form surface phenomena. Such a study enabled them to conclude with several generalisations. Most importantly a confirmation was made on isomorphism of surface to sub-surface, conditioned by various factors such as depth, erosional regimes and cultural features. This is analogous to Redman and Watson's observation, and might be systematically stated as a general principle: the probability of surface/sub-surface artifact class isomorphism decreases with depth from surface.

The important reason for doing surface collecting is that excavation can yield less information with the expenditure of more money and time. Modern researches do need comparative information from more than one site. If regional study is the research aim, only a systematic surface collection can provide comparative data for the various sites in a region. However uncontrolled surface collection may cause loss of information on provenience and destroys the correlation between surface and subsurface materials. An obvious disadvantage of surface collection particularly in the non-cultivated areas concerns the frequencies of diagnostic material; in an area where sites are undergoing recycling of material by natural geomorphological process, concentration of material or density of diagnostic artifacts may be considerably lower than in those areas where recycling factors are more active. In these circumstances continuous collecting may cause many sites to disappear. Thus, analysing artifacts in the field without collecting has been advocated (Schiffer and Gumerman 1977a: 189-190), if time and specialists are available. But there are several reasons which make collecting strategy essential (1) specific researches require more detailed analysis, which is not possible in the field only; (2) the lack of collection prohibits re-analysis, re-studies and re-tests of data which may be required in the next stages (Plog et al. 1978:406).

A systematic surface collection involves complete collection of selected portions of the site surface in order to understand distribution patterns of artifact types across the region. Selecting a portion of the surface and range of artifacts to be collected requires a proper probability sampling strategy to be carried out. If the sample is drawn properly it can: (1) minimise selection biases resulting from the over-representation of large artifacts. As stated above large artifacts on the surface have a better chance of being collected. Large sized artifacts are over-represented on the surface and have a high recovery rate, so that under an arbitrary collecting procedure biases will appear. An alternative way to reduce large sized artifact biases has been proposed by Ammerman and Feldman (1978). This procedure is the repeated collection of sets of grid squares of an area at different times, as a means of checking the kinds of variation in the surface pattern; (2) provide the level of confidence in the estimation of population parameters; (3) allow quantitative comparison of artifact frequencies in order to extrapolate the patterns of artifact distribution.

There are many different types of sampling designs available. Each sampling design to be applied to surface collecting should primarily consider two points: (1) collection should be made from different parts of the study area to provide information about all occupational periods, their spatial extent, and functional similarities between artifact and chronology; (2) time restraints are an important point in sampling design. Some sampling procedures require more time to collect samples and locate sample units. Although simple random sampling has the advantage of equally choosing sample units, it is more time consuming (Plog et al. 1978: 407) and it may leave more productive areas unsampled (Redman and Watson 1970: 281). The alternative way to delineate such problems can be the use of systematic sampling design such as stratified systematic unaligned sampling (Redman 1987: 252). In addition, there are other factors such as sampling unit shape and size (see sampling section) that can affect the accuracy of the collecting strategy. It must be considered that in the more elongated units the provenience of artifacts may be lost. Experiments have demonstrated that square units can provide precise information about provenience of artifacts rather than rectangular units and there is a less chance of mixing artifacts from different activity areas or from different occupational periods (Plog et al. 1978: 408). Size of sampling units and the size of samples are relevant to the site size in square metres, and the artifact density. These factors have to be balanced in relation to the research problem. Units of adequate size would provide sufficient number of artifacts from different areas. The size of sample (sampling fraction) for each site varies with the size of the site. Through a large amount of sampling fraction a sufficient number of artifacts as a whole can be collected from the study area.

8. Background and some problems of traditional surface surveying methods in Iran

For decades most archaeological investigation in the Near East (Iran) focused on excavation of relatively large *Tell* sites. Nevertheless, regional investigations were common in the beginning of present century, where site identification was a major problem, and again in the 1930s and 1940s when new ceramic sequences made it possible to date more of the sites found by regional surveys. Traditionally, site survey in Iran has entailed the collection of surface artifacts, their dating with reference to comparable materials excavated at other sites, and the selection of one or more of the surveyed sites for excavation. Several recent survey projects represent a radical departure from this traditional approach to the notion that excavations at a single site contribute to the definition of spatio-temporal characteristics of artifact assemblages and to the development of regional chronologies, but they cannot in themselves clarify changes occurring on a regional scale, which are reflected in part by variations among sites. The most influential surveys, and the first systematically aimed at the study of ancient patterns of rural land use and the definition and explanation of long-term transformation in economic and political organisation in Iran and Iraq, were those of Adams and Johnson conducted from the 1950s to 1975 (Adams and Hansen 1968, Adams and Nissen 1972, Adams 1981, Johnson 1973). These highly productive surveys encouraged others to undertake archaeological surveys in many parts of the Near East. During the 1970s many researchers adopted the methods of archaeologists working in the southeastern United States to surveying for archaeological evidence in southern Iran. Survey techniques that are highly productive on the irrigated alluvial plains of Iranian Khuzistan and Mesopotamia (and in the southwestern American desert) may not be appropriate in the highlands of Iran. The goal that guides many regional surveys in Iran is to document change in land use, in settlement systems, and in the size and distribution of human populations. It should be stressed here that a large flat alluvium that supports agriculture only under irrigation offers different possibilities and presents different difficulties to the archaeologists than surveys in the wetter highlands. Nevertheless, some archaeologists have used these lowland surveys as inspiration for surveys in regions whose physical and cultural landscapes differ radically. For instance, Adams' surveys of lowland Mesopotamia and the floodplain of Iranian Khuzistan were developed mainly on the possibility of recognising ancient networks of canals and natural watercourses on the floodplains. In examining aerial photographs often "a pattern of linear discolorations emerged, generally consisting of the faint traces of ancient levees". He also suggested that in semiarid areas settlement would have been possible only where water was available along rivers and canals. Where settlements of a period showed linear patterns, it could be assumed that the lines reflected the watercourses upon which the settlements depended (Adams 1981: 27-28). Some problems arise from this type of survey; one of the problems Adams encountered was that modern agricultural fields affected visibility; crops covered the study area and in some cases the slightly raised contours of canal levees and low *Tell* sites were subject to obliteration by ploughing. These circumstances are common where fieldwalking has been the only method for site location. Adams' extensive type survey was more dependent on ground checks of highly visible sites and levees by vehicle. The modern canals, furthermore, are a considerable impediment both to fieldwalking and to vehicular surveys. Adams attempted to avoid both problems by restricting most of his survey to territory outside modern cultivated lands (Adams 1981: 35). Another serious source of problem is geomorphological. In the floodplains of Mesopotamia and Iran there is regular inundation of rivers such as the Euphrates and Karun which are associated with aggradation. Deposits of sediment around many ancient *Tell* sites are now more than 5m higher than the lower occupation floors of the sites (Adams 1981: 10). The implication is that many sites could be completely buried by the river's sediments (Brookes et al. 1982: 295-299, Kirkby and Kirkby 1976). If thick alluvium can hide even a *Tell* some 4m high, how many more of the small, low sites may be hidden? Perhaps wherever alluviation has contributed significant deposits of sediment there will be under-representation not only of small or low sites, but also of sites whose most recent occupation is very ancient. In other words, there will be an inverse relationship between the probability of discovering a site in the alluvium and the age of its most recent occupation. Furthermore, Adams' and Johnson's surprising discoveries of dense settlements in both regions lacking any demonstrable associations with canals indicate a research problem that purposive sampling along canal routes can never address, and the lack of controlled sampling prevents us from assessing the accuracy and precision of estimates of the parameters of the population of all sites. Indeed, the fact that they found so many of sites in spite of a survey strategy that avoided territory not associated with canal traces suggests that such sites may be even more common that their evidence indicates. To conclude, except under cultivation the flat alluvium affords easy visibility for the more obtrusive sites, such as high *Tells* and better preserved levees. The flat area also permits easy and rapid survey by air and wheeled vehicle. Unfortunately, these benefits are accompanied by the systematic loss of data from sites buried by deep sediments. Alluvial plains in Iran also are unique in representing clusters of sites along canals. Economic surveys take advantage of this clustering by restricting fieldwalking to areas adjacent to canal levees. These areas may be treated as one stratum of a stratified sample that undergoes much more intensive investigation than other strata (Schiffer et al. 1978: 5-6). If we are to reconstruct the agricultural history of such plains, and our assumption that agriculture and settlement depend on irrigation is valid, these are certainly the most economic field strategies (apart from sample biases); and they permit a small crew to cover a large area in few seasons of fieldwork as was the case in Adams' surveys. It is important to recognise that if the irrigation assumption cannot be substantiated, or if we are to discover the full range of sites in the survey area, other field strategies are necessary.

In the highlands, geomorphological and cultural phenomena present a different position. Systematic burial of low or more ancient sites by alluvium is more rare, sites are not obscured by overlying deposits, but by colluvial or cultural and plant covers. In the highlands wheeled transportation is generally difficult or impossible.

In some such areas soil may be accumulating or site visibility may be low; in others the soil may be deflated or washed away, making sites more visible. In the mountainous areas, furthermore, there is usually little visible contrast between sites and natural features; from a distance of 100m a *Tell* may be indistinguishable from a natural hill. In general, the problem of archaeological survey in the highlands is that the visibility and obtrusiveness of sherd scatters are extremely low. Vegetation cover and leaf-fall are a common impediment to sherd visibility, particularly in the wooded parts of the Zagros and Elburz highlands. Colluvial deposition in valley bottoms buries sites there, and causes our estimates of site distribution to be biased in favour of eroded hilltops. In addition, the stony surface cover on many soils contrasts very poorly with scatters of sherds or lithics. Furthermore, in the highlands of Iran there are no regional canal networks along which we can expect sites to cluster, and in the highlands the sites (especially the Neolithic sites) are often small and dispersed throughout the landscape. They occur in diverse habitats that often obscure site visibility. As a result, in such areas the techniques used by Adams will tend to produce biased samples, and eventually poor estimates of site locational parameters. Thus, it is useful to consider all types of archaeological survey. This permits some generalisation about the factors that contribute to the probability that the survey will discover particular kinds of sites in various environments.

In summary, survey data constitute a basic source of archaeological information for tracing shifting regional patterns of human past life styles. Survey data also permit interpretive reconstructions of the changing patterns of settlement, social, economic, and political organisation structure of regionally defined communities. Considerable caution is needed when obtaining and analysing regional survey data. The landscape must be viewed as an evolving artifact subject to many of the same processes of distortion as other archaeological records. How regional data are collected and what processes contributed to the formation of the record that is sampled are questions that affect directly the accuracy and reliability of the data themselves. Much has been made of survey methodology over the past three decades, particularly the issue of sampling strategy (see references in the beginning of this chapter). Central to this discussion has been a concern for the construction of explicit survey research design (e.g. Schiffer et al. 1978). Every survey is guided by a research design, whether it has been made explicit or not. Cultural and natural formation processes represent a second set of issues that must be addressed when assessing the accuracy of survey data. The impact that natural formation processes such as erosion and alluviation can have on the archaeological record is profound. In most parts of Iran, with their long history of settlement, the survey universe is particularly complex. In southern Iran, for example, erosion and alluviation have had a powerful effect, altering the topography and influencing the distribution and visibility of archaeological sites; for instance, under the sediment deposits many sites that would have formed part of the settlement landscape in a given period now lie buried beneath alluvium (see the above discussion, and discussion in chapter 4). Although in such cases a variety of useful survey approaches focusing specially on the off-site components of settlement systems will be of great importance, without subsurface testing even these innovative methods will fail to detect this buried portion of the archaeological record. The impact of cultural activity also plays an important role in the formation of the archaeological record. In case of Iran, the Neolithic and Early Bronze Age sites are frequently buried beneath the accumulation of millennia of subsequent human activity, obscuring large portions of these records. Many of *Tell* sites, however, clearly contain extensive accumulation of different occupation levels, in which each of them is enveloped and concealed beneath metres of debris.

In the Palaeolithic period the above problem is very obvious and the identification of the Palaeolithic sites is very difficult. In this period the periodic fluctuations of climate during the vast span of time covered by the Palaeolithic period have led to its archaeological evidence being contained with a variety of types of geological deposits. These are often deeply buried and only accessible in the present-day where they have been exposed, but not yet destroyed by either natural or human activities. Thus, a understanding of the geological correlations to make climatic and environmental framework for Palaeolithic seems to be more necessary. In Iran, so far the Pleistocene environmental framework has not been established from the investigation of numerous Pleistocene deposits, many of which may not contain direct evidence of human activity (such as lithic artifact) , and hence they are not recognised as Palaeolithic archaeological sites. Also undisturbed landsurfaces containing lithic artifacts associated with environmental evidence have not been recognised by archaeology of Iran. However, other type of site also contribute significantly to our understanding of the Palaeolithic. Sites containing artifacts and or faunal remains , even when disturbed, help to complete our understanding of the regions of Iran occupied, or otherwise, at different stage of the Pleistocene and the climatic conditions tolerated by early hominid populations. Site without artifactual remains also p[lay a major role in the Palaeolithic research, helping to provide the chronological, climatic, and environmental framework within which the artifactual evidence can be studied. Sites rich in mammalian remains but without artifacts or hominid skeletal remains are so important in the study of the human physical evolution. The Palaeolithic archaeological resources with its special nature needs a distinctive set of academic priorities and research strategies. At present, the Iranian archaeological exercises focus mainly upon the more visible, accessible, and better documented archaeological sites and do not adequately address the needs of the Palaeolithic part of the Iranian archaeological resources. The biggest problem of Palaeolithic Iran is the fact that the potential archaeological significance of non-artifactual sites is not widely accepted, this means that such sites are excluded from the any research priorities and eventually throughout the heritage management policies (see also chapter 6). There are also problems for the sites containing artifacts, which are at least generally accepted as an archaeological site. The deeply buried and non-structural nature of Palaeolithic sites makes them much more likely to be inadequately preserved. In Iran open air Palaeolithic sites are by the traditional definitions of 'archaeological site' (above) are excluded from statutory protection on archaeological ground. With respect to above discussion, it appears that the identification and delimitation of the Palaeolithic sites is a key task. At first step a comprehensive survey strategy throughout Iran (both in theoretical and in practical sides as outlined above) is needed. It will provide a complete inventory of all Palaeolithic sites scattered throughout Iran (particularly traces of the Lower and Middle Palaeolithic Iran, see chapter 5) and the identification of all Pleistocene deposits, their characterisation in terms of relevant attributes, and their subsequent discriminations. The important attributes are included for example, kinds of Pleistocene deposits, period, disturbance, stratigraphic and geological evidence, botanical evidence, mammalian evidence, molluscan evidence, and artifactual evidence. This inventory associated with such attributes will provide the basic information which can be used as a data base for the research priorities and archaeological heritage management policies. What remains to be noted here is that in the areas where the Palaeolithic sites are buried beneath the depositions, the gathering of information in the absence of technical equipment may be impossible and surveying the surface alone may fail to provide the necessary data. In such cases surveying strategy should be oriented towards a full investigation (such as geological and environmental processes, see chapter 4) of the present landscape of the study area. Such investigations enable us to assess the key variables that might have influenced the operation of cultural systems in the areas. For the reconstruction of the ancient human environments, what we can locate by survey is as much geological and environmental accident as cultural artifacts left on the surface.

Related to this problem is the question of how representative surface distributions are of the subsurface distributions. Although experiments have shown that cultural debris in ploughed soil tends to displace laterally and vertically, with surface material composing only a small fraction of the total distributed below ground, a broad isomorphism between surface and subsurface assemblages generally persists (Redman and Watson 1970). However, the relationships between surface and subsurface material distributions depend on a variety of factors, including the depth of deposition, erosional regimes and cultural features (Dunnell and Simek 1995).

Modern development and in most cases in Iran the frequent resurveying of a site or region add further distortion to the visible archaeological record. For survey results to provide reliable data, therefore, the temporal and spatial limitations of these data must be clear and must condition any attempt to reconstruct human past activities.

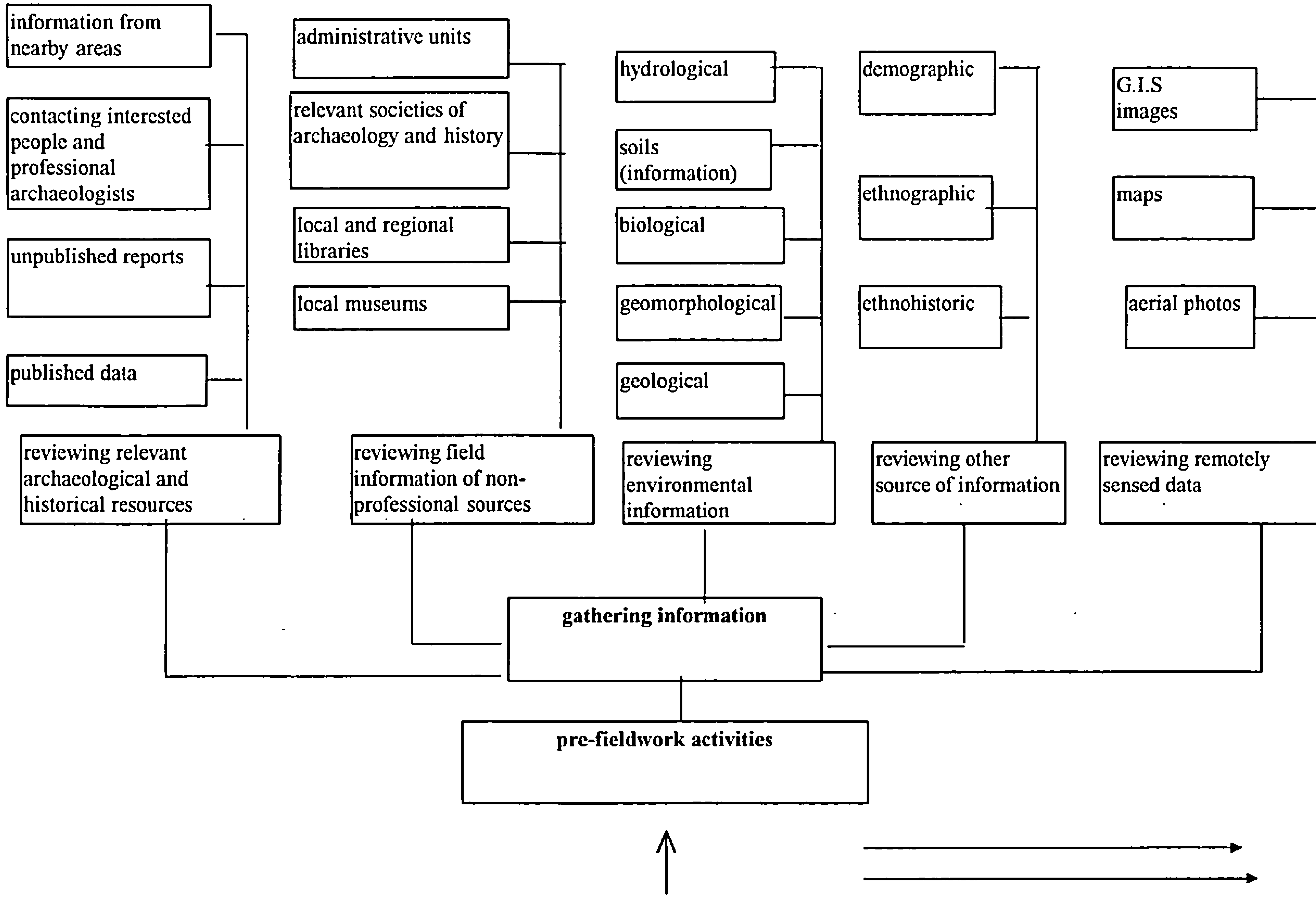
The main goal of this chapter is concerned with the development of the methodology which I believe is seriously required by archaeology in Iran. The main thrust of the chapter is to introduce a framework to explain the principles of survey strategy, as well as to suggest the fact that in Iran, there is a great deal which could be done to improve the situation. It will be argued from the present state of archaeological survey methods in Iran that what is lacking, in effect, is a methodology tailored to the very specific problems of survey data and its interpretation. Only by doing this can the deficiencies inherent in Iranian survey work can be recognised (whether they relate to archaeological method, the nature of archaeological and environmental factors, or to the present system of Iranian archaeology), and the means of compensating for them be devised. This chapter emphasises that regionally based, ecologically stratified, multi-stage data collection programmes (Cherry and Shennan 1978) are the best means of obtaining adequate samples of the full range of Iranian archaeological heritage to serve for planning, educational and research purposes. Such data collection programmes involve an explicit survey research design and an integrated range of surface survey techniques. Unfortunately, no projects that are conducting survey in Iran are making an effort to describe their survey design. To achieve this, a model describing the processes of conducting a regional survey is provided. In this model among the various techniques of survey strategy the main emphasis is basically on fieldwalking technique, because under present financial circumstances and the absence of specialists working in various technical fields conducting surveys which need technical equipment such as geophysics may be impossible. Some of the main requirements of a competent survey team according to this model may be summarised as follows:

1-an understanding of current knowledge concerning natural and human landscapes, their history and their formation processes. This is essential for an understanding of the problems involved and for the design, implementation and interpretation of survey programmes;

2-a knowledge of artifacts of different periods; a knowledge of cultural processes leading to their occurrence in the archaeological record; an understanding of how such artifacts and their distributional patterns may be affected by natural and cultural processes;

3-a knowledge of the range, limitations, and applications of the different fieldwalking techniques available and of sampling theory. There is also a need to understand the factors affecting artifact recovery in the field, team management and experience.

9. Designing a regional scale archaeological survey strategy



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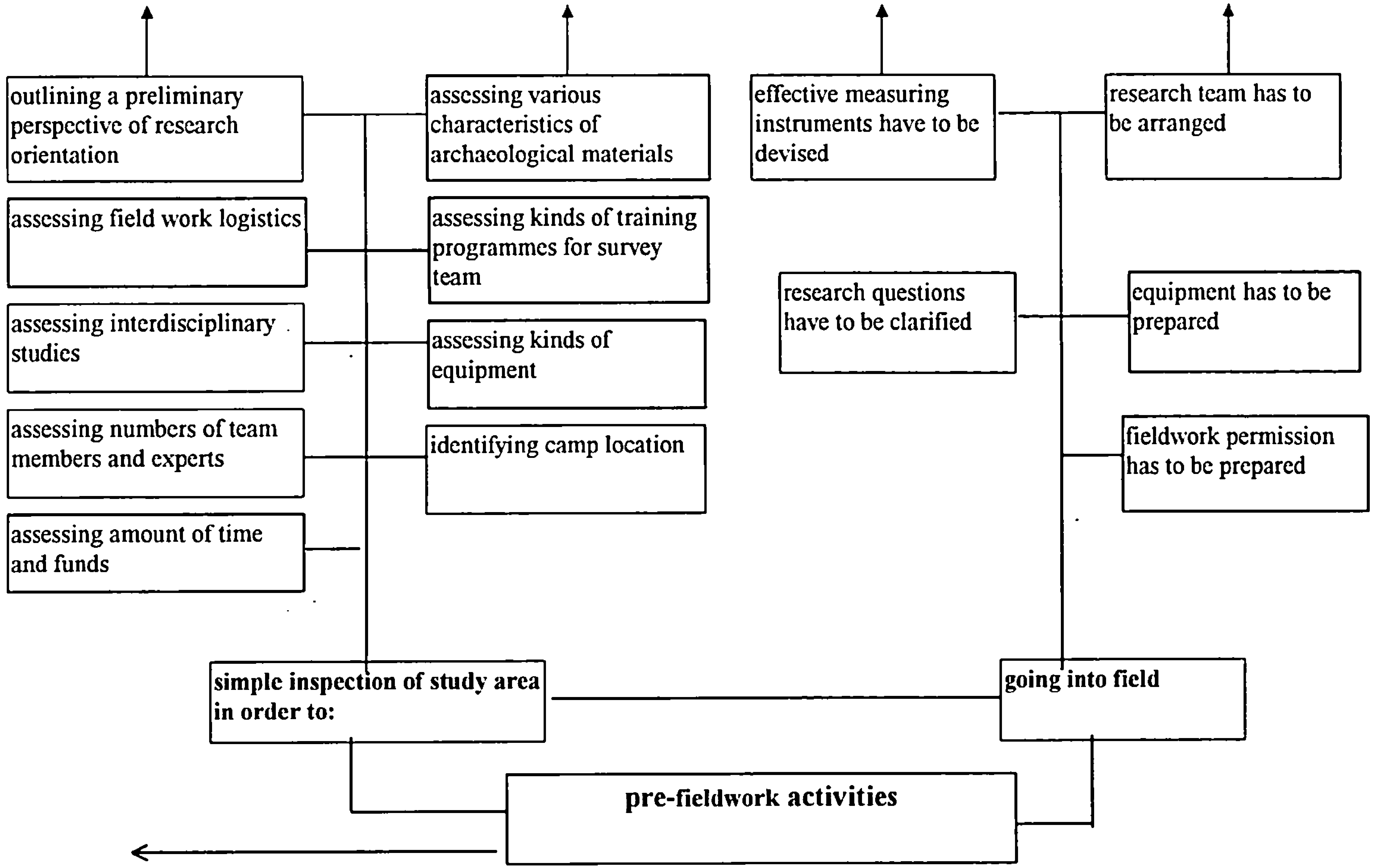
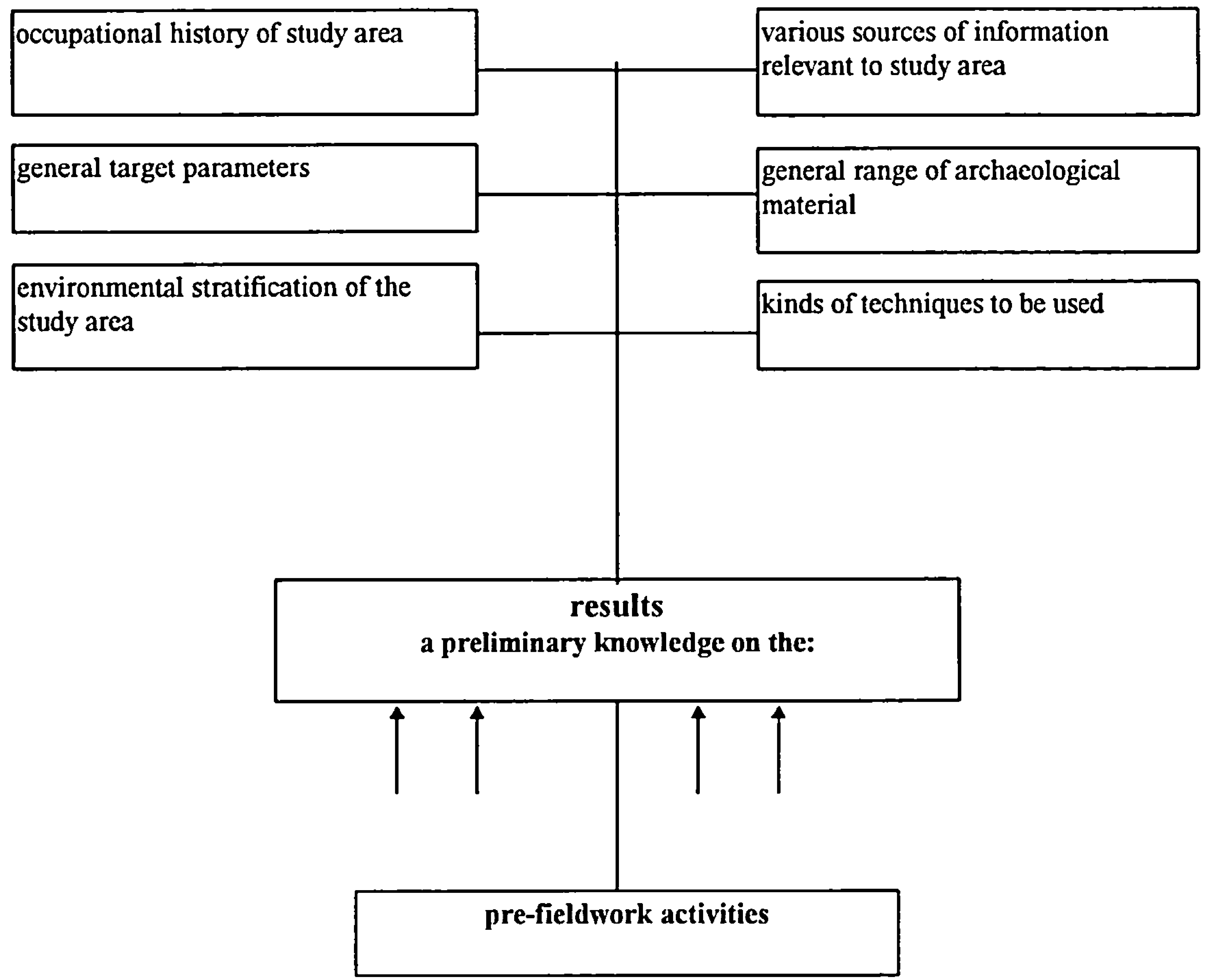


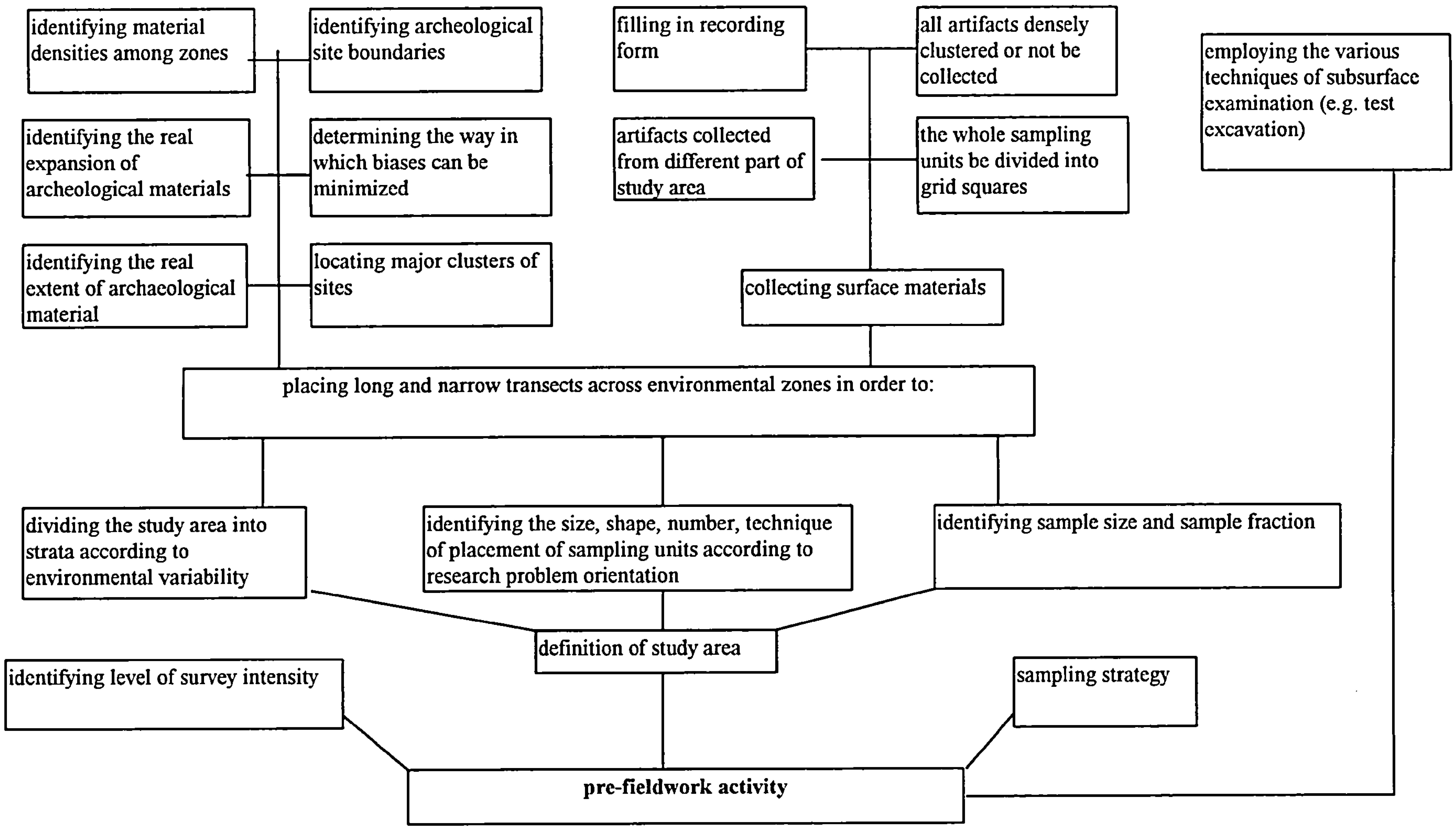
outlining a preliminary perspective of research orientation
assessing various characteristics of archaeological materials
effective measuring instruments have to be devised
research team has to be arranged
assessing field work logistics
assessing kinds of training programmes for survey team
research questions have to be clarified
equipment has to be prepared
assessing interdisciplinary studies
assessing kinds of equipment
assessing numbers of team members and experts
identifying camp location
fieldwork permission has to be prepared
assessing amount of time and funds
simple inspection of study area in order to:
going into field
pre-fieldwork activities

continued

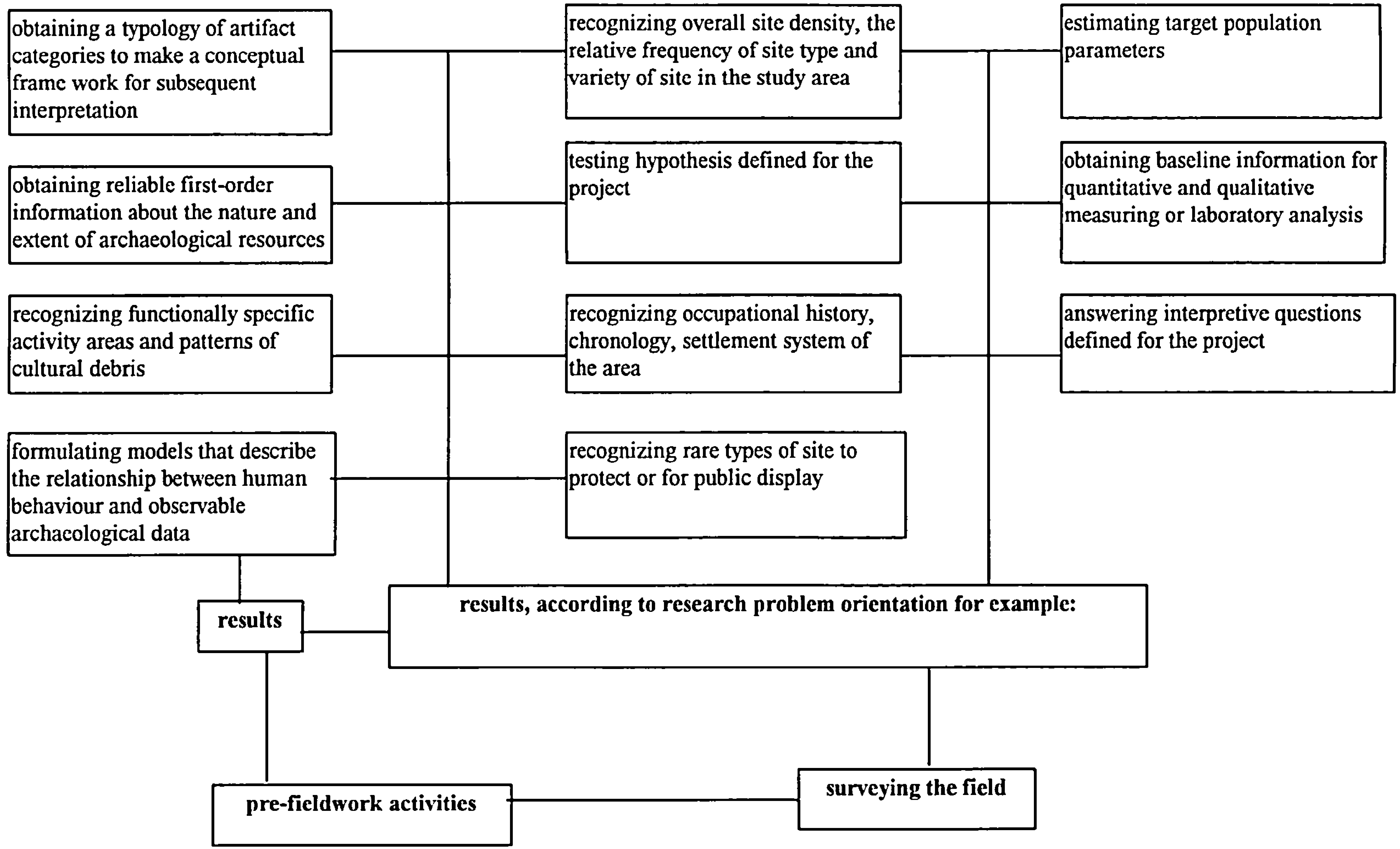


occupational history of study area
various sources of information relevant to study area
general target parameters
general range of archaeological material
environmental stratification of the study area
kinds of techniques to be used
results
a preliminary knowledge on the:
pre-fieldwork activities

continued


identifying material densities among zones
identifying archeological site boundaries
identifying the real expansion of archeological materials
determining the way in which biases can be minimized
identifying the real extent of archaeological material
locating major clusters of sites
filling in recording form
all artifacts densely clustered or not be collected
artifacts collected from different part of study area
the whole sampling units be divided into grid squares
collecting surface materials
employing the various techniques of subsurface examination (e.g. test excavation)
placing long and narrow transects across environmental zones in order to:
dividing the study area into strata according to environmental variability
identifying the size, shape, number, technique of placement of sampling units according to research problem orientation
identifying sample size and sample fraction
definition of study area
identifying level of survey intensity
sampling strategy
pre-fieldwork activity

continued



obtaining a typology of artifact categories to make a conceptual frame work for subsequent interpretation
obtaining reliable first-order information about the nature and extent of archaeological resources
recognizing functionally specific activity areas and patterns of cultural debris
formulating models that describe the relationship between human behaviour and observable archaeological data
recognizing overall site density, the relative frequency of site type and variety of site in the study area
testing hypothesis defined for the project
recognizing occupational history, chronology, settlement system of the area
recognizing rare types of site to protect or for public display
estimating target population parameters
obtaining baseline information for quantitative and qualitative measuring or laboratory analysis
answering interpretive questions defined for the project
results
results, according to research problem orientation for example:
pre-fieldwork activities
surveying the field

Chapter 4

Palaeoenvironmental Background of Iran and its Archaeological Implication

1. Introduction

The idea of climatic change as a determinant factor in major cultural change in the Near East has always been promoted from Huntington (1905) in the early twentieth to Childe in the middle of the century, and more recently by the majority of archaeologists. Bar-Yosef (1994, 1995) and Turner (1992) have stressed that the early Palaeolithic human movements from Africa to Eurasia coincided with climatic fluctuation of the various glacial cycles as well as by change in the carnivore communities. For the Neolithic Revolution the climatic determinism concept emphasises a climatic change from a cooler and drier condition to a warmer climate in the terminal Pleistocene. This change was assumed to have had a profound effect on the environment of the Near East that contributed significantly to the adjustments in human adaptation that resulted in the development of plant and animal domestication and the beginning of agriculture (Bar Yosef and Belfer-Cohen 1989, 1991, 1992, Braidwood 1972, Cauvin 1978, Henry 1989, Redman 1978, Mathews et al. 1990, McCorriston and Hole 1991, Miller 1991a, Moore 1985, Moore and Hillman 1992, Watson 1991, Wright 1968, 1976). In the period of urbanisation it is argued that environmental forces played a major role in shaping social development. Hole (1994) and Sumner (1988) (see also Adams 1981, Postgate 1992, Weiss et al. 1993) have addressed climatic change as a basic factor in the reorientation of

Mesopotamian and Iranian societies since the fifth and fourth millennia B.C. that caused a change in the organisation of irrigation systems and mobilisation of labour.

The reconstruction of the environment first requires an answer to questions of chronology and climate. It is essential to understand that when the human activities under study took place in terms of the broad world climatic succession. This then is a matter of chronology. A reliable data allow us, for instance, to determine whether the context belongs to a glacial or an interglacial phase, and what the temperature is likely to have been in that part of the globe. Other questions such as sea-level will be related to this one. An important step in the reconstruction of Palaeoenvironment especially for all postglacial context is the study of the vegetation (pollen or other plant remains)at that time. Other important step is to turn to the fauna and microfauna including insects, snails, and rodents, all of which are very sensitive indicators of climatic change.

No single method will give an adequate picture, and so as many methods as data will allow need to be applied to build up a comprehensive image. There are a series of advanced methods are used by environmental archaeologists in reconstructing Palaeoenvironmental patterns of the globe, including for instance, extracting data from the sea bed and ice cores (the most coherent record of climatic changes on a worldwide scale is now provided by deep-sea cores, drilled from the ocean bed. These cores contain shells of microscopic marine organisms known as foraminifera, laid down on the ocean floor through the slow continuous progress of sedimentation. Variation in the ratio of two oxygen isotopes in the calcium carbonate of these shells give a sensitive indicator of sea temperature at the time the organisms were alive. We now have an accurate temperature sequence stretching back 2.3 million years which reflects climate change on a global scale. Thus the cold periods in the deep-sea cores relate to glacial periods of ice advance, and the warm periods to interglacial or interstadial periods of ice retreat. The deep-sea core oxygen is a framework for a relative chronology for the Pleistocene. Fluctuations in Pleistocene and Holocene climate as recorded in deep-sea cores, ice cores, and sediments containing pollen are of considerable value for dating purposes. This method records the fluctuations in climate during the Ice Age. From the beginning of the Pleistocene, about 1.7 million years ago, down to about 730,000 years ago (Lower Pleistocene) there were perhaps ten cold periods separated by warmer interludes. Another eight or nine distinct periods of cold climate may have characterised the Middle and Upper Pleistocene (oxygen isotope stages 19-1 from 730,000 to about 10,000 years ago). The period of warmer climate known as the Holocene covers the last 10,000 years)(see Aitken 1990).

The modern archaeology today for the Palaeoenvironmental reconstruction applies the following techniques as well. Studying ancient winds (Parkin and Shackleton 1973); ancient coastlines (van Andel 1989); submerged land surfaces (Shackleton and van Andel 1986); rocks and soils (Holliday 1992); the composition of the sediments and soils of cave sites (Courty et al. 1990); and dendroclimatalogy (Schweingruber 1988); as well as studying micro and macrobotanical remains and micro and macro fauna remains (Moore et al. 1991, Rackham 1994).

2. Problems of the Palaeoenvironmental study in Iran

The researchers who deal with Iranian Archaeology to document climatic patterns and their influences on the human cultural processes are initially facing the following problems:

(1) knowledge of past environmental events and processes in Iran is relatively poor, although from the nineteenth century there have been a large number of studies for this purpose;

(2) the correlation of geological events and archaeological processes has not been sufficiently well established; for example, the glacial and pluvial environmental fluctuations of the Pleistocene period have been poorly documented so the contextual framework of Palaeolithic cultural processes is relatively unknown;

(3) dating methods to document palaeoenvironmental processes have not been developed; apart from the radiocarbon dating control that is still used for archaeological purposes, with a few exceptions there has been no application of dating methods such as thermoluminescence, potassium-argon, uranium-thorium and many others that are successfully used in other parts of the world and;

(4) and although some field studies in Iran, particularly in the palynological field, were excellent, they are very limited in scope, amount and area (e.g. the pollen sites in Iran come from the forest and steppe-forest association; there is no pollen evidence from either desert or steppe zones). These limitations demonstrate the difficulty of reconstructing the environmental background of human activities in less well known parts of the country.

In theory, at least, climatic change in terms of variation in temperature, precipitation and other climatic variables, would have affected the physical pattern of the land and the nature and distribution of faunal and botanical communities. There is evidence for a significant climatic changes during the late Pleistocene and early Holocene in Iran which would have affected the land morphology. Erosion and deposition are both geomorphological processes that affected the preservation of sites as well as the lives of people who lived in them. The severe environmental changes that have occurred could help account for some cultural responses manifested in such events as shifts in settlement pattern or change in technology. Apart from the other principal geological processes such as tectonics and earthquakes that deeply affected the land patterns there is also another problem, that is extrapolating the past environmental patterns from the present ones. It is land use practice that prevents direct comparison between past and present situations and disturbed the landscape through time (Miller 1991b: 155). Such practices include the removal of trees and woody shrubs, overgrazing by domesticated animals, compaction of topsoil, and increasing degradation of the root network; all these contribute to increased surface runoff and wind erosion. The cultivation of domesticated plants has increased domesticated seeds and replaced wild species. The increased cultivation may have gradually decreased organic materials in the soil while increased irrigation with associated salinisation has profoundly affected the landscape in Iran during the last few thousand of years. All these adversely affect our knowledge of former climates in Iran. The reconstruction of earlier human cultural processes in the Palaeolithic, for example, relies heavily on the quality and availability of the Palaeoenvironmental data, and if not, the lack of such data affects the quality of research and results, so it is necessary to explain why Palaeolithic archaeology in Iran stands now in a undeveloped state.

In terms of archaeological techniques, particularly systematic surface survey (see chapter 3), the geomorphology of the land has a considerable effect on survey results. It has been argued by most archaeologists that regional archaeological studies require a knowledge of the geological history of the region, since the archaeological data need to be interpreted in the light of natural and cultural processes that have affected them (Brookes et al. 1982; see also Schiffer et al. 1978, Schiffer 1987). In the areas where some archaeological sites have been buried under alluvial deposits the archaeological samples taken from the surface cannot be representative of the former population and the conclusion eventually tends to be distorted. Thus one can assume that fluctuating climatic conditions of the late Pleistocene and early Holocene in Iran (as we will see in this chapter) may have caused a large number of archaeological sites to become buried, affecting the reliability of reconstructions of cultural processes. For the future, a matter of high priority must be a careful assessment of the geological processes that have affected each of the settlement areas. In the areas where deposition has been excessive, sub-surface sampling to identify buried material by means such as coring or penetrating radar can produce results if funding permits.

Since this thesis is dealing primarily with the Palaeolithic Iran within the wider context of the Near Eastern Palaeolithic, so assessing the potential and limitations of the Pleistocene record for Iran in particular and the Near East in general appears to be necessary here. For this a general outline of geography, environment and chronology of the Near East is provided in the following section. Noting that in the absence of more reliable Palaeolithic data from the most parts of the Near East, the chronology discussed in this section is based mainly on the Levantine chronology.

3. Geography and environments of the Near East

The main geographic features of this region include the topographic combination of mountains, plateaux, and alluvial plains. The coastal plains are narrow in comparison with those found on other continents. The Anatolian plateau is bounded by the Pontain mountains to the north and the Taurus mountains to the south, with each range spanning about 1500 km in length. Both join the northwestern end of the 1800 km long Zagros chain which, together with the Caucasus mountains, comprises the deeply dissected landmass. The Iranian plateau is bounded by the Zagros mountains to the west and south, the Elburz and Kopet Dagh mountains to the north, and the Khurasan and Baluchistan mountains to the east. The Mesopotamian plain stretches and descends from the foothills of the Zagros and Taurus into the Persian Gulf. It is bounded to the west by the Syro-Arabian Desert, which stretches into the Arabian peninsula. The Mediterranean Levant is a special zone within western Asia, covering an area about 1100 km long and 250-350 km wide. Topographically, it include the coastal mountain range, the Dead Sea System or the Rift of the Orentes-Jordan valleys, inland mountain ranges such as the Anti-Lebanon mountains, and an eastward sloping plateau, dissected by many wadis flowing into the Syro-Arabian Desert and spotted by oases. Today, the climate of the Near East is dominated by two distinct seasons: cool, rainy winters and hot, dry summers. Winter temperatures are milder in the coastal ranges and more severe inland or at higher elevations. Precipitation is affected by distance from the sea and by altitude, with the central Anatolian and Iranian plateaux the Syro-Arabian Desert and Mesopotamia being the driest zones. In the Mediterranean Levant, rainfall decrease in a north-south direction from the Taurus mountains to the Sinai peninsula. Today, Eu-Mediterranean vegetation, consisting of woodlands or open parklands, prevails along the coastal ranges. Dwarf shrubland and steppic vegetation dominant the eastern Anatolian plateau, forming a wide arching belt from northern Mesopotamia into Sinai. In the semi-arid and arid region, xeromorphic dwarf shrubland and desert plant associations cover most areas. The current complex climatic system of the Near East makes it difficult to reconstruct the pattern of the past. Several lines of evidence (e.g. Palynological sequences and lake levels) suggest that the present climate in Iran (and generally in Southwest Asia and the Near East) differs in some respects from climates of the late Pleistocene and early Holocene (Butzer 1975, COHMAP Members 1988, Flohn 1981, Kutzbach 1981, 1983, Kuzbatch and Guetter 1986, Kuzbatch et al. 1993, Roberts and Wright 1993, van Zeist and Bottema 1982, Wright 1993), while Upper Pleistocene rainfall distributions were somewhat similar to those of today. Decadal and centennial fluctuations in the amount of precipitation, rather than temperature changes, were responsible for the expansion and contraction of vegetational belts (e.g. Roberts and Wright 1993). The distribution of past mammalian fauna, as well as birds is poorly known, and most of the information is gathered from animal bone collections retrieved from excavations across the region.

4. The Quaternary environmental and climatic changes in the Near East

Our knowledge of environmental and climatic changes in the Near East during the Quaternary is still fragmentary. This makes it difficult to correlate events there with those taking place in northwest Europe at the same period. In this latter region, an accumulation of evidence from many sources has shown that the last glacial period, known as the Würm occurred between about 70 ka and 10 ka, and was followed by the Holocene period. During the latter part of the Würm between 25 ka and 15 ka a major ice advance occurred, which at its maximum, covered a large proportion of the northern hemisphere. The nature of the changes which occurred beyond the ice front, in places such as the Near East, still remain largely unknown (with some exception in the Levant), owing to the paucity of research work which has been carried out here. Early works postulated climatic changes on a large scale, which they claimed had a fundamental effect on the geomorphic processes operating in the region. Pluvial periods, that is times with higher precipitation than at present, were considered to have occurred in the Near East contemporaneously with glacial activity in northwest Europe. Recent work, however, has shown that the pattern is much more complex than this, and that perhaps different conditions prevailed in different areas at the same period. The lack of evidence from large parts of the region makes it difficult to be precise in drawing detailed conclusions. Information on the Nile Valley has been greatly enhanced over the last few years as the result of work on the Aswan High Dam as well as by continued archaeological investigations (Beaumont et al. 1988). Studies of alluvial deposits in Egypt have been used for two main purposes. Small wadi deposits provide an indication of local climatological conditions, while flood plain sediments of the Nile record environmental events, particularly summer monsoonal rainfall, in Ethiopia. Evidence of pluvial conditions in southern Egypt, possibly about 60 ka is provided by the Wadi Floor Conglomerate, which overlies bedrock along many wadi floors. At the time of the accumulation of this deposit there is no evidence for higher Nile flood levels, which would be indicative of pluvial conditions in Ethiopia. The Korosko Formation, consisting of Nile silts, was deposited between 50 ka and 25 ka. During the first part of this cycle, pluvial conditions still continued in southern Egypt, while at the same time increased precipitation in Ethiopia produced grater floods along the Nile. Later, pluvial activity in Egypt declined, although even higher flood levels were recorded down the Nile river system. This lack of complete agreement between environmental conditions in south Egypt and the source of the Blue Nile in Ethiopia seems characteristic of the latter part of the Pleistocene period. During the time of LGM in northwest Europe the climate in southern Egypt appears to have been arid, as it is today, while at the same time wet conditions prevailed in Ethiopia. In the 10 ka following 15 ka the discharge of the Nile increased, as too did wadi incision in southern Egypt. This latter fact is taken to indicate the return of pluvial conditions in that region. Nile flood levels began to decrease in the third millennium B.C., and local wadi activity also declined in intensity. Since this period the climate of southern Egypt has remained arid. The lowest Nile floods appear to have been recorded between 2350 and 800 B.C., with slightly less arid conditions prevailing since that time.(see also Paulissen and Vermeersch 1987).

Although similar sequences of alluvial deposits exist throughout the Tigris-Euphrates basin, their chronological significance has not yet been studied in any detail. So far the most detailed work on the Euphrates comes from Syria, where late Pleistocene and Holocene terraces have been described (Peaumont et al. 1988).

Pleistocene stratigraphy has been well studied in the basin of the River Jordan. Here, the main sequence of sediments, known as the Lisan Marls, are considered to be late Pleistocene in age and to have been deposited in a huge lake over 300 km in length, which possessed a water level about 200 m above that of the present Dead Sea. Following the Maximum development of the lake, more arid conditions occurred, and the lake decreased in size. With a lowering of water surface elevation, a sequence of shorelines were cut in the Lisan Marls at many different heights down to the present level of the Dead Sea (Klein and Flohn 1987).

Glacial activity at the present day is confined to a few small corrie glaciers and permanent snow patches in the Pontus and Taurus ranges and the Armenian Plateau of Turkey, as well as on Savalan, Suleiman, and Damavand in the Elburz mountains of Iran. In Turkey the contemporary snowline reaches a minimum height of about 3200 m I the northern part of the Pontus Range, rising inland to more than 4000 m , while in Iran it appears to be slightly higher at between 4000 m and 4300 m (Messerli 1967). During the Pleistocene it seems that glacier grew large and that new ones come into being in other upland regions. The actual amount by which the snowline was depressed during this period is still the subject of considerable controversy. Values of 800 to 1200 m have been reported for Turkey, while in parts of the Zagros it is claimed to have been at least 1200 m (Wright 1980).

A considerable body of research has been carried out in the Near East on alluvial deposits of Tertiary and Quaternary age fringing the major upland regions. The deposits are often of very great thicknesses, upwards of 300 m, and would seem to indicate continued continental sedimentation over very long periods of time. In a series of papers (see next for discussion and bibliography) dealing with alluvial deposits along the southern slopes of the Elburz mountains three major alluvial formations of post-Upper Miocene age have been identified. The oldest (Hezardarreh Formation) between 100 and 120 m in thickness. It age is estimated to be Mio-Pliocene. Overlying this is the Kahrizak Formation. This is much thinner, really more than 60 m in thickness, but it has been subjected to folding and faulting. It age is estimated to be mid-Quaternary. Finally, the youngest formation, the Tehran Alluvium, is generally less than 35 m in thickness and has been unaffected by orogenic activity.

The dating of recent alluvial material, and the land forms to which they give rise, still poses problems. Two phases of alluvial deposition are widely recognised in the Near East. In Iran, the earlier phase began no more than 50 ka and had probably ended by the fourth millennium B.C. This was followed by a period of erosion, after which a second phase of deposition occurred during the Middle Ages. In the Konya basin of central Turkey, research suggests that present environmental conditions are not responsible for the major geomorphological features. Such features, including abandoned shorelines, wave-cut cliffs, sandpits and deltas, all testify to lacustrinal conditions during the recent geological past. Studies of the fauna of the lacustrinal sediments suggest that the water was fresh, even though it had no outlet. Archaeological evidence shows that the basin was largely dry by 8500 years ago (De Rider 1965). At present depositional processes appear to be confined to alluvial fan formation along the margins of the basin. The total thickness of sediments within the basin is unknown, but boreholes have revealed that in some places it is at least 400 m.

Sea level changes also occurred during the Pleistocene period leaving behind well marked raised beaches in the Mediterranean Sea, Red Sea, and the Persian Gulf. As yet attempts have been made to correlate the differing levels which have been described in studies of local significance. In the Black Sea region eight distinct Quaternary shorelines have been recognised, ranging in height from 105 m to the present sea level (Schrader 1979). A much more complex situation exist in the Mediterranean with no general agreement about correlation between the different areas, owing to the absence of diagnostic faunal assemblages. Shorelines have been described ranging from 200 m to 2 m above the present sea level, with many of these being recognised in the eastern Mediterranean region. In Lebanon, high-level shorelines have been identified at 180-190 m, 110-120 m, and at 60 m, together with a series of lower ones (Beeaumont et al. 1988)).

5. Chronology of the Quaternary in the Near East

Review of the Palaeolithic record and Palaeoenvironmental data from the Near East mostly from the Levant reveal that a significant amount of chronometric research has been carried out in this region. Although application of radiometric techniques is not as plentiful in the Near East as in Europe and Africa, Quaternary biostratigraphic and climatic records of the Pleistocene are correlated to deep see oxygen isotopic records, which aid the reconstruction of Palaeolithic chronology and environment (e.g. Farrand 1994). Unfortunately, similar investigations in the other countries of the Near East are generally lacking to this day; once these are conducted further clues to understand the Palaeoclimatic patterns and the Palaeolithic colonisations of the Near East will emerge.

The geochronology of the Near Eastern Quaternary is based on the correlation of coastal, marine and inland fluvial-lacustrine sequences. Calculations of the relative ages of the different formations are often based on their biostratigraphic positions, interpretations of their Palaeoclimates and possible correlations with the curve of the oxygen isotope stages (noting that there is no established palaeoclimatic sequence for the most parts of the Near East into which one can fit evidence found in the prehistoric sites, nor are the climatic implications of deep-sea isotope curves clear for this region).. In the past, Quaternary terminology was adopted from the Alpine sequence generally correlated with the central European loess cycles (e.g. Sanlaville 1988). Obtaining secure dates for this region is problematic due to the rare presence of tuffs and lava flows, which are necessary for radiopotassium dating techniques. A sufficient number of palaeomagnetic readings is not yet available for large areas of the Near East. Therefore, the Quaternary subdivisions are based on local sequences of marine shorelines and inland fluvial sequences in river valleys. Their chronologies are derived from either correlation with known Palaeoclimatic chronologies, such as the oxygen isotope stages, or the European terrestrial faunal sequences (Sanlaville 1988, Besançon et al. 1988). Given the variability of the Near Eastern landscape, Quaternary cycles were identified in marine and coastal sequences, on the one hand, and terrestrial sequences, on the other. Inland sequences are often based on the study of wadi and river terraces such as Nahr el-Kebir, the Orontes, the Middle Euphrates (e.g. Sanlaville et al. 1993); a few riverine and wadi localities in Turkey (e.g. Albrecht and Müller-Beck 1994); and the Kura Valley in Georgia (Lubin and Bosinski 1995). Inland basins outside the Rift Valley accommodated lakes, but their Pleistocene history is still poorly known (Copeland and Hours 1989). The existing lakes in the Near East are often located in tectonic basins. Major tectonic movements took place during the Plio-Pleistocene, but later, minor once had additional effects on the landscape. In particular, the role of tectonic movements can be observed in the formation and subsequent changes along the Syro-African Rift Valley. These movements caused older lakes to disappear and new ones to form (Sanlaville 1988). Thus, the efforts to correlate marine coastal cycles with inland fluvial-lacustrine cycles are often tenuous. Palaeoclimatic correlations of these formations with the oxygen isotope stages may not always be feasible until new or improved techniques make possible the dating of stratified sequences where volcanic tuffs and lava flows are absent. Without a chronological control, the subdivision of the Lower and Middle Pleistocene is still a puzzle composed of stratigraphy, relative chronology based on general subdivisions of fauna and pollen assemblages. It should be noted that marine transgressions played different roles along the Mountainous and flat coastlines. For example, while the change in sea level affected the width of the flat coastal plains, shorelines along the mountainous coastal line are often expressed in series of terraces. However, the main sediments, whether the Kurkar (sandstone) dunes, the sandy beaches or the hamra (red loam deposits), are present everywhere along the Mediterranean shores (Bar-Yosef 1998). The chrono-stratigraphy of the Levant was based on the assumption that the Mousterian is solely of the last Würm glaciation. Currently, (ESR) and (TL) dates indicate that this industry is at least as old as oxygen isotope stage 7 age, or even oxygen isotope stage 8 (Schwarcz 1994). Therefore, the Lower Palaeolithic in the Near East began with the first colonisation of *Homo erectus*, 1.8–1.4 myr, and lasted until the end of the Acheulo-Yabrudian, around 300-250 kyr (see (Bar-Yosef 1994 and discussion in chapter 5). The different topography and climate of the Near East is demonstrated by its floral (e.g. van Zeist and Bottema 1991, see also relevant section in this chapter), and faunal history (e.g. Tchernov (1988). Given its location on the crossroads of the palaeoarctic, oriental, and African zoogeographic zones, the region has preserved a mixture of mammals, reptiles, birds, and molluscs, demonstrating the coexistence of various species. A number of species characterise the Mediterranean Basin, where local climatic conditions facilitated the emergence of endemic species, especially during the heights of the glacial periods when the desertic belts reached their maximum expansion. Today, the results of fieldwork allow the subdivision of the Quaternary into biozones based on two areas alone: the Caucasus (e.g. Vekua 1987), and the central Levant (e.g. Tchernov 1992).

6. Chronology of the climatic changes and cultural transformations in the Near East

The Near East provides a unique opportunity to consider several crucial events in human evolution that may have been affected by climatic changes. The oldest movements of hominids resulted from major shifts in the distribution of food resources of the African landscape that occurred during the Olduvai subchron (1.95-ca. 1.84 myr). The Olduvai subchron seems to have resulted in palaeoecological changes. A series of migrations out of Africa by *Homo erectus* is recognisable in the archaeological records of Eurasia, even when the fossils themselves are not found. The dispersals of modern humans who evolved in Africa sometimes between 500 and 50 ka (Stoneking 1993) also resulted from environmental changes in their homeland (Barham 1999). Without identifying the timing of these events, it is difficult to understand their relationship to known climatic fluctuations during the Middle and Upper Pleistocene. In the desertic Saharo-Arabian belts, evidence indicates that humans did not survive in arid zones when glacial conditions prevailed in northern latitudes. Movements out of Africa are therefore expected to have taken place in the more humid intervals, either at the onset of glacial cycles (such as isotope stage 5d, ca. 115 ka and 5b, ca. 90 ka) or perhaps later, during early stage 3, ca. 60 or 50 ka. Movements southward from northern latitudes was driven by the expansion of glaciated areas and the periglacial belt. Because there is no evidence that prehistoric technologies before the Upper Palaeolithic enabled humans to survive in close proximity to the glaciers, they must have had to seek foraging territories in the Mediterranean Basin or in the lowlands around the Black and Caspian Seas. The Levant offered a special area, with different vegetation associations that provided various species of edible seeds, fruits, as well as a number of mammals, and birds that could have been hunted. Although during less stressful climatic conditions, the Levant would have been an important two-way corridor for movement of humans between Africa and Eurasia, the number of African elements in the Near Eastern faunas decreased through the Pleistocene (Tchernove 1992). The region always enjoyed higher temperatures than did adjacent areas, as well as plant and animal food resources that were more stable and reliable than those of most European environments (Bar-Yosef 1995). The Levant would therefore have been attractive to human groups living under conditions of diminishing resources and increasing social stress, for example, in such places as the Balkan, the Anatolian Plateau, and the Taurus-Zagros ranges. Those who occupied the Caucasus area had their own refugium in the lowlands near the Black Sea and the Caspian Sea. Evidence for the Presence of Neanderthal morphological features in Middle Palaeolithic human fossils (ca. 80-55 ka) in the Levant is therefore not surprising (see further discussion in chapter 5). The possible role of environmental changes in affecting the Middle-Upper Palaeolithic transition must be noted here. This transition, ca. 47-45 ka represents a time of rapid technological and social change, as expressed in the European and Near Eastern archaeological record by the incremental exploitation of the northern latitudes in Eurasia. The establishment of farming communities ca. 10 ka in the Near East is interpreted to be the result of socio-economic decisions made by sedentary hunter-gatherers facing the vagaries of the Younger Dryas (Wright 1993). Newly emerging lifeways are seen as the result of the 'Neolithic Revolution' that in due course led to the establishment civilisations in the Near East.

A brief overview of the present day physical geography, climate and vegetational patterns of Iran will help us draw inferences for earlier conditions. It is important because, according to Krinsley (1970), Zohary (1973) and Ganji (1978), the basic climatic gradient of increasing aridity from west to east and from northwest to southeast in the Pleistocene can be compared with that of the present day and that modern vegetation can be compared with that in prehistory.

Fortunately, there is a range of studies available that facilitate the work of researchers seeking information on Iranian geography (e.g. Ahmadi 1988, Alijani 1990, Fisher (ed.) 1968, Ganji 1968, Jafarpoor 1988, K-Tehrani and Darvish Zadeh 1984, Kasmaiee 1993, Kelt and Shahrabi 1986, Mahdavi 1987, Mahmoudi 1974, 1988, Sarvati 1993). More detailed information on the Iranian natural flora can be found in *Flora Orientalis* (Biissier 1867-1888), *Flor de l'Iran* (Parsa 1943-1959), and *Flora Iranica* (Rechinger, ed.,1963-1997), while Zohary's research (1973) provides a unique aid to the knowledge of the vegetation of Iran.

7. Geological background (fig. 1a)

In recent decades our knowledge of the evolution of the continental masses has increased owing to geological and geophysical investigations in many parts of the world. As a result of this work new theories of sea floor spreading and plate tectonics have been put forward. The basic idea of these theories is that the continental masses are embedded in huge plates which move over the denser material beneath the earth's crust. These plates, and the continents on top of them, travel across the surface of the earth probably as the result of currents acting deep within the earth. This movement can lead to the plates coming into contact with one another, so producing crush zones, or mountain ranges. In contrast, where to plates are moving away from one another, upwelling of magma occurs usually beneath the ocean floors, to produce see floor spreading. In the Mediterranean and Near Eastern region three major plates can be identified. These are the African, Eurasian, and Arabian plates, and the boundaries between them are the Azores-Gibraltar ridge and its extension across North Africa, the Red Sea and the Alpide zone of Iran. In Iran it would appear that the northward motion of Arabia toward Eurasia has been accomplished by widespread overthrusting in a belt from southern Iran to the central Caspian. The result has been to thicken the continental crust over large areas. Iran can be divided into two regions: the Zagros folded belt, and the rest of the country. In the Zagros region continuous sedimentation under tranquil conditions has occurred from Cambrian to late Tertiary times, when the sediments were folded into a series of parallel anticlines and synclines. In contrast, the rest of Iran has suffered more severe epeirogenic movements, as well as considerable igneous and metaphormic activity. Three provinces can be identified in this latter region. The first, Rezaiyeh-Esfandegheh orogenic belt runs parallel with the Zagros mountains and unites with the Taurus orogenic belt of Turkey. It is separated from the Zagros mountains by the Zagros crush zone, which is an area of thrusting and faulting. Central and eastern Iran, a fault bounded, roughly triangular shaped region with its apex in the south, forms the second province. The Elburz mountains of northern Iran and the Parallel region to the south of them make up the final division of the country. The northward movement of Africa and Arabia during the Mesozoic caused a reduction in width of the Tethyan Sea. This was achieved by a subduction zone which consumed oceanic crust. Eventually at some time during the late Cretaceous all the oceanic crust disappeared into the mantle and the leading edges of the African and Arabian plates reached the subduction zone. When this occurred ophiolites were emplaced along the Zagros crush zone at the leading margin of the Arabian plate. The Zagros sedimentary basin, the present Zagros mountains, continued as the shelf of the old Afro-Arabian continent, with continuing sedimentation, mostly of a carbonate nature.

Yet another period of compression occurred in the late Tertiary period, associated with the formation of the Red Sea and Gulf of Aden, and also the south-eastwards movement of Eurasia. These movements, which are continuing at the present day, led to the underthrusting of Iran by the Arabian plate and resulted in the complex folding of the Zagros mountains, together with folding and faulting in other parts of the country. Based on the above outline the distribution of rocks of different ages is relatively possible to explain. The oldest rocks, of pre-Camberian and Palaeozoic age, are found on the stable masses with occasional smaller outcrops occurring throughout the country. Marine sediments, in particular limestones and marls of Mesozoic age, make up a much larger proportion of the outcrop. These sediments, it is believed, where deposited in the Tethyan Sea, between the respective remnants of Gondwanaland and Laurasia. Calcareous sediments, such as these have importance in the economic life of the region, for it is in these rocks that the oil reserves are concentrated. For example, in Iran, the Asmari limestone is the most important reservor rock for oil accumulation. Rocks of Tertiary age, mostly marine sands, clays, marls and limestones are also found in Iran. Thick Quaternary sediments, almost all of which are unconsolidated, are confined to the upland basins of the highland zone, and the majority valley systems of rivers. A characteristic feature of the region is the widespread occurrence of eruptive rocks, mainly basalts. They are found associated with zones of weakness especially in the highland zones of Iran. The formed volcanic peaks, from which lava flows radiate, are seen in Damavand mountain and Taftan mountain. Although the lava fields of Iran have not been investigated in detail, most of them appear to be geologically young, dating from the Tertiary to the historical period. Owing to the tectonic instability of much of the region of Iran, earthquake, with epicenttres along the major plate boundaries, are of common occurrence. Throughout history these natural hazards have had considerable impact on human activity in the region affected by them.

8. Geographical background (fig. 1b)

The heartland of Iran can be defined geographically as a plateau bounded in the north by the Elburz system and to the southwest and south by the Zagros Mountains. This vast triangular plateau is far from homogeneous and includes not only the extensive desert lands of the Dasht-i-Kavir and Lut, but also large areas of well watered and fertile soils lying between the enclosing mountains and the desert basins which are the centres of the seasonal drainage systems. The two principal mountain chains form natural barriers causing regional diversity. In geographical terms they provide an effective barrier into the interior plateau for atmospheric moisture and rain bearing clouds coming especially from the Mediterranean Sea in the west, and also to the other atmospheric system from the north. In historical terms they have played a major role in preventing easy access for invaders into the interior of Iran. The Elburz Mountains with a general level of 3000m dominate the topography of Northern Iran where higher precipitation and the local climate permit specialised agricultural activities. The Zagros Chain running from northwest to southeast imposes its own regional influences throughout its length; it rises generally to a height of 2000-3000m, specially in the west where sufficient altitude and rainfall have always encouraged forest cover and a rich agriculture.

With its considerable regional diversity, Iran can be divided geographically into the following areas:

The Plateau. The interior desert basins cover about one half of the area of the country or some 780,000 km^2. These basins fall naturally into two groupings separated by mountain ranges. The northern sections known as Dasht-i-Kavir (the Great Desert) and the southern as Dasht-i-Lut. Both areas are characterised by clayey, salty soil and extremely brackish ground water and temporary salt lakes. Both the nature of the soil and climatic conditions turn these areas into one of the driest lands in the world. The Great Desert contains few but well known settlements; many of the richest agricultural areas lie in the lands bordering the Desert, including among others the Dasht-i-Ghazvin, Dasht-i-Varamin and Mashhad. Many of the country's famous ancient cities were located on higher ground about 1000m in altitude and represent for the most part staging posts on the ancient caravan routes linking northern Khurasan and the Caspian areas with the south. Agricultural life is primarily based on oasis cultivation in which dates, palms, other fruits, grain and fodder play a major role.

The Plains of the Zagros Slope. A series of fertile plains and basins surround the Central Deserts lying along the northeastern edge of the Zagros Mountains. The most extensive areas are those surrounding Isfahan, Kirman and Marvdasht, though many other smaller centres exist with a prosperous agricultural base. Throughout the zone the principal water supply is river water and the Kanat (a subterranean canal). Drainage within the basin is largely internal and a number of salt-lake basins similar to those in the Central Deserts stretch from the southeast through the Gavkhuni Bog to Isfahan. Outside the area of saline soil and toward the Zagros slopes, soils are generally deep and fertile supporting a varied agriculture, mainly irrigated, but with a significant area suitable to dryland grains and a rich livestock economy. This is an important zone in archaeology because the agricultural way of life started in this zone, and readily accessible mineral deposits permitted the early growth of sophisticated urban centres in this area of Iran. It is an interesting fact that many of the modern mining enterprises in the area represent new working of ancient sites. Copper mining has also ancient origins in this zone, the deposits to the south of Kirman (e.g. Tell-i-Ibllis) having been exploited at an early date.

Northwest Iran. This zone includes East and West Azerbaijan, Kurdistan and Hamadan with its geographical continuation to the south. Despite the geological similarities throughout this zone, the northwest remains geographically distinct from the areas further east. Topographically, the zone contains a series of irregular mountainous areas where altitudes can reach over 4800m with the highest peak of the Sabalan. This zone is drained by plenty of permanent rivers water fed by rainfall and snow melt across the area. Much of the area in the north is drained by Aras-Rud River and in the southwest by Zanjan-Rud River whose tributaries eventually join the Kizil-Uzon River and the Sefid-Rud system. The other drainage system of this zone, including those streams around Mahabad together with Zab-e-Bozorg River, cross the frontier of Iraq and link with the Zab-e-Kochak River. Lake Urmia in Western Azerbaijan constitutes an internal drainage basin fed by local rivers: the Zarrineh-Rud River and Simineh-Rud River from the south, and others from the east. Azerbaijan is among the better watered areas of Iran and irrigated cultivation systems can be found throughout the region, with the most productive areas located in the major river valleys around the cities of Tabriz, Urmia, Ardebil and Zanjan where soils are rich and deep and water supplies are easily available, though dryland cultivation is also possible over large areas where cereals are cultivated conventionally by rainfall. The southern rim of this zone toward the north of Isfahan in the Central Zagros is geographically similar to Azerbaijan as noted above; this rim takes the form of a broken mountain system beginning in the northwest with the Kuh-i-Chehel Cheshmeh Mountain with a height of more than 3000m and continuing in the Kuh-i-Alvand Mountain with a height of 3500m. All parts of this zone are agriculturally well developed with deep soils in the valleys and reliable rainfall. Both the Kanat and the river water irrigation supplies are utilised for sedentary agriculture. Livestock is generally important with a strong transhumant tradition affecting mainly the Kurdistan area.

Baluchistan. The mountains of Baluchistan are recognised as the southeastern part of the Central Iranian zone. To the north the area is clearly defined by the Kuh-i-Basman Mountain which reaches its greatest elevation at about 3500m. This narrow chain runs east-west to link with the Zagros. To the east another mountain chain, the Kuh-i-Sultan serves as a link with the mountains of Baluchistan-Pakistan. Topography throughout the region is irregular and mainly above an altitude of 1000 m. In addition to the mountain ridges traversing the area two plateaux can be seen, one toward the north located around Zahidan and the other centred on Khash with the mass of the Kuh-i-Taftan Mountain lying between. Unlike the northern part which is covered by sand and silt and dune deposits with insufficient soil or water resources to offer a base for a strong sedentary agriculture, the Khash Plateau in the south represents a strong contrast with settled cultivation developed over large areas dependant upon adequate if not abundant underground water resources and rich deep soils.

South of this region and its immediate neighbour to the south, is the Iranian Makran. The zone itself consists of two distinctive topographical areas. First, the northern Makran is characterised by the roughly west-east alignment of Bashagird Mountain that rises to over 1500 m separating the Makran from the Djazmorian-Hamon lake basin to the north. Second, there is Central Makran beginning from Ras-Al-Shir in the west and continuing into Pakistan in the east. This zone consists of a series of relatively regular folds of an anticline structure which gives coastal Makran a character very different from the other major depressions and internal basins in the country. The Iranian Makran offers far less inducement to human settlement because of the greater proportion of rocky outcrops; springs are fewer, and the sporadic rainfall quickly disperses to the sea, and frequent floods have covered the valley floors with sand and debris. With monsoon rainfall some areas of flat ground which are covered by fertile alluvial soils can be cultivated with a wide range of crops but there are two major hazards: frequent extreme drought, and flood; in one year extreme drought may prevail followed a short period later by extensive and equally disastrous flooding. Thus, despite the occurrence of monsoon rainfall, and plenty of water available, in the lack of construction dams for water conservation, sedentary agriculture has not been developed.

The East Iranian Highlands. This system runs from the Kuh-i-Surkh Mountain south of Mashhad and links up with the Kuh-i-Taftan Mountain in northern Baluchistan. Kuh-i-Surkh with an altitude of 3000 m is separated from the hill areas to the south by the Great Kavir. A large area including foothills is located in the southern part of this zone and acts as an intermediate zone where areas of good soils and rich underground water resources permit cultivation of cereals, vegetables and other crops. South of the foothills soils are poor and salty where marshes are also found. Drainage from the northern highlands flows to the marshes.

The other highland area in this zone is the moderately large-scale mountain chain which runs from east to west covering an area about 90 km width and about 120 km length from north to south. This is the Birjand-Kayinat Highland region which achieves its greatest height in the Kuh-i-Ahangaran Mountain at about 300 m. Agriculture in the Birjand-Kayinat region is based on the Kanat and earth dam systems replenished by the irregular rainfall and heavy snowfall on the mountain ranges. Some villages are universally famous for saffron cultivation which is exported to the other parts of the country. Because of tectonic instability this zone and many settlements suffer periodic earthquakes of which the greatest occurred in 1978 particularly affecting Tabas.

The Sistan Depression. Centred on Zabul is a large depression which links in the east with the foothills of the Hindu Kush in Afghanistan. The principal features of this zone within Iranian territory are the two permanent lakes of the Hamon-i-Hirmand and Hamon-i-Sabari which link the Hamon-i-Pusak in Afghanistan to form a single sweet water lake. The lake is fed by the Hirmand River which originates in Afghanistan. Despite the abundance of water supplies available for irrigation, settled agriculture is poorly developed. A most important factor to inhibit rich cultivation is the Wind of 120 Days which is specially vigorous in Sistan. It blows during all of the days from May to October starting in the morning as a hot blast from the northwest. The wind contains heavy dust and so the air is thick and hazy, and usually the wind is strong enough to carry sand particles that act as a highly efficient abrasive. Vegetation can be stripped off, bushes and trees distorted, small plants crushed and the growing layer of plants eroded away; lighter soils are eroded away and the wind causes an intense evaporation of surface moisture.

The mountain Ranges:

The Elburz Mountains. These form one of the world's greatest mountain systems. It comprises an almost continuous wall dividing the two climatic zones of the Caspian shoreline in the north and Central Iran in the south. It extends in a shallow arc from the Caucasus Mountains on the frontier with Azerbaijan at Astara, over a length of some 1100 km, as far as Jajarm in the east. This system has an average height estimated at 3100m while its peak in the Damavand reaches its highest point at 5600m. The range carries a heavy snow cover throughout the winter and the northern slopes receive heavy rainfall varying with altitude. Abundant water maintains a dense forest cover on the northern slopes of the Elburz above the Caspian plain. The Elburz system is made up of two unequal portions (1) the Talish Hills in the west and northwest and (2) the main Elburz in the centre and east. The Tallish Hills consist of a long narrow ridge running northwest-southeast and rising to a maximum height of over 3000m. Near the Caspian Sea the Tallish Hills experience a heavy rainfall without a dry season, and this gives rise to a thick vegetation cover.

Drainage patterns in the Elburz are aligned to the Caspian or to the central basins with streams flowing down the steep slopes. In the west the Sefid-Rud system captures the Kizil-Uzon and the Shahrud rivers and flows toward the Caspian Sea. In the east the main lines of the drainage run to the east along the Khurasan Mountains as Hezarmasjid and Binalud Mountains. From a watershed in the Kuchan the region is drained westwards by the Atrak River and its tributaries towards the Turkman Sahra region while the Kashaf River drains to the southeast joining the Hari River in Garmab. In the eastern part of the Elburz livestock herding is important, especially in the hill areas of northern Khurasan. The major areas of settled agriculture occur both in the lower Atrak region and the broad plain around Mashhad and the extended oases of Nishabur and Sabzvar, while the western parts of the Elburz with their higher precipitation have commonly developed the cultivation of cereals and fruits.

The Zagros Mountains. These bound the Iranian Plateau on the northwest to southeast running from the Irano-Iraqi border at Kasr-i-Shirin to the Hurmuz Strait in the Oman Sea. It occupies the entire western part of the country, about one half of the total area. Considerable areas lie above 3000 m with Zard Kuh Mountain reaching 4500 m. The land of the main Zagros is drained by major perennial rivers which flow to the Persian Gulf, including the Karkheh, Karun, Hendijan, Mond and Mehran systems, though several small streams make a direct but seasonal route to the Persian Gulf. The extensive oak forests on the higher ridges is the vegetational characteristic of the zone and a relatively heavy and reliable rainfall in the areas of the western Zagros allows sedentary agriculture particularly around the Marvdasht plain, though most of the areas have been exploted by tribal groups with an economy based on herding. The main tribal groups occupying this vast area include Kurds, Lurs, Bakhtiyari and Kashkay all of whom are still engaged in transhumant herding. In recent years the establishment of agricultural extension services and road construction programmes are leading to increased sedentary cultivation. The eastern Zagros is an area of poorer rainfall than the west. Sedentary agriculture has been developed in the major river valleys and plains particularly around Istahban, Fasa and Niriz. Livestock, often under a nomadic regime, remains the basis of the economy of the area, exploiting seasonal grasslands, by moving between the cool and warm places.

The Iranian Lowlands:

The Khuzistan Lowland. Is the largest single expanse of true lowland in Iran and the area does represent a sharp contrast to the rest of the country where mountains are rarely out of view. The plain is regarded as part of the Arabian Platform with a deep cover of recent layers of alluvial deposition making up a continuation of the Mesopotamian region to the foothills of the Zagros. A high rate of deposition of alluvium still occurs in the headwaters of the Persian Gulf brought down by the Tigris-Euphrates and Karun systems. The plain is virtually an integrated plain with a slow rise in altitude from the Persian Gulf to the slopes of the Zagros. The Khuzistan plain is in fact the gift of the Karkhe and Karun Rivers. The Karkhe drains northwestern Khuzistan while the north and northeast is served by the Karun and its tributaries and the east is drained by the Jarahi system. Although much of the waters feed into the Persian Gulf through the Arvand River, a number of creeks known as

Khur also distribute the river waters of both systems. The largest of these creeks is the Khur-Musa which serves as a sea-way to the ports of Imam and Mahshahr. The former has developed as a major port and the latter acts as a terminal for oil product exports from the Abadan refinery. The flat plain of Khuzistan because of the availability of irrigation waters has offered favourable conditions for sedentary agriculture and urbanisation throughout the Iranian history. The land has been continuously settled from the early Neolithic to the Achaemenid, Sasanian and Islamic periods.

The Caspian and Turkaman Sahra Lowlands. Extending east-west between the Caspian Sea and the Elburz Mountains in a strip of land varying width from 2 km to 50 km. Much of the Caspian lowland represents the areas left by the recession of the Caspian Sea and is characterised by non saline alluvial soils. To the east in the Gurgan plain, the Caspian piedmont soils and heavy rainfall produce an especial agricultural condition over much of the plain. Administratively, this zone is divided up into three provinces: Gilan in west; Mazandaran in centre; and Gurgan in east, and these territorial divisions reflect real geographical differences.

Gilan consists of a delta formed by the Sefid-Rud River which extends 40km north-eastward into the Caspian. The river itself is divided into several distributary channels entering to a number of lagoons lying on the western flank of the delta. Gilan has a extremely rainy and a hot steamy climate allowing the cultivation of crops which are usually restricted to monsoon regimes of the world. Rice growing has its greatest development on the marshy lowland at or sea level. Other products are grown on an increasing scale and there are extensive mulberry groves which support silk worms.

Mazandaran consists of a number of narrowing enclaves; the largest are the Tunikabon lowland and the Chalus valley, both woodland areas covered by fairly thick scrub. Many small streams descend as seasonal torrents from the central Elburz and here the greater elevation results in higher rainfall which is to some extent reflected in the number and size of these local streams. Farther east there is a greater width of plain due to the presence of several larger rivers formed by the division of the Haraz River. Most of the lowland is given over to rice and fruit growing. Since annual precipitation declines quite sharply to the east, the majority of the lowland is cultivated by irrigation systems. To the east also where the rivers flow below the surrounding plains, direct irrigation is no longer possible and rice growing which demands much water tends to be replaced by the cultivation of other cereals, cotton and flax.

Gurgan is a transition zone towards Central Asia . Its climate is distinctly semi-arid but on the hills there is greater soil fertility and slightly heavier rainfall, so that most of the towns and villages are to be found on the hill slopes. From the southeastern corner of the Caspian Sea there is a rapid transition into semi-arid and the fully arid steppe conditions. The Gurgan River crosses this region but its course has changed so frequently that a number of ancient irrigation channels can be seen crossing the area. As in eastern Mazandaran the principal streams flow a few metres below the general level of surrounding plains so here the landscape differs markedly from those of the central and western Caspian plains. The main feature of the Gurgan plain are steppes broken only by artificial mounds (Tepe) representing older settlement sites.

9. Climate

Because of the position of Iran in the Asian land mass, its distance from the oceans and the encircling mountains that block oceanic influences from most of Iran, most of the country has a continental type climate characterised by dryness and extreme change in temperature. In general four large-scale atmospheric features control the climate of Iran, (1) the subtropical jet stream which steers the course of the Mediterranean airflow over Iran; (2) the Asiatic high pressure zone which affects westerly winter airflow over central and eastern Iran; (3) the low-pressure centre on Northwest India and Pakistan which affects airflow from the north over Iran; and (4) the arid-warm air from the Arabian Desert in the south which spreads northwards throughout the summer and steers the humid airflow rising from the Persian Gulf. The variations in Iranian climate can be classified as follow:

The Caspian Lowland may be regarded as a region of mild winters. It comprises the southern coastal plain of the Caspian Sea and the adjacent lower zones of the northern part of the Elburz Mountains. The mean annual temperature varies here from about 15° to 18°C and the mean monthly temperature for January between 4° and 9°C. In upper parts of the Elburz from 500 m upwards there is a sharp drop in the winter temperatures similar to those of cool temperature zones. The January extreme minimum at Polour at about 2100m for instance, is -24°C. Some of the Elburz peaks are snow-covered all the year around.

Northwest Iran along the Zagros Chains is to a large extent subjected to particular climatic influences. The thermal climate closely resembles those of higher zones in the east Mediterranean Mountains. A considerably lower winter temperature in this zone and the long distance from the sea increases continental characteristics so they do not support a Mediterranean vegetation. The temperature varies both with altitude and latitude. The climatic conditions in the northern part of this zone is to some extent similar to the humid Caspian mountains. It differs however from the southern Zagros in its hot and dry summer.

The Central Plateau has a typical continental desert climate resembling that of the Central Asian Deserts in moisture deficiency and to some extent in its extreme winter temperature. In the Kirman area the mean annual temperatures is about 18°C, with extreme maximum temperatures reaching 44°C and extreme minimum temperatures of 14°C.

The Coastal Plains of the Persian Gulf and Oman Sea is a narrow region extending from Khuzistan in the west to the Pakistan border in the east, with a high winter and summer temperatures. The amount of rain is very scant and displays a climatic regime similar to that of tropical Northeast Africa. The extreme maximum temperatures in some places such as Bushehr Port (in the Persian Gulf) reaches 46°C while its extreme minimum is 0°C and Jask (in the Oman Sea) has 6°C as its extreme minimum and 45°C as its extreme maximum. This climatic variation dominates a wide continuous belt extending further northwards and eastwards to Iranian Baluchistan, Pakistan and the southern Afghanistan border.

Annual precipitation ranges in Iran from over 2000mm (e.g. Sabalan Mountain in the northern Zagros Chains and Damavand Mountain in the Elburz Chains) to 50mm or less (e.g. Dasht-i-Lut). The amount of rainfall decreases in general from north to south and from west to east, but the driest part of Iran is not located in the extreme south but in the Central Plateau where higher mountain chains prevent oceanic climate influences. As the rainfall distribution map indicates, very high amounts of precipitation fall only in a few localities in the Caspian region where the majority of the summer heavy rain coupled with extreme temperatures of 30°C in summer results in a subtropical environment and a vegetation of thick forests on the northern slopes of the Elburz Chains, while the adjacent areas such as the Kurdistan Mountains with heavy rain but very dry summers display only thinly scattered forests. Topographical patterns of the areas lying on either side of the Elburz and Zagros Chains affect the amounts of rainfall, which varies with altitude, local exposure, longitude, and latitude. Ramsar, for example, is an area in the Caspian plain which enjoys an annual amount of 1200mm while Tehran on the southern slopes of the Elburz receives only 230mm. Ravansar, an area in the northern Zagros about 1450m in altitude receives about 620mm precipitation, while farther south Hamadan with a height of 1900m receives only 370mm. Proceeding towards the Central Plateau rainfall decreases eastwards considerably. The areas such as Kirman, Yazd, Qom, and Isfahan which are all located in the marginal lands of the central desert receive only 100-120mm precipitation. To the south, towards the Persian Gulf, the amount of rainfall increases slightly although it does not normally exceed 150-200mm.

To sum up, in terms of the climatic diversity Iran can be divided into following:

(1) humid-subtropical zone including the coastal plain of the Caspian Sea and the lower zones of the adjacent mountains slopes;

(2) humid-temperate zone including the higher zone of the Elburz northern slopes;

(3) subhumid-temperate zone including the northwestern highland of Iran;

(4) semi-arid-temperate zone including the highland of the Zagros;

(5) arid-temperate mountain zone including all the mountains of Northeastern Iran;

(6) desert-temperate zone including the Central Plateau and adjacent mountains slopes;

(7) arid-hot desert conditions including Dasht-i-Kavir and Lut;

(8) arid-subtropical zone of southern Iran; and (9) tropical Savanna zone of the coastal belt of the Persian Gulf and Oman Sea.

10. Vegetational Patterns

In the western part of Iran there is only one area of truly humid forests. It covers the lowlands along the southern coast of the Caspian Sea and northern slopes of the adjoining Elburz Chains. It is termed 'Hyrcanian Forests' from the vigorous growth of its tall trees. The lowland type of forest growth can be divided into several classes according to variations in the characteristics of deep ground soils, swampy areas and coastal dunes. The characteristics species of the Hyrcanian Forest include: trees such as lime, ash, elm, walnut, and maple which form the main cover of the zone, with some species of evergreen flora such as *Buscus sempervivens*, *Buscus hyrcanicus*, *Prunus laurocerasus*, *Quercus castaneaefolia* and others. The characteristics of the lower Hyrcanian Forest is the presence of evergreen trees and shrubs such as *Ilex spinigera*, *Buscus hyrcanicus*, *Hedera pastuchovii* and trees such as *Pterocarya fraxinifolia*, *Parrotia persica* and *Albizia julibrissin*. The Hyrcanian Forest in the foothills and in the areas more than 500m above sea level falls into two groups. At an elevation of between 700 and 1000m it is dominated by the species of the Hyrcanian mountain forest such as *Fagus orientalis*, and *Carpinus orientalis*. At elevations of between 200-2400m the closed forest changes into colddeciduous broad-leaved mountain woodland mostly covered by oak (*Quercus macranthera)* which is accompanied by elms, ash, wild pear and many shrubs including juniper.

The western slopes of the Zagros Chains extending from Kurdistan in the northwest to the Fars in the south is covered with a semi-humid forest namely the 'Zagrosian Forest' . It differs from the Hyrcanian Forest in its low trees which permit enough light to encourage growth of grass and steppe cover on the ground. Its more characteristic members are: *Quercus brantii*, *Quercus libanii*, and *Quercus boissieri* along with elm, maple, walnut, pistachio (*Pistachio khinjuk* and *Pistachio atlantica*) and several almond trees.

On the southern slopes of the Elburz Chains and both sides of the main ranges of Khurasan located between Iran and Turkmanistan, the main vegetational pattern is a cold resistant-type known as 'Juniper Forest'; it is made up of low trees of *Juniperus polycarpos* along with shrubs or trees such as *Pistachio atlantica* and *Pistachio khinjuk*, almond berberis, maple, and various others. The ground cover is also made up of a complete steppe complex.

A special kind of dry forest known as the "Pistachio-Almond-Maple Forest" covers the interior slopes of the Zagros Chains to the Central Plateau. It once extended from the west of Tehran to Kirman and Baluchistan but in many part it has been completely removed; today its remnant can only be seen in the Fars Province around Lake Nayriz and on the elevated parts of the interior plateau as on Jabal Bariz Mountain in Kirman. This forest consists mainly of Pistachio trees or shrubs and several species of almond, maple, juniper, and others. Characteristically, this kind of forest is considerably less dense than those of the Juniper Forest. The lower elevations of the inland plateau has a similar pattern but much less dense with no maple or juniper, and they are covered by pistachio trees along with several shrubs and species of berberis, lonicera, lycium and others. The vegetational pattern of the ground cover on the interior plateau and the majority of the country is of steppe formations (dwarf-shrubland). The steppe cover of the Central Plateau in Iran under semi-arid to arid conditions comprises *Artemisietea herbae-albae iranica.* The flora is dominated by *Artemisia herba-alba* along with *Alantbolimo* and *Astragalus* together with the other brush wood and many grasses. This kind of association generally occupies more elevated mountain zones above 2000m. Other associations cover areas of medium elevation containing mostly Artemisia with other species such as dwarf bushes, grasses and herbs. In the depression of the central desert where the altitude is less than 1000m above sea level the conditions of lower precipitation but higher evaporation and salinity do not allow vegetation growth, so the ground seems completely bare. Outside the deserts, to the south and along the Persian Gulf and Oman Sea, the predominant vegetation is of scattered trees and shrubs with a steppe-like ground cover. This pattern toward the southwest (Khuzistan and upper reaches of the Fars region) is mixed with those of the Pistachio-almond formation. There the Kunar tree (*Ziziphus spina christi*) has a wide distribution with several species of Acacia which are accompanied by shrubs like *Salvadora persica*, *Colotropis procera*, *Prosopis spicigera*, the dwarf palm (*Nannornhops ritchiana wendland*) and many other components.

The vegetation of the large depression of Sistan in the southeast about 500m above sea level is the same as the desert flora pattern, while to the north and in the eastern hill ranges the pattern changes into steppe of Artemisia type. From the foothills upwards the Pistachio-almond type becomes dominant and is accompanied with several almond species as *Amygdalus bucharica*, maple trees, *Cercis griffithii*, trees of *Celtis Caucasica* and several shrubs. At altitudes above 2000m this pattern is replaced with dry Juniper Forest. The latter is a pattern which dominantly covers the uplands of Afghanistan and Central Asia where the altitude reaches to 3000 m above sea level.

11. Palaeoclimatic Pattern of Iran

Selected evidence to understand past climatic conditions in Iran is presented here, noting that the faunal evidence which is generally used for this purpose will not be discussed here because this line of evidence has not been properly developed in Iran and publications analysing faunal remains from Iranian archaeological sites are still very limited.

11.1 Geomorphological evidence

Glaciation and Snowline. The end of the terminal Pleistocene is usually placed at approximately 9000 B.P. when, in Europe at least, climatic conditions had returned essentially to those of today. Clearly retreat and disappearance of the ice had been a gradual process that took place parallel with the warming of the climate. In this respect the characteristics of the ice fields and glacial gradients such as moraines have been considered as clues to understanding climatic changes. The small extent and inaccessibility of late Pleistocene and modern glacial features in this country restrict definitive palaeoclimatic inferences and due to the lack of radiometric dates for this period, the dating of palaeoclimatic phases has relied entirely upon relative topographic and geomorphic relationships and comparisons with the Alpine Würm glacial sequence (Brookes 1982: 195).

Few glacial studies in Iran have tried to define the limits of Würm III maximum glaciers in order to determine the surface gradient of present and past snowlines to indicate whether past snowfall was greater or less than at present. Bobek (1940) who was the first in this field argued that the late Pleistocene snowline was only 650-800m lower than today; he calculated a temperature lapse rate of 0.6°C/$_{100}$m elevation for the Iranian Kurdistan mountains and suggested a temperature depression of 3-5°C. In 1960 Wright (Wright 1961) visited the Zagros Mountains and found the Iraqi side glacier moraines attributable to the last glaciation extending to a much lower elevation than Bobek had mapped. He calculated a temperature lapse rate of 0.67°C/$_{100}$m elevation to arrive at 12°C of temperature lowering at a height of 1800m. Wright concluded that the snowline depression was due in part to increased snowfall. He argued that the apparent increased precipitation on the western flank of the Zagros could have occurred contemporaneously with the colder but not more humid climate on the Iranian Plateau. Since the two areas would have been separated climatically as they are today, Wright argued that the climatic contrast may have been due to increased frequency and intensity of the cyclonic disturbances in the Pleistocene period that entered Mesopotamia during the Pleistocene, and that this could account for increased snowfall on the western flank of the Zagros, but the intensified Siberian anticyclone in winter could block the penetration of these storms into the Iranian Plateau (Wright 1961: 160). In his later study (Wright 1980), on the basis of pollen evidence indicating a drier rather than wetter climate during the last glaciation period for the Zagros area, he suggested that the snowline depression must have resulted from temperature drop rather than increased snowfall (see also Wright 1976, Roberts and Wright 1993). Wright`s suggestion can be supported to some extent by findings by Messerli (1967) from the Mediterranean areas and by Brookes (1982) from Iran. Messerly estimated a highest lapse rate of 6°C to 7°C/$_{100}$m temperature drop for the eastern and southern Mediterranean areas during the last glaciation. In the same way Brookes, by comparing the various modern and Ice-Age snowlines in Iran, proposed a lapse rate of between 4.7 to 6.7C/$_{100}$m temperature drop for this country during the last glaciation. However, palaeoclimatic studies of the last glacial-age in Iran have problems in establishing regional Ice-Age snowlines: first, snowlines studies have often been concentrated on the isolated areas where the glacial remnants are too small to yield palaeoclimatic inferences; second, as Messerli (1967) has concluded, the most isolated glacier patches in the Mediterranean Mountains have been the results of snow-slides and avalanches and are independent of the climatic condition of the snowline. On the other hand van Zeist and Bottema (1977) have proposed levels of global warming up to 1-2°C above present in the early Mid-Holocene c.7000-4000 B.P. which would have resulted in the complete disappearance of the small Iranian glaciers at that time. Archaeological evidence to support this idea lies in the developed irrigation system among societies from the Neolithic onwards in the various areas of the Zagros where, after the disappearance of the glaciers, the people relied heavily on stream flows from winter rainfall for water supply (Adams 1981, Hole 1987, Kirkby 1977).

Stratigraphic alluvial deposits are the other line of evidence to understand palaeoclimatic variation in Iran. Vita-Finzi in his studies (1969, 1973, 1975) in the three areas of Iran identified two alluvial units from the late Pleistocene and Holocene. The earliest sedimentary unit (Tehran Alluvium), on the basis of associated artifacts, has been provisionally dated from c.50,000 B. C. to about c.4000 B.C. under a semi-arid condition (Vita-Finzi 1969: 951-973). The later unit, so-called Khorramabad Alluvium, tentatively dated to the Little Ice-Age beginning in about 1500 A.D. formed under the conditions of finer sediment deposition and more continuous discharges. He tentatively correlated these two depositional phases with the Würm glacial period and speculated that the deposition of coarse material indicated a semi-arid condition and flood discharges of short duration rather than a pluvial condition in the Pleistocene period. Similar approaches to characterise alluvial fan formation was made by Beaumont (1972) in the southern foothills of Elburz. In his view fan formation occurred under cold climate conditions particularly during the Würm glaciation.

Kirkby (1977) in his study in southwestern Iran identified archaeological sites buried by alluvium. He referred the alluvial sediments of the lower Karkheh River across the Khuzistan plain to the period of 6500 to 2000 B.C.

A study in this field with palaeoclimatic and archaeological implications was conducted by the Royal Ontario Museum in the Kermanshah region in 1975 (Brookes et al. 1982). The study area along the course of the Ab-i-Marik, Qara Su and Ab-i-Razawar exposed five alluvial sediments. These units were designated I-V in order of increasing age. Unit V with a depth of three metres consisted of a reddish brown silty clay and $CaCo_3$ concentration was believed to represent the original fan deposits caused by stream and mud flows during the Late Würm. Unit V also was seen to overlie unit VI (the lowest unit) which comprised fan gravels.

These gravels were assigned to the end-Pleistocene phase of cool, semi-arid climate, recorded in the Lake Zeribar pollen zone sequence (see next) which dates to c.33500-14000 B.P. The top of unit V represents fluvially re-deposited sediments with entirely fine-grained structure, which it was tentatively concluded had had a more complete vegetation cover (Brookes et al. 1982: 291). This situation according to the pollen evidence of Lake Zeribar, which shows a gradual increase of tree pollen indicates climatic warming through an interval dated between 10500-6200 B.P. (van Zeist 1967, van Zeist and Bottema 1977) unit V is therefore tentatively dated at about 10500 to 6000 B.P. Unit IVa was assumed to be deposited by more than one major flood which caused erosion in the basin and incision in the channels; this unit marked a major change in watershed conditions. The three silty clay and sand alluvial units with a 10 metres depth above unit IVa were referred to a more regulated fluvial sedimentation. Several lines of evidence such as animal bone fragments, a potsherd in unit IVa, written historical documents, and a TL date on a sherd, tentatively dated the flood of unit IVa to a maximum age of between c.200 A.D.to c.1000 A.D.

Data obtained from the Kermanshah area have been used to establish the geomorphic sequence for the area which has helped in the interpretation of most palaeoclimatic and archaeological events. Data revealed that in the late Pleistocene and early Holocene the mountainous areas of Western Iran were drained by streams from snow and glacier meltwater which were responsible for deposition of a poorly sorted gravel and sand over the flood plain and fans. With the early Holocene a warming climate reached the Zagros Mountains and streams moved slowly and carried finer sediments to built alluvial flood plain. This study suggested a period of environmental stability at least for the Zagros area, perhaps not too different in some respects from those of the present, and which characterised at least part of the period from the early Holocene until the Parthian. It is not clear what date should be assigned to the beginning of the early Holocene, although the radio carbon-dated pollen record has been used for this purpose; so the dating of the terminal Pleistocene alluviation in this area is therefore uncertain. But as Vita-Finzi (1969: 966) has pointed out in the Iraqi-Zagros there were two parallel alluvial deposits cut by erosional processes. Most of this dissection may have been completed by the early seventh millennium. Also in the Mediterranean areas two alluvial fills were dated to some 8000 years ago and, as in Iran, a later alluvium dated to the medieval period. Thus, it is acceptable that the long period of stability represented by the deposits separating the Tehran and Khorramabad alluviums had begun by about 4000 B.C. when, according to the interpretation of the Lake Zeribar pollen core, climate had achieved modern characteristics.

Such studies should have a top priority in archaeology since subsequent erosion and deposition have had the direct affect of burying a large number of prehistoric and even historical sites in Iran making many sites essentially invisible. A reason for this is that nowadays one can find along the river bank sections, sherds of various dates at various depths below the modern surface. This has been especially confirmed by archaeological excavations in Western Iran where the study cited above revealed the active alluvial periods. For example at Ganj Dareh, a seventh millennium site, there was at least 1 m between virgin soil and the current plain level (Smith 1972: 183), and Hole reported early deposits of a depth of about 3.5 m for

Tepe Sabz (Hole et al. 1969: 50); likewise the deepest occupation at Haji Firuz and other sites in Azerbaijan were also well below modern plain level (Voigt 1983).

Lacustrine and marine features have been studied in Iran since the late nineteenth century and well developed. Most research in this field was carried out in semi-arid and arid interior basins and produced significant results for the geomorphological pattern during the periods concerned. The detailed work of scholars such as Blanford in 1893 and Huntington in 1903 shed light on the understanding of sedimentation processes in the arid interior basins of Iran. Huntington recognised traces of a progressive desiccation in Eastern Iran (Sistan) since the end of the Tertiary period and also since the 14th century A.D. (Huntington 1905). He also proposed a fluvial period in Sistan from the latest Pleistocene to about the 10th century A.D. which Huntington assumed supported a rich agriculture in Sistan.

The excellent state of preservation of the geomorphological sequence of the Caspian shorelines has received special attention from scholars from various countries, particularly from the former Soviet Union. The highest Caspian shorelines are 80 to 90m above the present lake level. These were considered by Granmann and Bobek in 1937 to have been formed during the Mindel glaciation. Terraces at 73 to 75m were attributed to early and late Würm, while the early Holocene terraces were mapped at 16 to 10m relative to the present Caspian level (for a summary of previous investigations on the subject of explaining changes in the level of the Caspian Sea, see Ehlers 1971). Ehlers, in his work along the southern shores of the Caspian Sea, traced thirteen terraces from -20 m to 240m and attributed them to transgressions of the Caspian during the cold-climate phase of the Würm glaciation. He also concluded that the lower level terraces had been formed during the Mid-

Holocene when the warm conditions caused evaporation and eventually sea regressions. This interval has been confirmed by palaeoclimatic material from the well-watered settlements in the Elburz foothills which today are semi-arid steppes (McBurney 1968).

A comprehensive study in this field appeared in Krinsley's work in the 1970s, which drew attention to the sequence in the Iranian Central Desert and surrounding areas. From this area he found sediments with various components that had been deposited by expanded and reduced lakes during cooling and warming climatic conditions. In the area around the Neyriz Lake in Fars Province, for example, he found six earlier lake terraces the highest of which dated to c.20,000 years B.P. or the Würm III glacial maximum. A steep profile between the fourth and fifth shorelines represented a rapid desiccation which he assumed was contemporary with a post-Pleistocene warming climate (according to the Lake Zeribar pollen analysis, c.11500 years B.P.). Krinsley (1970) on the basis of the various abandoned shorelines concluded that there were alternatively a rise and regressions in lake level recognisable in the sediments deposited on the shorelines. The first regression was tentatively dated to 6000B.C.and the final most likely marks the present-day lake level.

Studies of lake level change to establish the geological sequence of the hydrological system and their palaeoclimatic significance were also carried in the Sistan basin by Meder, the geologist member in the Italian Archaeological Expedition to the Sistan, in 1970. Like Krinsley, Meder examined deposition around the Sistan lakes and the Hilmand River to produce evidence with the following interpretation. He found largely expanded gravel terraces around the Hilmand River which he interpreted as deposited during the Würm glacial period. On the lake-floor he also found sediments which he considered were deposited during a cold climatic condition contemporary with the Holocene Atlantic Phase c.8500-5200 years B.P. Similar research was carried out by Schweizer (1975) around Lake Urmia in West Azerbaijan. He compared earlier and present lake-levels by calculating the amounts of water feeding the lake and its evaporation. He concluded that the vertical sequence of terrace deposits visible in the present shoreline can be referred to a cold climate period when increasing glacier meltwater caused fluctuations in the lake level, which reached a height of 30 to 115 m above present lake level during the Wü rm III, Würm I, Riss, and Mindel glacial periods. No interpretation of lake levels was made in this research and no precise dating was proposed for the glacial sequences. Recently research in Lake Urmia has distinguished various lake levels and interpreted the lake as a playa type with a shallow depth until around 9000 B.P. (Kelts and Shahrabi 1986). The result of this study is similar to that of Lake Zeribar sedimentological and limnological study conducted in 1960 (see Hutchinson and Cowgill 1963, Megard 1967). The data obtained from Lake Zeribar have been incorporated into the Oxford lake level data bank that categorises individual lake histories according to water level status (see Street-Perott and Roberts 1983). The results indicate that from before 22000 years B.P. Lake Zeribar was at least 8-10 m deep and slightly cooler than it is present. Aquatic flowering plants and diatoms dating to the period after about c.11000 B.P. to c.9000 B.P. suggested that there was intermittently lower lake levels and a warmer or drier climate than previously. Warm temperate cladoceran species became more common between 9000 to 6000 B.P. indicating a condition of maximum summer warmth. In this period the cool-temperature species characteristic of earlier deposits disappeared (Wright 1968: 338). By about 5500 B.P. the lake was again deep and the fluctuations of the period c.22000 B.P. to 6000 B.P. had ceased (Vita-Finzi 1969: 967). This fluctuation in the Lake Zeribar water level which was low during the period of terminal Pleistocene and intermediate in the Early Holocene has been confirmed by pollen analysis from the lake indicating a delayed rise in tree cover in the Zagros mountains during the early Holocene (van Zeist and Bottema 1991).

The water level fluctuation as a result of the climatic change can be also seen in the sedimentation pattern at the head of the Persian Gulf. These sediments represent deposits washed down from the Zagros Mountains to the Persian Gulf, and indicated different water levels of the Gulf during its intermittent regressions and transgressions (Diester-Hass 1973, Sarnthein 1972; see also Kay and Johnson 1981). Evidence shows that the beginning of the rise in sea level occurred about 21000 years B.P. from a low some 120m below present sea level and attaining approximately present levels around 6000 B.P. (Al-Asfour 1982:fig. 7.1; Dalongeville and Sanlaville 1987: fig. 9). Sarnthein suggested that before that time (6000 B.P.) in the Zagros area rivers were less active than they are today, and that the climate in the Zagros was considerably drier than it is now. It is important to note that on the basis of the earliest transgressions which dated to 12000-11000 years B.P. Sarnthein concluded that the decreasing aridity and beginning of a warmer conditions may have continued until about 9000 B.P. This period of warm but relatively arid climate was followed by a period of fluctuating precipitation and less aridity until about 6000 B.P. when modern precipitation and temperature levels were established. This conclusion, with a slight difference in dating, can be correlated with those results demonstrated by Vita-Finzi (1969), Butzer (1975, 1978) and Brice (1978). They believed that the Zagros Mountains experienced colder and drier conditions during the later portion of Würm glaciation (Würm III), and an amelioration of temperature in the early Holocene.

Desert formation. The evolution of desert conditions as a consequence of climatic fluctuation has always been a favoured research area for scholars working in the Iranian Central Desert. This is a completely arid or semi-arid belt extending almost continuously from the Western Sahara, across Syria and Arabia in the west, into the Iranian Plateau and to the east towards Turkistan and Mongolia. This great arid zone is assumed to have been formed in the Pleistocene glacial period (Ganji 1978: 154). Gabriel (1957) in his excellent book "Geographical Study in Iran" has listed a considerable amount of work carried out in this inaccessible desert area beginning from the eighteenth century. Gabriel himself succeeded in crossing the Great Kavir and recognised the two pluvial periods in the Lut Desert corresponding with the Riss and Würm glaciations. On the basis of the previous work Gabriel interpreted the Great Kavir as the dry basin of a previous body of water which had evaporated during the latest period of desiccation. Bobek in his study (1969: 190) attributed the basin fill of the Lut Desert to a shallow, closed lake from the upper Pliocene to Pleistocene. According to Bobek there was an increase in aridity in the early Pleistocene that was accompanied by wind erosion. Thus, the glacial periods in Iran were characterised by greater aridity due to increased continentality of the Iranian Plateau during the Pleistocene cold phase. He concluded that after the aridity of the Pleistocene there occurred a warm period with increased run-off which he equated with a "wet interglacial". Research conducted by Krinsley during 1965-1967 produced valuable results. He managed to visit more than 200 playa from north to south within the Central Desert. He analysed chemically sediment and mineral deposits, and from the alternating deposits of salts and brown and green clays, proposed a significant change in depositional environment and suggested a condition of intermittent moist, cool and arid climate (Krinsley 1970). The Qom playa for instance whose present surface is covered by salt crusts, he interpreted as a shallow lake which accumulated during the Pleistocene onwards. The clay layers between the salt crusts were considered to represent a cooler period while the salt layers, particularly those on the surface, he assumed must have been deposited during post-Würm arid conditions. In general Krinsley believed that the cooler condition of the terminal Pleistocene in the interior of Iran caused a lower rate of evaporation, especially in the shorter and cooler summers, which eventually resulted in the increase of run-off from the glacial mountains which reached the playas and caused the lake to form. Finally the water evaporation during the arid climate and intense wind from the northern quadrants eroded the dry superficial lake sediments and transported them to the sites of the present dune fields.

11.2 Palynological evidence

Palaeoenvironmental investigation in Iran started with Braidwood`s interdisciplinary team, with geological and palaoecological studies aimed at evaluating the environmental setting at the time of early plant and animal domestication and the development of village life. These investigations for the first time in the Near East, led to palynological research, initiated by Wright at Lake Zeribar in the Zagros Mountains. Pollen studies in Iran were continued by van Zeist, Bottema and Wright in some localities in the central Iranian Zagros. Two of these, Lalabad some 40 km northwest of Kermanshah, and Nilofar some 15 km northwest of Kermanshah, are still essentially unpublished (Wright 1968), but detailed accounts on the Lake Zeribar, Lake Mirabad and Lake Urmia pollen records are already available.

Lake Zeribar is a small lake in the Zagros Mountains near the Marivan, situated at an elevation of 1300 m. The lake is surrounded by the oak-woodland vegetation typical of the Zagros which can be found here between 700 and 230m. The lower part of the Zeribar zone 1b diagram covering the last 22000 years indicated a period in which arboreal pollen was completely absent, while the record was dominated by *Artemisia, Chenopodiaceae, Umbelliferae* and *Graminea* characteristic of cold and dry conditions (van Zeist and Bottema 1977, El-Moslimani 1982, Wright et al. 1967). Zeribar zone 3b diagram dating from c.22000 to c.14000 B.P. indicated that during this period steppe and desert steppe vegetation must have prevailed in the area, and a cool and dry climate condition is assumed to have limited tree growth. The pollen assemblage from zone 4, dating from 14000 to 10500 B.P. and contemporaneous with the Late Würm glaciation saw an increase in temperature to about 2-3°C below the present levels, but very dry. Increase in tree pollen values of *Pistacia* and decrease in the *Artemisia* values suggest a temperature rise, while high concentrations of *Chenopodiaceae* pollen values indicate dry conditions (van Zeist and Bottema 1977, 1982, Roberts and Wright 1993). Climatic conditions in the Zeribar area in the early Holocene from 10500 to 6000 B.P. can be seen in the zone 5 assemblage. This zone sees the development of true woodland throughout the area, as indicated by an increase in pollen values for trees such as *Quercus* and *Pistacia*. During this period oak woodland and grasses became rather more dense, and abruptly replaced the dominant herbs *Artemisia* and *Chenopods*. Although in the early Holocene, temperatures rose quite considerably, the dry climatic conditions prevented a more rapid expansion of trees. By 9000 years B.P. the vegetation could be described as a grass steppe with some trees. This pattern is similar to the oak-pistachio forest steppe found today on south facing slopes in the Zagros foothills which receive an annual rainfall of about 500mm. By 6000 years B.P. the total value for oak, pistachio and ash pollen was about 20%, but subsequently the percentage of oak pollen rose rapidly to levels of 40-55%, suggesting that, by then, vegetational pattern and therefore precipitation and temperature conditions may have been similar to those of the present day (van Zeist and Bottema 1977: 83). The importance of the Zeribar pollen diagram was enhanced by examining a sediment core from Lake Mirabad 300 km to the southeast. This lake is situated at an elevation of 800m, or 500m lower than Zeribar. A radiocarbon date of 10370 ± 120 B.P. was obtained for the lowest core (Wright 1968: 337; van Zeist and Bottema 1977: 60) and suggested a Holocene age for the pollen record. There was a similarity between components of Zeribar zone 5 and the lower part of the Mirabad diagram. The Mirabad diagram showed that oak-pollen percentage gradually increases from the bottom upwards. In this section of the core pistachio and oak combined to comprise nearly 20% of the total pollen while, in contrast, non arboreal species such as *Chenopodiaceae* dominated the higher area at Lake Zeribar, which reflects the dryer climate of the Mirabad area. The Mirabad diagram in zone 6 and 7 (5500 B.P. onwards) marked an increase in oak pollen values (rising to 80%) and a decrease in *Chenopodiaceae*; thus, during this period the Mirabad area was covered by typical Zagros oak woodland (fig. 2).

A third pollen core comes from Lake Urmia, a saline lake some 140 km long and 15-50 km wide located at an elevation of 1280 m in the northern part of the Zagros Chains. Bottema (1986, 1987) suggests a radio-carbon date of 13200 to 9500 B.P for the lower pollen zone Y, which more or less correlates with pollen zone 4 at Zeribar. The pollen diagram of this zone is characterised by very low arboreal pollen values (less than 5%). The dominant species were *Chenopodiaceae, Gramineae* and *Artemisia* that are indication of dry climatic conditions. Some fluctuation in the moisture regime was suggested by the pollen record obtained from the subzone Z1 with the decrease of *Artemisia* value and its replacement by open forest-steppe and grass vegetation between 9000-8000 B.P. indicating slightly more moist conditions (Wright 1993: 201, van Zeist and Bottema 1991: fig.16, Bottema 1986). The subsequent periods in sub zone Z2-Z4 dated c.7000 B.P. onwards were characterised mainly by higher values of oak (*Quercus). Artemisia* reappears again and the various trees and shrub such as *Juniperus sabina* and *Acer* colonised the area. In spite of the increased *Artemisia,* the climatic conditions cannot have been drier than during the time of subzone Z1 (fig. 3).

In summary, the pollen records found in the areas of the northwestern Zagros document the vegetational and climatic pattern in the area during a time span of c.22000 to 5000 B.P. According to pollen diagrams, the Zagros area during the period of c.22000-14000 B.P. was virtually treeless, with steppe and desert steppe dominated by *Artemisia* and *Chenopodiaceae* for the greater part of the area. This pattern was conditioned by a cool and dry climate (van Zeist and Bottema 1982: 278) which at the time prevailed throughout the greater part of the Near East (a temperature of 6.8°C has been suggested by Messerly for the Near Eastern mountainous areas on the basis of the maximum snowline depression to 1000-1200m). Thus, the Würm glacial temperature drop did not allow tree growth at elevations above 1100-1500m, and also climatic dryness would have prevented tree growth below 1000-1500m; so elevations between 800 and 1500m were covered by *Artemisia, Chenopodiaceae* and others. Such a pattern adapted to cool, dry climatic conditions is comparable to the present day vegetation of north Afghanistan (van Zeist and Bottema 1977). For heights below 800m a pattern of desert steppe similar to that of present day Mesopotamian lowland steppe was also suggested. Although there is no palynological information for the Caspian shoreline van Zeist and Bottema (1991) suggested a very humid climatic condition and forest pattern. Slightly later, in the late Pleistocene (c.13000-10000 B.P.), the pattern tended to be divided into two distinguishable patterns; the northern slopes of the elevated part of the Elburz were covered by closed forest and woodland more dense in the west than toward the east (similar to the present day pattern), while the majority, particularly below 500m was covered by open vegetation such as grass and scrub (Uerpmann and Frey 1981). In this period the greatest part of Lake Urmia remained as dry land. At around 12000 B.P. a slight change appeared in the climatic condition of the area and an increase occurred in temperature rising to 2-3°C lower than at present, but considerably drier than nowadays. This condition permitted the growth of a very open forest steppe of *Quercus* and *Pistacia* between 1500-1600 and 2200 m (van Zeist and Bottema 1982). The Mesopotamian lowland type steppes survived from the previous period and remained the dominant pattern of areas below 800m elevation, while the basin of Lake Urmia remained unchanged as dryland as before (van Zeist and Bottema 1991: 70, Wright et al. 1967: 442).

Information on vegetational sequence and climatic conditions in western Iran in the early Holocene comes out from the pollen evidence from the above mentioned lakes. For the period between 10500 and 6000 B.P. the pollen diagrams suggested a maximum for tree growth in the Urmia area. Although the temperature reached present day levels, the Zeribar evidence indicates that the early Holocene climate of Western Iran must have been relatively warm and dry (El-Moslimani 1986, Wright 1976, Wright et al. 1967). Oak-pistachio forest-steppes developed a wide distribution at an elevation between 800m and 2500m and suggests an increase in precipitation. This pattern can be compared with that of the present day Zagros oak woodland. Because of the aridity of this period most parts of the forest-steppe areas must have been taken over by steppe containing *Artemisia*. Two kinds of *Artemisia* steppe family were distinguished: the elevated interior plateau was covered by *Artemisietea herba-alba iranica,* and the Zagros foothills below 800m by Mesopotamian lowland type steppe (both are comparable to the present day steppe pattern). The climatic condition and vegetational pattern of the southern shoreline of the Caspian Sea and the north facing slopes of the Elburz Mountains during this period seemed to be similar to those of the present day Hyrcanian Forest as described by Zohary (1973). This similarity in vegetational cover can be attributed to an approximately similar level of precipitation with humid conditions (van Zeist and Bottema 1991: 118; see also Frey and Kurschner (1989), Frey et al. (1985) for the relevant maps).

12. General conclusion

This review of the literature on late Quaternary geomorphology and palynology in Iran suggests that, despite the interpretative problems, these independent sets of palaeoclimatic data reflect a uniform if broad pattern. In very general terms, on the basis of the pollen records, the Zagros Mountains experienced a cold and dry climatic condition from 2-3°C (Wright 1980) to 5-8°C (Krinsley 1970, van Zeist and Bottema 1977) below the present time temperature during the last glacial maximum. The vegetational pattern of the area under these condition was dominated by *Artemesia* and *Chenopodiaceae*. This pattern today can be seen only in the most arid mountain regions such as at the very eastern end of the Zagros near the Shiraz and cold steppe of the Armenian (Wright 1993, Wright et al. 1967) as well as the cool and dry mountainous areas of north Afghanistan (van Zeist and Bottema 1977, 1991). Subsequent pollen studies in other parts of the north and east Mediterranean areas and the Near East support the inferences that the late Pleistocene climate of this entire area was cold and dry rather than moist. It is assumed that these conditions throughout the Eurasian continent relate to the Siberian winter anticyclonic circulation (Freitage 1977), and suggests an annual precipitation of 50-200 mm or about a third of present day precipitation. At the same time lower evaporation increased an accumulation of ice and caused a general lowering of the snowline of 1800m on the outward slopes of the Zagros and Elburz Mountains, and between 3000-4000m on the mountains of interior Iran (Brookes 1982). This indicates that the changes leading to glacial conditions in Iran were mainly caused by temperature depression, affected by the general pattern of atmospheric conditions, differences in exposure, and differences in the distribution of precipitation. During the cooler phase in the mountains, at least, summers were probably mild but the winters would have been extremely cold with heavy snowfall (Wright 1976), and lake levels at least seasonally higher because of decreased evaporation and higher meltwater, while in warm phases many of them may have dried up. Thus, the cooler phase of Iran, particularly in the mountainous areas, with a poor vegetation cover and animal life, probably did not allow hunter gatherer groups to occupy the areas. Unfortunately, for the other parts of Iran outside the Zagros a primitive state of knowledge exists today for reconstructing the past climatic conditions, but according to geomorphological evidence the interior basins of Iran during the last glacial period contained lakes of various sizes and depths. Since the end of the Pleistocene most of them have dried up or have been reduced in size, though some lakes such as those around Shiraz in Fars, persist at least perennially (Krinsley 1970). The Hilmand Lake in southeast Iran was much larger and deeper in Pleistocene times (Costantini and Tosi 1978: 171). Thus, during the cooler phase, at least, there was much more surface water than today in the interior basins of Iran. Although there has been limited Palaeolithic research, Smith (1986), on the basis of sporadic finds of Palaeolithic surface material and the similarity of past conditions of these areas to the present day interior desert of Australia, has suggested that there were rather more favourable living conditions for hunters, gatherers and perhaps fishermen. Attempts to evaluate the southern coastal regions of Iran meet with similar difficulties because very little palaeoclimatological and archaeological research has been attempted in these areas. Some research has concluded that during the last glacial period the Persian Gulf was much smaller than it is today, and its expansion occurred in the warmer phase when the world's oceans rose because of the melting of the great ice sheet in the northern and southern hemispheres (see Al-Asfour 1982, Dalongeville and Sanlaville 1987, Fairbanks 1989). The same may be true for the Oman Sea shorelines toward Pakistan. The problem that Palaeolithic archaeologists are facing here is whether or not these now-submerged coastal belts were inhabited by Palaeolithic groups.

The Pleistocene conditions in the northern highlands are also not known in detail, but Krinsley (1970) suggested increased snowfall in the Caspian basin in glacial times because of the decreased temperature. Van Zeist and Bottema (1977, 1991) attributed this zone to a continuous forest vegetation within warmer and more humid climatic conditions. This pattern shows a distinct contrast to the treeless regions of most of Iran where a cold and dry climate prevailed. Geomorphological evidence has demonstrated several fluctuations of sea water level in the Caspian Sea and a number of beaches considerably higher than the modern one (up to 90m). Although in the late Pleistocene the Caspian shorelines seems to have been very promising hunter-gather territory, so far no sites have been found here. It is likely that successive fluctuations of sea level have destroyed the sites or buried them deep beneath the modern plain.

About around 11000 B.P., because of the reduction in the winter cyclonic activity over the Near East, surface air temperature became 5-10^{o}C warmer than during the last glacial maximum (Brookes 1982: 194). This increased evaporation and, eventually, aridity and higher temperatures caused a transitional pattern in the vegetation, from the steppe to open woodland, a pattern which at the time dominated more or less the higher regions of the Near East. Warm dry conditions were the dominant characteristics of the early Holocene in most parts of Iran. With the higher temperature the sea level dropped and coastal plains were expanded. Warm summers and ameliorated winters of the terminal Pleistocene allowed Palaeolithic human occupation inside caves or year round open sites in the both the Zagros and the Elburz foothills. These conditions permitted humans, plants and animals to move out of restricted areas, and then man was able to enlarge his geographic range and to adopt new economic strategies, new technologies and eventually a new way of life with the beginning of agriculture.

Climatic variation in Iran is shown to reach a maximum aridity around 6000 B.P. By 5500 B.P. precipitation again increased and caused lake levels to rise and changed the open woodland cover of the Zagros to a truly forest vegetation (van Zeist and Wright 1963: 67). Both the pollen and sediment profiles as well as archaeological evidence reveal a series of fluctuation reversals particularly during the period of 9000 and 6000 B P. There is general agreement on the basis of vegetational history that implies the modern temperature and precipitation ranges had been established by about 4000 B P. (van Zeist and Bottema 1982: 289), while Ganji (1978: 162) and Siahpoush (1973: 27) have argued for less rainfall, higher temperature and more aridity covering most parts of Iran between 4400 and 2850 B.P. In their view the climatic stabilisation in Iran must occurred after 1300 B.P.

In addition to these traditional attempts to reconstruct the past climatic conditions in Iran a new line of evidence has recently been developed. It is a climate model in which it is assumed that the climate is governed by atmospheric circulation patterns, which are in turn affected by surface boundary conditions, distribution of land, ground cover, ice sheets, sea ice and sea temperatures and by the earth's orbital parameters (COHMAP Members 1988; Kutzbach 1981, 1983; Kutzbach et al.

1993). For the present discussion the essential points are that at 18000 B.P. ice sheets were at their maximum and sea surface temperature and sea levels were lower than at present. This model demonstrates for the Near East a January temperature of at least 10°C lower than at present and a July temperature of 1-2°C lower than today. For the early Holocene climate models confirm palaeoenvironmental data in showing climatic conditions significantly different from those of the late Pleistocene and the present; simulated experiments showed a gradual warming of the northern hemisphere caused by increasing solar insolation (radiation received by the earth) due to the changing tilt of the earth's axis, together with a shifting balance in the influence of the southwest monsoon and the location of the westerlies in the Near East and North Africa (COHMAP Members 1988, Kutzbach 1981). At the same time (around 9000 B.P.) the earth was closest to the sun on 30 July, resulting in an increase in summer temperature and correspondingly colder winter temperatures. It is estimated that July temperatures in the northern hemisphere averaged 2-4°C and over Southwest Asia at 9000 B.P. 2-3C° higher than today. The result was greater seasonality in the northern hemisphere and in this period the Near East experienced the most extreme seasonality in its history. In addition to greater contrast between summer and winter temperatures, summer aridity was longer, and winter temperatures are assumed to be 1.5°C lower than modern values. The enhanced thermal contrast between seasons and greater summer heating of the Asia landmass resulted in an increase in the intensity of both the westerlies and the monsoon systems. At the same time the intertropical convergence zone is thought to have shifted northward to south of the Mediterranean areas, across North Africa and perhaps north of the Persian Gulf (Roberts 1982: 209, Sirocko et al. 1993) resulting in powerful moist maritime air from the Indian Ocean causing summer rain on the area from the southern edge of the Atlas Mountains in Pakistan to the western parts of Southern Iran and Mesopotamia (El-Moslimani 1986: 62). Thus, increased rainfall in the early Holocene in some parts of the Near East, as in North Africa, can be attributed to the joint contributions of the westerlies and the monsoon system (Kutzbach 1983). The results of this model can be confirmed for the most parts of the Near East by the palaeoclimatic data in the form of higher lake levels, (Roberts and Wright 1993: 196) for example, but it does not, however, explain why parts of the eastern Mediterranean regions such as Iran in the early Holocene were drier than at present, as suggested by palynological data. The climate model suggests, that it may have been a stronger winter outflow of cold air from the Eurasian land mass that blocked the easterward movement of airflow from the Mediterranean Sea into interior areas such as Anatolia and Iran (Wright 1993: 218, c.f. the palynological data represented by van Zeist and Bottema 1977, 1982, 1991).

From the maximum effect of this increased solar insolation at 9000 B.P., the model then suggests that there was a decline to values of temperature and precipitation approaching those of today by around 6000 B.P. As mentioned above, the southern-eastern sector of the Near East (Iran lies in this sector) received moisture from both the monsoonal system from the southwest and the Mediterranean system driven by westerlies (COHMAP Members 1988, Sirocko 1993, Kutzbach et al. 1993). As solar insolation declined the monsoon became progressively weaker and shifted to the south, and so total precipitation declined and became more seasonal occurring only in winters. This event around 6000 B.P. has been well documented by Kay and Johnson (1981: 259) at least for the southern part of Iran. They concluded that the humid episode in the southern Zagros ended around 5900 B.P. and that the ensuing drier period lasted until about 3000 B.P. after which modern wetter conditions appeared. In the central Zagros they noted a wetter period from about 6400-5200 B.P., followed by aridity to about 3400 B.P. However the rapid decline from favourable climatic conditions affected substantially the Neolithic system of the central and southern Zagros. This climatic event can be seen clearly in archaeological data in the form of a wide range dislocation of population, and abandonment of some regions throughout the Zagros (Hole 1994). Interestingly, archaeological data obtained from Neolithic sites (during the sixth-fifth millennium) throughout the Zagros regions confirm this climatic event and eventually the same demographic trend and settlement patterns. Sumner (1988: 29-38) remarks that "sedentary population decreased at an accelerating rate between 4900-4350 B.C." a reduction of 69% in 500 years which, he attributes to "a severe crisis in subsistence production". This pattern similarly can be seen in Marvdasht (Sumner 1988: 4), Bakhtiary (Zagarell 1982: 65), Fasa and Darab (Miroschedji 1973), Deh Luran (Hole 1987a: 85), Behbahan (Nissen and Redman:1971) and Ramhormuz (Caldwell 1968), in all of which there was a marked decline in sites, and at some sites the climatic change forced people to shift away from agriculture toward animal husbandry, as occurred in Luristan (Henrikson 1985: 40).

Chapter 5

Research Priorities and Methodological Structure

for the Future Development of Palaeolithic Archaeology in Iran

1. Introduction

My thoughts on Palaeolithic archaeology in Iran are based on the one hand on my personal observations and on the other hand on the results of previously conducted and on-going Palaeolithic research in various parts of Iran. First of all, however, it is necessary to mention certain important problems. Our knowledge of the Palaeolithic in Iran is quite fragmentary. Most of the research and studies are far from giving us precise information either on the location of sites or on the chronostratigraphy of Palaeolithic materials. In addition Iran has been only partially explored and a huge area still needs to be surveyed. In the light of this my suggestions are provisional and of course open to change or at the very least to further modification. Despite insufficient studies the Palaeolithic of Iran is very rich and allows us nevertheless to attempt a few summary thoughts on the problems of Iranian Palaeolithic archaeology. *It must be pointed out that this essay is not a theoretical or methodological work. It is unfortunate that the information we have about the Palaeolithic in Iran today does not allow that kind of presentation. Instead this is basically a descriptive account that tries to identify the main problem areas.*

The first section of this chapter attempts to explain the current state of academic knowledge of Palaeolithic archaeology as a basis for a discussion of the future of Iranian archaeology; the second section will try to illustrate the present day state of the Palaeolithic in Iran and in the third section some suggestions will be made about what we need to know to make further progress.

The Palaeolithic period is the oldest period of human prehistory and in Iran spans the time from the assumed appearance of *Homo erectus* ca. 0.8 million years ago (ca. 0.8 Ma) to the beginning of the 'Neolithic Revolution' ca. 10,000 thousand years ago (ca. 10 Ka). Current priority in Palaeolithic research includes the understanding of the physical evolution, the cultural development and the global colonisation of our early ancestors. Although there is a diversity of thinking of how to study the Palaeolithic and what parts of are interesting and important (e.g. Gamble 1987, Wynn 1991), there is a common agreement within this diversity to study:

(1) the absolute age of our earliest ancestors and information on the palaeoclimate in which they survived;

(2) to understand the role of environmental and chronostratigraphical information in association with geographical processes which is a key aspect of palaeolithic research. The periodic fluctuation of climate during the vast span of time includes archaeological evidence from a variety of types of geological deposits including river, lake, marine, colluvial and solifluction deposits. These are often deeply buried and access to them can only be possible where they are exposed by natural processes such as river erosion or human activities such as quarrying;

(3) the main direct evidence of humans in the Palaeolithic is their lithic artifacts. Typological and technological analysis of lithic artifacts becomes more significant where their changes through time can be identified and interpreted;

(4) studying hominid skeletal material has a great importance where the processes of human physical evolution are sought;

(5) studying the past ways of thought from material remains (cognitive archaeology). Such approach attempts to provide answers to some fundamental questions of the ability of archaic humans in the Palaeolithic to plan ahead intelligently and organise themselves logistically (e.g. Gamble 1987).

Of great importance are also studying the remains of animals used for food and the remains of non-food mammals, molluscs, pollen and insects. Such evidence provides knowledge of the prevailing climatic conditions and environmental contexts of the Palaeolithic and economic patterns of Palaeolithic life.

The main interest of Palaeolithic research is the interpretation and reconstruction of the life of past extinct humans from their preserved skeletal remains, their assumed behaviour and the processes that shaped them, by using a multidisciplinary approach and within a methodological context. Thus, the questions of 'why' 'where' and 'how' did some later species of hominids such as *Homo erectus* and *Homo sapiens* emerge or disperse to other parts of the world appears to some archaeologists and anthropologists to be the single most important point of contention.

As has been stressed in the archaeological and anthropological literatures, the Near East, as the geographic crossroad between Africa, Asia, and Europe, was certainly a main route for the dispersal of *Homo erectus* into Eurasia. The archaeological record of some parts of the Near East (western Asia) can contribute to explain the

Middle to Upper Palaeolithic revolution undertaken by anatomically modern humans. This region was also the core area where the 'Neolithic Revolution' took place. The successful adaptation of hominids in western Asia facilitated their movement farther into eastern parts of the Near East; therefore locating the earliest sites in the Near East that mark the possible routes of hominids at various periods is of great importance. Such sites may provide clues to when these movements took place and to gain insights into the various phases of human evolution and their behavioural capacities while colonising each region. Unfortunately, among the Near Eastern countries, only the extensive research in the Levant contributes to these problems of Palaeolithic research in contrast to Turkey, Iraq, Iran and Afghanistan where such research is lacking.

It is worth mentioning that the chronology of the first appearance of the hominids and the evolutionary phases in Asia has been in recent years a subject of major controversy. Although almost the whole of Asia is still blank on archaeological maps, the recent discoveries of early hominids in China, Pakistan and Central Asia seem to change the date and traditional views on the issue and most importantly they indicate the potential of Asia to provide dates and the possibility that the relevant data may be available elsewhere in Asia. Unfortunately, at the moment the undeveloped state of Palaeolithic research in some countries of the Near East prevents researchers linking archaeological records between the Levant and eastern Asia, and therby reconstructing the possible routes of early hominid dispersal into Asia. As has been pointed out by some scholars (e.g. Wolpoff and Nkini 1985: 204) *Homo erectus* is far better represented outside of Africa than it is within Africa, particularly in Asia. As we will see, this is also true for the emergence of anatomically modern humans. Therefore Asia (particularly western Asia) can be viewed as an ideal region for testing a number of conflicting evolutionary hypotheses. If this is the case, the Palaeolithic should have a top priority in archaeological research in western Asia.

The earliest human fossil comes from Africa dated to between 4.0 and 5.0 Ma but complete fossil remains are only known from between 3.0 and 4.0 Ma (Johanson et al. 1982). These are generally attributed to *Australopithecus*. The earliest species attributed to the genus Homo is *Homo habilis* (the first tool maker) which may have first appeared at about 2.3 Ma but the earliest good fossil evidence is a little less than 2.0 Ma old. Members of *H. habilis* are well documented in East Africa in deposits at Olduvai and Koobi Fora (Leakey and Walker 1976). They produced the so-called Oldowan technology by which a stone pebble (the core), usually of lava, was struck using a second (the hammer) to produce a crude chopper or scraper and sharp flake. Both the pebble tools and the flakes were probably used in various ways, but their technology is seen as a more opportunistic stone shaping or tool making rather than a systematic technology (Isaac 1984, 1986). By 1.6 Ma or more, *Homo habilis* was followed by species characterised by tall stature named *Homo erectus* (for more detail see Rightmire 1990). The transition from *habilis* to *erectus* involved a slight enlargement of the brain and a change in facial features including the development of prominent ridge above the eyes, the brow ridge (Turner and Chamberlain 1989). By 1.4 Ma the Oldowan tradition had been supplemented by a new tradition; Acheulian technology is characterised by large bifaces in the form of hand axes and cleavers. The number of identifiable tool types in Acheulian assemblages is small, not all of which occur at every site; in some cases the dominant tool is the biface. However, the great majority of typical Acheulian assemblages in Africa, the Near East and India combine varying percentages of both Acheulian and Oldowan components but none occur in East Asia (Gowlett 1988). Instead, a chopping tool assemblage like the Oldowan appears in this part of the world. This different pattern is argued to indicate the existence of two different types of people in the west and the east, but Clark (1992: 210) concludes that in the Far East the raw materials used by *H. erectus* were mostly not hard and resistant. So, it is likely that the technology was based on the use of bamboo, wood and their by-products. This issue can best explain the unspecialised nature of the stone industries in this region, the use of which have been restricted to the basic needs of chopping, sawing and scraping these raw materials. In Africa about 0.5 Ma there began to appear hominids that replaced *H. erectus.* This group shows more advanced morphological characteristics combining *H. erectus* features with certain modern ones. The new form of hominids, specimens of which have been found in Africa, Europe and Asia, are generally known as archaic *Homo sapiens.* It is argued that during the Lower Pleistocene and even the early part of the Middle Pleistocene some *H. erectus* became extinct and during the later Middle Pleistocene or earlier later Pleistocene (ca. 0.5-0.2 Ma) specimens of archaic *Homo sapiens* occupied Europe, the Levant, India and eastern Asia. The earliest hominid fossils in Europe are generally assigned to this specimen and are associated with both Acheulian and Oldowan type technology (Roberts et al. 1994, Roebroeks 1994, Stringer 1989). In the Levant at Zuttiyeh, the stone industry is an evolved Acheulian (Vandermeersch 1989); at Hathnora in India it is also a typical later Acheulian (de Lumley and Sonakia 1985). In China and southeast Asia associated stone artifacts are in the core/chopper tradition (Rightmire 1990: 34-52). The Acheulian type bifaces which are characteristic of specialised Acheulian core techniques in Africa, Europe and western Asia have not been found in east Asia as yet.

The date and circumstances in which the early *H. erectus* dispersed from their African homeland, where several species evolved from ca 4.0 to 2.0 Ma is a major issue debated by scholars for several decades. The new dates for the Javanese human fossils would indicate that *Homo erectus* arrived in southeast Asia at about 1.8 Ma (Swisher et al. 1994) but this needs to be confirmed by further field work. The new data also suggests that *Homo erectus* as a species with innovative abilities and general adaptive skill could have emerged either during or immediately after the Olduvai subchron which is currently dated to 2.1/1.98-1.75 Ma (Cande and Kent 1992). Thus, the early dispersal of *Homo erectus* may have occurred after 1.8 Ma, probably from the south towards the north of Africa, and to Eurasia under a severe climatic constraint (Turner 1992). Therefore the early part of the Lower Pleistocene about ca 1.8-1.4 Ma was the crucial formative period for *Homo erectus* populations. In the lack of convincing evidence to demonstrate an alternative route of human migration into Europe and Asia, the Near East will remain the only potential corridor for *Homo erectus* migration out of Africa (Bar-Yosef 1994: 214-217). The evidence from Lower Palaeolithic sites in western Asia indicates that both Ubeidiya and Dmanisi were among the first stations of *Homo erectus* in the Near East and Eurasia (fig. 4).

Dmanisi, an open site in south Georgia, is situated on a basaltic block between the two tributaries of the Kura River. Stratified faunal assemblages of this site are associated with a lithic industry containing core-choppers but no bifaces. Data gathered from the site suggest a lower Pleistocene age for the site, when a wet environment with well-watered forests was dominant (Dzaparidze et al. 1989). The hominid mandible discovered from the site is considered to be more primitive than that of Ubeidiya; therefore the site is thought to have been occupied contemporarily with the Olduvai subchron and is dated within a time range of 1.8±0.1 Ma. Palaeomagnetic analysis of the lava flow (the sites occurs over a lava flow) revealed normal polarity and accordingly was ascribed to the Olduvai event. Since the layer occurs stratigraphically above the lava flow, the K-Ar age provided the upper limit of the *Homo erectus* find. Since the find layer is also normally polarised, although it was argued that it belonged to the Olduvai event, however, it is in principle possible to ascribe it to the Brunches epoch ca. Less than 800/000 kyr (see Singhavi et al. 1998).

Excavation at Ubeidiya in the Jordan Valley produced a fairly large lithic and faunal assemblage (Opdyke et al. 1985). Deposits at this site accumulated in or near an ancient lake and most of the archaeological horizons are associated with a single period of regression of the lake water. The faunal remains include a number of large mammals as well as rodent species and these indicate a climate more humid and cooler than at present. The dating of Ubeidiya is based on the faunal studies by Tchernov (1992) that he suggests the age as 1.4-1.0 Ma. The raw material used for the manufacture of artifacts was basalt, flint and limestone. The early hominids used each type for different tool types: core-chopper and light tools were made of flint, while the hand axe group were made of basalt. The earliest layers of Ubeidiya contain an abundance of core-choppers but lacks bifaces. These assemblages are similar to those of developed Oldowan tradition and can be used as an indication for the presence of an early group of *Homo erectus* in this area. The upper layers contain a lithic industry which includes bifaces, termed as early Acheulian industry by Bar-Yosef and Goren-Inbar (1993). The presence or absence of bifaces in the different layers of this site is taken to designate different groups of people who lived in this area. In terms of overall pattern of mammalian movements, hominid remains and lithic items from Dmanisi and Ubeidiya seem to mark a stage in human dispersal from Africa into Eurasia. Evidence from Dmanisi and Ubeidiya would enforce the possible hypothesis that in the late Pleistocene several mammalian species moved from Africa across Arabia, probably via the Levant, or perhaps through the Bab-el-mandab Straits (Wood and Turner 1995: 240). As has long been debated by western archaeologists and palaeontologists, the spread of *Homo erectus* from Africa through the Levantine corridor to the east, eventually reaching into tropical Asia, may have occurred around 1.0-1.2 Ma. Their conclusion is mostly based on similarities between the morphological patterns of the hominid fossils from the temperate regions of the Far East (Java and Peking men) and African hominids on the one hand, and the resemblance of associated stone artifacts of Peking man to the developed Oldowan tradition in Africa on the other (Wei Qi 1988). During the last decades there have been sporadic attempts particularly by Chinese scholars to demonstrate a separate origin for the hominid lineage in Asia, suggesting that the hominid remains from East Asia are from more than one species. They refer the hominid remains of East Asia to an early form of *Australopithecus* and suggest an earlier more primitive phase of hominid evolution in East Asia. Recently the excavation of Longgupo Cave in China by a joint Chinese, American and Canadian team provided important evidence, including very archaic hominid dental fragments and primitive stone tools. This evidence enabled the excavators to claim that the hominid remains from Longgupo Cave are comparable in age and morphology with the earliest examples of the genus Homo *(H. habilis* and *H. ergaster*) and the Oldowan technology in East Africa. The age of the Longgupo hominid is tentatively estimated as 1.96-1.78 Ma; it means that this hominid may be older than any reported *Homo erectus* from China (Huang et al. 1995). If the date of 1.8 Ma suggested for the Indonesian *Homo erectus* (Swisher et al. 1994) is correct the new evidence of the Longgupo Cave suggests a date for the hominid occupation of East Asia at around 2.0 Ma. These evidence from Pakistan (see below) and China opens up the possibility that the first hominid to leave Africa was at least as primitive as *Homo ergaster* and indicates that *Homo erectus* may have evolved within Asia and then spread back into Europe and Africa, (see also Wood and Turner 1995, Dennell 1995).

Homo erectus is consistently present throughout the Lower Pleistocene and most of the Middle Pleistocene, at least in East Asia (Howell 1994: 267) and in the Levant (Bar-Yosef 1994: 214). Admittedly, in most of the Near East there has been nothing like such detailed multidisciplinary surveys for fossil hominids and associated cultural and faunal remains as there have been in the Levant. The researches carried out in a diversity of situations and in a succession of geological contexts at sites such as Latamne (Orontes River), Evron-Quarry (coastal plain), Gesher Benot Ya'aqov (Jordan Valley) and Joub Jannine II (southern Bekaa) provided information about the Acheulian industry complex and clues to the early colonisation of western Asia by *Homo erectus*. The systematic excavation at Evron-Quarry conducted by Ronen (1991) revealed an archaeological horizon of the Lower Palaeolithic containing small pebbles of quartz, limestone and flint. The lithic assemblage reported from this site consisted of bifaces, flint artifacts and various flakes including retouched pieces. Bifaces are generally large and similar to those found at Ubeidiya, while flint artifacts are relatively small. The faunal remains have also a close similarity to those of Ubeidiya and indicate a mixed woodland environment at this site around 700-500Ka. Latame is a unique site on the terraces of the Orontes River. This site has been re-excavated by Sanlaville and his colleagues (Sanlaville et al. 1993). Study of flora, fauna and the in situ lithic assemblage of the Latamne occupation floor, using TL dating, supports a date in the middle Lower Palaeolithic (the Middle Acheulian in the Levantine chronology ca. 700-500 Ka) for the site. The mammal bone assemblage is composed mainly of equids and elephant types, although the presence of two additional species, deer and a type of gazelle, is suggested. The worked tool categories include bifaces made from limestone and basalt, as well as core choppers which typologically are similar to the Ubeiddiya technology. Among the known Lower Palaeolithic sites in the Levant, the site of Gesher Benot Ya'aqov in the upper Jordan Valley is unique, since the deposits on the site produced the remains of hominids: two broken femora which are attributed to *Homo erectus*. The archaeological horizon of this site was embedded in a depositional sequence that accumulated above a lava flow. This formation, together with the fauna assemblage retrieved from the site, were dated to around 900-700 Ka (Goren-Inbar et al. 1992). The lithic assemblage consists of an African type assemblage containing abundant bifaces including both hand axes and cleavers and a diversity of flake tools with extensive evidence of Levallois types (this tool making technique originated in the Acheulian; the core is shaped and flakes of the required size and shape can be removed; it is characterictic of Mousterian technologies) (Goren-Inbar 1992).

It is very unfortunate that outside of the Levant toward the east the Lower Palaeolithic sequences and the record of early humans in much of Asia (particularly in the Near East) is not at all clear. For example, until only a few years ago the region extending from east of the Euphrates across the plateau of Iran and on through Central Asia was almost without an example of a site of early Palaeolithic people that could be reliably dated on the basis of its geological context. Therefore little is known about early man and his ways of life in this large, arid zone of interior Asia. Fortunately in recent years in some parts of this zone there have been excavations and field researches, with the use of TL and ESR dating methods. They provide convincing evidence and suggest a longer chronology for the sites than previously was accepted.

Field research and excavation in the Arabian Peninsula indicate numerous repeated occupation levels containing the Acheulian biface tradition. Bifaces have been mainly found from the western part of this region where they were made from a variety of raw materials such as flint, basalt and rocks. Find spots along the Red Sea and site of Saffaqah provided evidence for the Acheulian lithic tradition with bifaces, cleavers and flakes (Whalen et al. 1983, 1984).

In the Transcaucasus the Lower Palaeolithic sequence is known from the cave of Azykh in southern Azerbaidzhan. There are 14 metres (10 layers) of infilling with continuous human occupation in the lower 6 units. The artifacts of the earliest occupation is termed the Kuruchai industry (Guseinov 1981,1985) and comprise cobbles including chopping tools, cores and irregular retouched flakes. The assemblages resemble the so-called developed Oldowan tradition and are dated as early as 1.2 My. The Acheulian industry is documented in unit 6 and 5 which contain mainly cobbles, bifaces, chopper tools and retouched flakes. Assemblages of faunal remains in this site comprise micromammals such as rodent species, carnivores, bison and caprines together with a hominid right mandible fragment. The pollen analysis at the site for the Early Acheulian (unit 6) indicates warm climatic conditions with a winter temperature of 9-14 C° and a precipitation of 500-1000 mm, and a subsequent reduction of both during the Middle Acheulian (unit 5) (Guseinov 1985).

The Lower Palaeolithic sequence is also known from two other caves in Georgia; Koudaro and Tsona, both in western Georgia. The Koudaro site comprises Acheulian occupation horizons, the lowest of which (5B) contains mammalian remains similar to that of Azykh unit 6 (Lubin and Barychinkov 1984).

Recently the most reliable evidence of early human presence in the adjacent regions of the Near East was obtained from Central Asia. Fieldwork along with stratigraphic, pedological and palynological studies at Kuldara, a site in southern Tajikistan, revealed a Lower Palaeolithic site within a very long stratigraphic series of loess in which 28 palaeosoils were deposited over 105 Myrs. The site occurs in the 11th and 12th of these palaeosoils. Analysing the archaeological assemblages, including lithic artifacts and a small quantity of broken bone remains, enabled excavators to suggest a date of 0.85 Ma for this site (Ranov et al. 1995). Among the Lower Palaeolithic sites now known from Central Asia are Khonako and Kuhi-Pioz in Tajikistan, respectively dated to ca. 0.5 Ma and the early Middle Pleistocene (ca. 0.6 Ma) on the basis of geological evidence (Gabori 1987). Bos-Barmak in

Kyrgyzstan, where a large amount of objects was found on the ancient terraces of Lake Issy-Kul is assigned to the late Middle Pleistocene. Karatau I and Lahuti I both in Tajikistan have been dated to 0.195-0.21 and 0.13-0.15 Ma respectively. The lithic industry in Karatau I is characterised by pebble tools similar to the Acheulian tradition but without bifaces (Davis et al. 1980). Selungur Cave in Kyrgyzstan containing skeletal remains attributable to *Homo erectus* (Islamov 1990). Uranium-series dating on the basis of geological evidence suggested an age of ca. 0.126 Ma for the site. The lithic industry in this site is similar to that of Karatau I in the absence of cores and the presence of pebble tools but displays a more developed feature (Ranov et al. 1995). In Iraq and Iran (see below) little is known about the Lower Palaeolithic sequence and the number of sites is still rather small. A similar situation still prevails in Turkey where most of the finds are surface occurrences and often of isolated bifaces or core-choppers (Yalçinkaya 1981). Mention should be made here of a claim for stone artifacts in conglomerates of the upper Siwalik Group, northern Pakistan. Dennell and his associates suggest a date of 2.0 Ma for the lithic assemblage at Riwat on the basis of palaeomagnetic and geological criteria. The Riwat finds are striking in their antiquity and were interpreted as made by *Homo habilis* (Dennell and Rendell 1988, Dennell et al. 1988). The Riwat finds have generated controversy (for detail see Hemingway 1989, Stapert 1989, Dennell 1995).

2. The emergence of modern humans

The issue of the origin of modern human populations has been a central theme of debate throughout the greater part of this century. The issue of the biological and demographic origin of modern human populations has been seen generally as a conflicting issue between two schools of thought. One view (the 'Garden of Eden' or 'Noah's Ark' or 'Out of Africa' Hypothesis); asserts that biologically and genetically modern human populations evolved initially in Africa at sometime within the last 200-300 Ka and subsequently dispersed to all other regions, replacing *Homo erectus* without any genetic admixture with the pre-existing population within the same regions (Howells 1976, Stringer 1990, 1992, 1994, Wilson and Cann 1992a, Mellars et al. 1993). In contrast, the 'Multiregional' Hypothesis asserts that an essentially gradual, continuous process of evolutionary change took place over a long period time in each of the different regions to which *Homo erectus* spread, resulting in the appearance the regional varieties of modern man in each of these regions. Gene flow between populations in the different regions is assumed to maintain a broadly similar pattern of evolutionary development within the different regions throughout the whole of this time range (Wolpoff 1989, 1992, Wolpoff et al. 1994, Thorne and Wolpoff 1992, Frayer et al. 1993).

The recent development in the field of molecular genetics is potentially critical to this long running debate. Support for the recent emergence of modern man from Africa is provided by genetic studies especially of mitochondrial DNA (mtDNA). This is based on the detailed work carried out on the variability in mtDNA from about 140 individuals of different modern geographic or racial origin, undertaken by Wilson and his colleagues and reported in 1987 (Wilson and Cann 1992b). It has been claimed that the important aspect of this genetic research is in the various estimates of the rate of genetic mutation of mtDNA, which can be used to date the emergence of the initial humans in Africa. As mtDNA is inherited from the mother alone the mtDNA in all members of a small population may derive from any one ancestral female, as other female lineages randomly fail to produce female reproduction in a given generation and disappear. If such a population then divides up into separated groups, the accumulation of neutral mutations in the mtDNA can be used as a clock to indicate the length of time that has passed since the groups separated. Wilson and Cann postulated that a common female ancestor had probably lived in the region between ca. 50 and 350 Ka, and that the descendants of this initial population had probably expanded to most other regions of the world by around 30-100 Ka. One feature that emerged from these studies is that the present day population in Africa shows a wider range of genetic variation than the combined populations in all other regions of the world suggesting a longer period of evolution of modern humans in this region than elsewhere (Vigilant et al. 1991). This indicates that modern man has existed in southern Africa for longer than elsewhere allowing local populations more time to diverge (Stringer and Andrews 1988, Cann et al. 1994 see also Cann et al. 1987, Stoneking and Cann 1989). Similar conclusions have been derived from the analysis of genetic polymorphisms and the development of language. A reconstruction of the human phylogenetic tree based on blood-group and enzyme polymorphysms shows that the first split separates Africans from non-Africans. Linguistic families largely relate to the population groupings defined by the tree (Cavalli-Sforza 1991).

These two theories of the evolution of modern man are currently in conflict. One of the most critical and controversial conclusions of the mtDNA studies is that the total replacement of one human population (e.g. Eurasian) by another (e.g. African), without any traces of genetic admixture, resulted in a high degree of isolation of the Eurasian archaic populations and therefore they became extinct without making any significant contribution to the biological make up of any of the subsequent populations. The other controversial issue that is challenged by supporters of the "Multiregional Evolution" school is the problem of estimating mutation-rate (the rate of genetic divergence of mtDNA). They argue that by using a different set of estimates one can push the suggested date of the inferred colonisation of Eurasia to as early as 850 Ka, a date that has been generally accepted for the appearance of *Homo erectus* in northern latitudes in the Early Pleistocene (see Wolpoff 1989).

A further problem relates to the phylogenetic trees derived from mtDNA data. Templeton (1992, 1993) argues that the co-workers of the phylogenetic trees misapplied the "parsimony analysis" and the data sets used were too large to allow the computer program employed to provide a unique solution. He also points out that the joining time of these trees was very uncertain and likely to be much more than 200 Ka. So, the detailed mtDNA results that were seen to support the 'Out of Africa' hypothesis seem to have been discounted (below) (see also Klein 1994: 6).

Finally, biologists speak of a 'bottleneck' when the number of individuals in a population is reduced after which it may once more expand. The principle of population bottleneck is that a large population displays wide genetic diversity among its members. If the population falls to very low numbers, only a fraction of the existing genetic variation will survive and be passed on to future generations (Wilson et al. 1985). In other words the new population represents only a small sample of the genetic variation that originally existed. This theory asserts that a bottleneck may be associated with the origin of new species and can be used to interpret the origin of *Homo sapiens*. Such an analysis was carried out by Rogers and Harpending (1992) suggesting that a major population expansion occurred around 45 Ka. They argue for a dramatic reduction in human numbers in Africa about 60 Ka, followed shortly afterwards by the appearance of fully modern humans in both Africa and Eurasia and the disappearance of the Neanderthals.

To summarise, the two models are very different in their requirements for gene flow. The 'Out of Africa' model assumes a special event in a geographically restricted population, from which descendants move into other regions of the Old World. Gene flow or interbreeding occurs within an original population and then between neighbouring groups of descendants. There is no requirement for extensive gene flow over distant geographical regions in the process of the evolution of modern humans. In contrast, the 'Multiregional Evolution' model requires extensive gene flow not only over large geographical regions but also through long tracts of time. It is fair to say, therefore, that genetic evidence supports the 'Out of Africa' hypothesis. The 'Multiregional Evolution' hypothesis finds little or no support from the genetic data at least as interpreted by some scholars. For instance, Cavalli-Sforza (1991: 104-106) states that "supporters of the 'Multiregional' model do not understand population genetics; they use a model that requires continuous change of genes, but it requires an enormous amount of time to reach equilibrium. There has been insufficient time in human history to reach that equilibrium". Indeed genetic data pushed the 'Out of Africa' hypothesis even further than its anthropological supporters initially thought by indicating complete replacement of established archaic populations by incoming modern humans (a relatively recent origin for *Homo sapiens* between 200 ka and 100 ka based on assumed rates of mutation). The identification in 1997 of mtDNA in the type specimen of Neanderthals appeared to prove the case. The DNA could not be matched with any living population. Also the identification of the large number of mutations between the ancient Neanderthal DNA and our own, indicated that about 400 ka had passed since we last shared an ancestor. (see Barham 1999). Thus, based on mentioned experiment the genetic evidece therefore suggests that Neanderthals evolved into a distinctive species well adapted to the rigorus of glacial periods in Eurasia, when modern humans were absent (see next).

In recent years an alternative hypothesis which incorporates elements of the 'Out of Africa' and 'Multiregional' hypotheses has been advocated (e.g. Smith 1994, Treisman 1995). According to this hypothesis the modern human evolved in isolation in Africa and then spread by migration and by hybridisation, or gene exchange, or both, throughout the archaic populations.

However, debates on the origin of modern humans continue and no doubt the problem can only be solved in the light of fresh evidence and further research.

3. The contribution of archaeology

One role of archaeology is to reconstruct change in behaviour associated with the evolution of modern humans, and to distinguish behavioural differences between non-modern and modern humans to help explain why non-modern humans failed to survive.

In archaeological terms the transition from Middle to Upper Palaeolithic in Europe coincided with an abrupt change in the behavioural, organisational and technological pattern of ancient human societies, and the appearance of anatomically modern humans that is thought to be contemporary with this event.

The main behavioural differences between the Middle and Upper Palaeolithic are the production of bone and antler objects; use of worked marine shells; development of rock art and the presence of a few art objects; frequent use of red ochre; and the extensive use of grinding tools. The Middle to Upper Palaeolithic transition is also marked by innovations and inventions including new or improved techniques of food acquisition and preparation which would have led to better nourishment and population increase. The transportation of materials over long distances indicates higher mobility, larger than the preceding period (Mellars 1989a, 1989b, 1992). The Middle to Upper Palaeolithic transition can be explained as resulting from changes in technological and social organisation that took place within one region and then spread throughout other areas (Soffer 1994, Bar-Yosef 1994). By contrast some scholars refer this behavioural transformation to the biologically based advances in human mental capacity and development of modern language (Klein 1989, 1994, Clark 1992). Davidson and Noble (1992) have proposed that the ability of modern humans at about 55 Ka years to cross the 100 km waterway to Australia was accomplished with boats whose construction required the use of modern language.

The archaeological evidence for the transition is best known in western Europe and is employed by many scholars as a model for other regions. In Europe the Chatelperronian culture seems to represent a transitional phase between the Mousterian and the Upper Palaeolithic. Archaeological evidence indicates that an abrupt change in behavioural patterns occurred about 40 Ka, and Mousterian Neanderthals of the Chatelperronian were replaced by modern humans of the Aurignacian (Cro Magon) moving in from elsewhere (Harrold 1989). In the Near

East and Africa the cultural periods that correspond to the European Mousterian or Middle Palaeolithic (before 40,000 years ago) are commonly also called Mousterian and are characterised by the same tradition of artifact types as characterise the European Mousterian. The succeeding cultural unit (after about 40,000 years ago) is called the Upper Palaeolithic and is marked by some kinds of artifacts that characterise the Upper Palaeolithic in Europe. The Near East (particularly the Levant) is one of the most interesting areas for the study of modern human origins, since it has produced a relatively large sample of skeletal remains belonging to this period and the remains show a range of morphological diversity which has given rise to a variety of competing interpretations. Advocates of the 'Out of Africa' hypothesis find the remains from Skhul and Qafzeh caves, dated by TL and ESR methods to the time range of 120-85 Ka, compelling evidence for early modern humans in the Near East. Proponents of the "Multiregional Evolution" hypothesis regard the human relics from Tabun Cave as transitional fossils between archaic Homo and forms closer to modern humans. Both hypotheses agree that such forms as Qafzeh or Skhul are not fully modern; these forms occur only during the Upper Palaeolithic (Bar-Yosef 1995: 514). This means that additional morphological changes within this lineage took place in the following period and probably continued into the early part of the Upper Palaeolithic. The skeleton uncovered from the Mousterian deposit of the Kebara Cave in 1987 is seen as a Neanderthal (Valladas et al. 1988). A TL examination dated the skeleton and its associated flint artifacts to an age of ca. 60 Ka. The big surprise came in the following year, when the same laboratory produced an age for the *Homo sapiens* fossils of Qafzeh ca. 92 Ka. These dates indicate that some *Homo sapiens* preceded Neanderthals in the area, and thus the Neanderthals could not be ancestors of modern humans. In 1989 more dates were determined, this time for Skhul (early modern) and Tabun (Neanderthals) of 100 Ka and 120 Ka respectively (Vandermeersch 1992). These dates indicate an early presence of Neanderthals in the region, probably immigrated from Europe, even though the first *Homo sapiens* appears some 20 Ka later. The appearance of Neanderthals at Kebara Cave from 60 Ka would complicate the interpretation of modern humans originating from the Neanderthals in this region. If Neanderthals had evolved into modern humans in the region as the "Multiregionalists" postulate, then no Neanderthals would be expected after the appearance of Modern humans. The Kebara Cave Neanderthal postdates Skhul by 40 Ka. The 'Out of Africa' interpretation of these fossils and their dates suggests that Neanderthals moved into the Near East from Europe by 120 Ka, and modern humans migrated into the region by 100 Ka from Africa, and the two populations coexisted for some 40 Ka. Because the anatomical characteristics of the Neanderthal and *Homo sapiens* in the Levant indicate no similarity to each other, Stringer (1989) concludes that Neanderthals and modern humans evolved separately, the former in Europe and the latter probably in Africa. If the Skhul and Qafzeh fossils are truly close in date to 100 Ka old, this puts them close to the earliest modern human fossils in east or northern Africa. It also means that the Near East must be considered as a possible centre of origin.

However, more recently, new type of evidence discovered from the sites of Zambia and Kenya in Africa shed new light on the origins of modern human. The earliest use of pigment dating to between 200 and 350 ka and new ways of making and using stone tools dating to about 200 ka found from those sites suggests for the makers a symbolic awareness and new behaviours. These lines of evidence enabled excavators to suggest a date of 200 ka or earlier for the emergence of modern humans in Africa (see Barham 1999).

The major cultural change in the Levant from the Middle to Upper Palaeolithic took place around 45 Ka. The sequence of the Upper Palaeolithic here begins with the transitional industry of the Emiran culture (early Upper Palaeolithic) that is best known from the Ksar Akil rockshelter in Lebanon, and from Boker Tachtit, an open air site in the Negev highlands (Ohnuma and Bergman 1990). This culture is characterised by the continued use of the unipolar Levallois core reduction technology with increasing frequencies of prismatic cores. Similar unipolar, convergent blanks within the late Mousterian times shaped into points were modified during this period into end scrapers, chamfered pieces and burins. The early Upper Palaeolithic which follows the initial transitional phase in the Levant is the Ahmaria tradition that is characterised by a series of blade and bladelet industries and is dated to about 38-35 through to 22-20 Ka. The Ahmaria sequence was succeeded by the Levantine Aurignacian sequence which occurs in the central Levant. The Aurignacian phase A is characterised by a series of blade and bladelets with carinated nosed scrapers and retouched bladelets. The characteristics of the Aurignacian phase B stone industry are the flake, nosed and carinated scrapers which are followed by the Aurignacian phase C flake, scraper and burin industries (Marks and Ferrig 1988, Bar-Yosef and Belfer-Cohen 1988). In summary, the Middle to Upper Palaeolithic transition is well documented in the Levant giving rise to different interpretations. Whether or not the change is an indigenous one or the result of acculturation is still debated. The case for in situ change finds support from many scholars (e.g. Bar-Yosef 1992, Gileada 1991). Nevertheless, the southwest Asia Middle/Upper Palaeolithic transition represents cultural changes at a similar rate to that in parts of Africa. The Ahmarian, the earliest Upper Palaeolithic (ca. 37 Ka) in the Levant, is comparable to, and contemporary with, the Dabban in Cyrenica, and the Nazlet Khater culture along the upper Nile (Vermeersch et al. 1990, Van Peer 1991). Therefore, the evidence may suggest that northern Africa and the Levant could be considered as a single culture area with regional variants, the material products of which were made by anatomically modern humans.

4. Palaeolithic archaeology in Iran

The researchers who deal with the Palaeolithic period in Iran are initially facing the following problems.

First, during a hundred years of Iranian archaeology the importance of the Palaeolithic has not been properly recognised. Although there was a handful of Palaeolithic excavations particularly during the 60s and 70s, the fact is that no Iranian prehistorian has ever specialised in the Palaeolithic or has ever produced a published report. Also Palaeolithic research has not been always a priority in official circles. After the Iranian Revolution in 1979, despite the many excavations now in progress in Iran, no research is concerned with the Palaeolithic. This official ignorance of the Palaeolithic seems to be due to a contrast between Islamic thought and the materialistic view of the Palaeolithic; contrary to western preconception of Islamic beliefs there is no direct evidence of cultural pressure at least at an academic level. Instead, the traditional views of Iranian archaeologists and archaeological services lead them to concentrate strongly on the historical period. A lack of interest within the educational system in the universities also explains the lag of Palaeolithic archaeology in Iran.

Second, the very obvious factor is the relatively limited amount of fieldwork that has been done, and the small number of sites that have been properly excavated (fig. 5). For the most part the work has been sporadic in nature with few extensive excavations lasting more than one or two seasons and no effort has been made to promote problem-oriented multi-stage investigation or serious multi-disciplinary research.

Third, there is a serious sampling bias resulting from the heavy emphasis on fieldwork in the Zagros area at the expense of other regions. Even there, however, the quality of excavation has not always been high, nor has the analysis of the excavated materials produced landmarks in archaeological methods. It is significant that, many sites that have been tested or excavated, have in fact received only a few lines in print. Until now there is only one report fully published and the results of some of the researches carried out in the past several decades are still not fully available for discussion.

Fourth, there is also a great deficiency of palaeoenvironmental and palaeoecological data which has limited our knowledge of the past environmental events and processes in Iran, and, although some of the field studies particularly in palynology have been excellent considering their restricted scope, their number has been small. Thus we still cannot properly evaluate the environmental background of human activities in any single region of Iran even in the comparatively well-studied Zagros Mountains, let alone in the country as a whole.

Fifth, the other handicap is our understanding of the absolute and relative chronology of the Palaeolithic sequence. This is a weakness in our understanding of many other parts of the Near East, but in Iran it is even more apparent. Thus, of the nineteen Iranian radiocarbon dates known, only a few can be accepted at face value and in any case they refer only to the past 50 Ka or less. There are no methods yet applied to arrange in even approximate chronological order the many thousands of years of the earlier Palaeolithic cultures although such methods such as potassium argon, thermoluminescence or uranium thorium have been successfully used in other parts of the world to date Palaeolithic sites.

Sixth, the Pleistocene period during which the development of the Palaeolithic cultures occurred is not well understood in Iran. Thus, the so-called glacial and pluvial environmental fluctuations of the Pleistocene period are poorly documented. Consequently it is not possible to say with any precision how long any of the Palaeolithic cultures or traditions in Iran lasted, to what degree they overlapped with each other, and how they might be chronologically subdivided to document their internal changes.

Seventh, the anatomical features of the humans are not well documented and there is a very limited information about human skeletal materials available. Thus, who the people were in the various cultural periods, how they evolved physically, and to what degree we can speak of biological continuity from the Palaeolithic occupants of Iran to the more recent inhabitants are problems that await solution.

Eighth, no effort has been made to relate Palaeolithic Iran with neighbouring regions, even though some authors assume Iran is a crossroad and must be seen as a meeting point of cultural influences from all the adjoining areas; indeed some researchers have assumed that the Upper Palaeolithic cultures of Eurasia were born on the Iranian Plateau (e.g. Garrod 1938, McBurney 1964). At the moment with the lack of any comparative studies of the material culture to define similarities or parallels, this is no more than an attractive assertion.

5. Sequences of the Palaeolithic period in Iran

5.1 The lower Palaeolithic; this period in Iran is the most ambiguous period in the archaeological sequence of this country. The paucity of evidence in this period may be due to the amount and the quality of the site explorations on the one hand, or, as in other parts of the Near East, destruction or covering of relevant sites under sedimentation or submersion caused by frequent environmental fluctuations on the other. Examples can be found in Bar-Yosef (1994), see also chapter 4 for detail. The limited evidence from the Lower Palaeolithic in Iran comes from open-air sites; no caves or rockshelter sites are known in this period. This situation is similar to Africa and the Levant where caves were little utilised until the end of the Lower Palaeolithic. Until now the earliest known Lower Palaeolithic site in Iran is a small site in Kashafrud Basin (Khorasan) investigated in 1974 and 1975 by Ariai and Thibault (1977). They found a relatively large amount of stone artifacts including choppers and chopping tools made from quartzite, and smaller tools of flakes such as scrapers, notched pieces and a kind of knife. A simple review of the stone industry discovered at the site shows an apparent resemblance to Asian chopper/chopping tool tradition from Central Asia, India and the Levant which enabled investigators to suggest a date of 800 Ka for the site, contemporary with the Acheulian tradition in Africa. No developed dating methods were used, nor was associated evidence such as fauna and flora remains and relationships between materials and their geological contexts studied; thus, the suggested date at the moment remains unconvincing unless additional in situ materials are discovered from this region.

Similar artifacts in the form of surface scatters were obtained from an open air site in Baluchistan by Hume in 1966-67 (Hume 1976), so-called Ladizian culture. The stone industry of this culture was referred to the Asian chopper/chopping tool complex. The industry is mainly composed of scrapers, knives, notched and pointed pieces, but no hand axes or cleavers. No study has been made of the fauna and flora remains, or the climatic and environmental background of the region. Although the geological and geomorphological features of the region are still completely unknown, Hume, on the basis of the geological processes observable on the ancient river terraces, has dated the Ladizian to a period beginning in the Riss and ending during the Würm glaciation period. At the moment the claim that many of stone tools found in Ladizian are the product of natural processes rather than by humans, or that they were made in post Palaeolithic periods (e.g. Smith 1986: 15) makes an evaluation of Ladizian impossible.

Very little is known about the Lower Palaeolithic in western Iran except some occurrences mainly in the form of surface finds in Barda Balka of Iraqi Kurdistan, the closest region to Iranian Kurdistan (Braidwood and Howe 1960) or Pal Barik in Luristan (Mortensen 1974) and Azerbaijan (Sadek-kooros 1976). The Barda Balka and Pal Barik finds represent stone industries which include pebble flake tools associated with a small number of Acheulian-like hand axes, while Azerbaijan yields artifacts of the general chopper flake tools without hand axes, similar to those found in Khorasan and Baluchistan described above. In the absence of any clear date suggested for the above finds we are not able to make inferences about differences between two groups of people who may have lived in the west, with the hand axe tradition, and in the east without it. Whether or not the traditions of pebble tools and hand axes belong to a single entity, or are separate, needs further research. As mentioned earlier in this chapter, if the claim for the combination of both traditions as a single entity from the Levantine and African sites is correct (see Bar-Yosef 1994 and Gowlett 1988), we can assume that this culture was first established in western Iran by people who probably migrated in from outside. They lived only in this area and rarely penetrated into the eastern parts of the country and left few traces. Unfortunately, in the lack of reliable evidence such as skeletal materials or adequate typological studies of the stone artifacts we cannot make any firm statement about the time of arrival of the earliest inhabitants, the actual directions from which they came or the biological types of hominids involved. The manner in which they exploited the physical environment and the nature of their settlement patterns and subsistence systems are largely unknown. The rate and nature of the regional and functional variations in lithic industries is another problem awaiting solution (fig. 6, 7).

5.2 The Middle Palaeolithic; the situation in the Middle Palaeolithic period is somewhat better than for the Lower Palaeolithic. Some twenty Middle Palaeolithic sites in the form of caves, rockshelters and surface scatters have been reported for Iran. Most of them occur in the Zagros Mountains, but some are known in other zones as well. The most important Middle Palaeolithic site, Shanidar in Iraqi Kurdistan adjacent to the Iranian border, is the richest one so far found. This site produced a wealth of data including human skeletal remains which can be used for the examination of the Iranian sites in this period. Within the cluster of sites located in Luristan near Khorramabad, three sites, Kunji Cave, Gar Arjaneh and Chamari Cave were investigated by Hole and Flannery in 1963 and 1965 (Hole and Flannery 1967). The Mousterian occupation here were dated with radiocarbon to between 50 Ka and 38 Ka B.C. The stone industry reported from the sites is composed of flake tools featuring side scrapers, unifacial triangular points, burins and borers but no Levallois method. The very poorly preserved faunal remains in these sites were examined and the authors concluded that these sites were seasonal camps and onagers were hunted by the inhabitants of Kunji Cave at least. The other rockshelter site in this zone called Humian was investigated by McBurney in 1969 (McBurney 1970, Bewley 1984). It was likely a summer camp site to hunt ibex or goat and sheep that migrated up from the plains. In the Hulailan Valley on the Saimarreh River Mortensen (1974, 1993) located at least seven Mousterian sites, two of which (Charvilla and Ghar Huchi) are rockshelters while the other five are surface occurrences. The Hulailan sites were claimed to be seasonal hunting sites (Mortensen 1975), and stone tool industries resemble those represented from Khorramabad sites but with Levallois method.

Toward the north on the Zagros Mountains the best known are Warwasi rockshelter excavated in 1959-60 by Howe (Braidwood and Howe 1960) and Bistun cave excavated by Coon in 1949 (Coon 1951). On both sites the lithic industry is composed of a high frequency of Mousterian type scrapers and points with some Levallois elements. The faunal remains obtained from the Warwasi site suggested that it served more as a camp site for hunting onager, red deer and other types of animals than as a living site (for detail and characteristics of the stone industry in Warwasi see also Dibble and Holdaway 1993).

Less is understood from the preliminary reports about the other Mousterian sites in this region. For instance, Char-i-Khar (Young and Smith 1966), sites no. 16 and 17 near Harsin (Smith and Mortensen 1980) and the earliest level of Gang Dareh (Smith 1975). It is also true for the region extending from the central Zagros toward the Persian Gulf. From this zone some kinds of Mousterian type tools have been reported as surface scatters but all lack further information on the typology of lithic industries found, or an adequate study of subsistence and settlement patterns. Sites include Fars (Field 1939), Kur river basin (Sumner 1977), Tell-i-Iblis in Kerman (Caldwell 1967) and Izeh plain in Khuzistan (Wright 1979). The same limitation exists in the greater part of northern Iran, Baluchistan in the east and the shorelines of the Persian and Oman Sea in the south. The only extensive work in the Elburz Mountains, northern Iran, is McBurney's excavation (1964) carried out in a large cave called Ke-Aram I. His excavation here produced a large amount of small stone tools categorised as Mousterian type similar to that of the Zagros. The animals hunted here such as cattle, red deer and rhinoceros, reflect forest conditions and so a modern type of climate, perhaps dating to the last interglacial period or to a warm phase of the last glaciation, according to the excavator. However, this claim should be regarded with some reserve until it can be confirmed by means other than faunal remains alone.

All the above indicate the level of our understanding about the Middle Palaeolithic in Iran; therefore it is hard to speak with any confidence about the beginning or end of the Mousterian period in Iran. A reason for this weak point is that there has been no dating other than the sporadic use of radiocarbon dating for which obviously the earliest phase of the Mousterian is far beyond its range. Also there has no been attempt to date the glacial deposits of the Early or Middle Pleistocene to be used as an indication to date artifacts obtained within such deposits. However, by considering an age of 100 Ka for layer D at Shanidar suggested by Solecki (1963) and evidence that implies the Mousterian lasted in the Zagros to about 40 Ka (Hole and Flannery 1967), accepting a duration of 50 or 60 Ka for the Mousterian period of the Zagros would be reasonable, but whether it spread elsewhere in Iran is at present completely unknown.

For the Mousterian in Iran no important skeletal materials have been found to help us to understand much about the biological side of the inhabitants. Thus, the only evidence for the biological characteristics of the human population in this period, at least in the Zagros region, is the available evidence from the Shanidar Cave. The level of earliest occupation in this cave is a thick Mousterian deposit which is characterised by points, flakes, scrapers and several human skeletons (Solecki 1963, 1971). The Shanidar skeletons suggested that the population was Neanderthal in type with large cranial capacities, and massive faces with fairly large brow ridge (Trinkaus 1983). From an examination of the fossilised pollen contained in the earth surrounding these skeletons, it seems that at least one of the bodies was purposely buried with flowers strewn across it (Solecki 1971, but see Gargett 1989 for a different interpretation). This type of attention to burial at least 50 Ka years ago is interesting evidence for human behaviour. If the Shanidar evidence is correct, then we can assume a similar physical and behavioural pattern for the Zagros; however the origin of the Neanderthals in this region in relation to the two evolutionary hypotheses raises problems. It is hard to say at the moment whether these Neanderthals evolved locally from preceding populations or migrated to the region, whether they remained unchanged to the end of the Middle Palaeolithic or had already been replaced by or developed into modern *Homo sapiens*. There is a gap in human skeletal materials from the latest skeleton of Shanidar dated to ca. 44 Ka B.C. to the Holocene time about 9 Ka B.C. The problem cannot be solved without further fieldwork.

The technological side of the Mousterian occupation in Iran also remains problematic. As we have seen, the artifact assemblages are from caves and open sites. There is a strong emphasis on points, side-scrapers, denticulates and borers, but the Levallois method is rarely used. There may be significant differences between assemblages found in caves and those from open-air sites. The Mousterian industry in the Levant consists of scrapers, notched pieces, borers and some burins, and the Levallois method as well as the Acheulian tradition was frequently used. As for the Taurus Mountains there are both similarities and differences with the Zagros sites. The settlements in this zone such as Kizilin and Okuzini (Kayan et al. 1987) are found in caves and open-air sites. The raw material is generally flint and the cores are reduced to their last limits. The characteristics of the assemblages found are disc cores and a great number of thick flakes; common tools are denticulates, notches and scrapers. Some Levallois flakes are present. This indicates that the Levallois method was known but as in the Zagros its use was very limited. Despite the local and internal differences, the similarities of the Zagros and Taurus regions become more obvious when it is compared to the Mediterranean coast. Aspects that seem to differ between the mountains and the coasts are the length to width and width to thickness ratio for the flakes and blades. These ratios show longer and thinner flakes on the Mediterranean coast than in the mountain assemblages (Minzoni-Deroche 1993: 150). A similar Mousterian technological pattern seems to have existed contemporarily elsewhere adjacent to the Iranian Plateau.

The transition from the Lower Palaeolithic to the Middle Palaeolithic in India took place not less than 100 Ka years ago. The assemblages from the two Middle Palaeolithic sites of Patpara and Nakjharkhurd, northern India, indicate that the stone industry appears to follow the pattern observed in Africa (Clark and Williams 1990) and the Levant where the Acheulian bifaces disappear and the flake tool components become abundant. But the typology and technology of the Middle Palaeolithic assemblages from both sites suggest their direct derivation from the preceding Acheulian industry of the region which are characterised by bifaces and core choppers without the Levallois method. The characteristics of the Indian Mousterian technology dated to 40-50 Ka is a flake-based technology (flakes with an inverse retouch) with modified form of the Levallois method (Clark and Williams 1987: 30, Clark 1992: 208).

The Middle Palaeolithic in Central Asia can be seen as a derivative of the Lower Palaeolithic, which is characterised by core choppers and scrapers (for detailed information on the site locations and stone artifacts, see Islamov 1990, Davis et al. 1980). The same pattern is also seen from the cave sites of the Transcaucasian region, where palynological and faunal data indicate a climatic condition drier and more severe than at present after the beginning of the Würm. In this region the first use of cave sites took place in the Mousterian period when the caves became dry and suitable for occupation (Beliaeva 1997: 151). The Mousterian cultural horizon here is recorded in the three caves of Monasheskaya, Barakaevskaya, Autlevskaya and in the Gubskiy rockshelter. The Mousterian layers of these sites were dated as belonging to the Middle Würm and have yielded remains of the open grassland species such as bison, wild horse and Caucasian sheep or goat as well as human remains belonging to a Neanderthal male (Beliaeva 1997: 151-153). The stone assemblage is typically Mousterian, resembling those of adjoining western Asia (the Levant) with its distinctive industries (Lubin 1997: 146) including scrapers of various types and a high frequency of points, denticulated and notched tools, borers and burins.

However, the Middle Palaeolithic assemblages recovered from Iran particularly from the Zagros indicate many aspects of the stone industry in this period. Included are similarities in raw materials, core reduction technology, retouched tool morphology, and other aspects of assemblages (Dibble and Holdaway 1993). The notion of a Zagros Mousterian as a recognisable entity within this region and distinct from other Near Eastern assemblage (particularly those of the Levant) has been widely used for many years (e.g. Hole and Flannery 1967: 155, Smith 1986), and is not discussed here. But of course it should be the subject of continuing discussion and refinement, most particularly with respect to the low frequency of Levallois products in Zagros sites in contrast to their supposedly much higher incidence in Levantine sites (Dibble 1984). The degree of typological homogeneity within and among the Zagros Mousterian assemblages is striking, and appear to exist despite the large region encompassed by this tradition, the differences between sites in elevation and in various environmental setting, and the long period of time that may be involved (Baumler and Speth 1993). Explaining these similarities is not simple matter, and one that is far beyond the descriptive goal of this chapter. For at the heart of this issue lies the complex debate concerning the nature of variability in the Palaeolithic stone tool assemblages, and in particular the degree to which the observed variability is a reflection of style, function, technology. Dibble (1985) has presented data that demonstrate another kind of patterning within the Mousterian of southern France that appears to be related to differences in raw material (see also Roland and Dibble 1990)

In Iran as in adjacent regions it is unclear whether the variability in Middle Palaeolithic stone tool assemblages such as infrequency of the Levallois tradition implies a regional technological tradition and a degree of continuity independent from the west (the Levant) as has been argued (above) or alternatively the Mousterian of Iran has developed as the result of the diffusion of techniques (on the basis of the apparent homogeneity in Mousterian stone tool assemblages particularly in Zagros Mousterian assemblages discussed above) and even people from outside of Iran, possibly from the Levant, Central Asia or India. These are questions which, with such a scanty evidence now available, cannot be answered and require further fieldwork (fig. 8, 9).

5.3 The Upper and Epipalaeolithic; as mentioned earlier in this chapter, archaeologists argue that the transition from the Middle to the Upper Palaeolithic was accompanied by a major change in human life ways including a shift in behavioural patterns, subsistence strategies and stone tool inventories. As far as the Iranian Upper Palaeolithic is concerned, despite the availability of relatively well documented information from Upper Palaeolithic sites in the Zagros as well as information on the palaeoenvironmental conditions of the region (at about 40 Ka) there is no remarkable improvement in our archaeological knowledge to understand this transition in Iran.

The Upper Palaeolithic stages in Iran as Iraq (mainly in the Zagros) is divided into two periods. The first is called Baradostian (the name used by Solecki for layer C at Shanidar), and the second the Zarzian (layer B at Shanidar). The Baradostian industry in the Zagros is based mainly on blades including some microblades. Typologically, it is dominated by burins, scrapers and notched blades, but with no use of the Levallois method. There also heavier implements such as picks, choppers and grinding stones. The radiocarbon dating suggests a date of 33-38 Ka for layer C at Shanidar (Solecki 1963). The Baradostian culture in Iran is seen in the so-called Khorramabad Valley in the three well documented archaeological sites of the Yafteh Cave, Pasangar and Gar-Arjaneh. The Baradostian deposits at these sites contain a greater variety of tool types and evidence, and there was much greater emphasis on the technique of making blades. Characteristics of the Baradostian in these sites, as in Shanidar layer C, are small slender points, backed blades, retouched bladelets, scrapers, and simple and polyhedric burins. Several coarse stones used for grinding ochre were found at Yafteh Cave; they are the first evidence of a ground stone technology that was a pre-requisite for early agriculture. Wild goat seems to have been the main game animal. Ochre was used perhaps for body decoration. Some fragments of human bone covered with ochre were found at one of the sites (Gar-Arjaneh) and some pebbles which may have been polished for ornamentation. On the basis of the Khorramabad evidence Hole and Flannery (1967) saw two phases: an early Baradostian (38 ka-30 ka) and a late Baradostian (30 ka-20 ka), with a progressive reduction in size of the implements and an increase in the microlithic element. This requires confirmation at other sites. However, the dating of the Baradistian sites in the Khorramabad Valley appears to be more critical; if we are reasonably sure of the beginning of the Baradostian, we are far less so about its end. There are at least twenty-two radiocarbon determinations available, all from Shanidar and yafteh Caves, which range from ca. 38 ka or older to ca. 20 ka (although no dates after ca. 25 ka are considered reliable). Thus, we cannot realy say how late the Baradostian survived in the Zagros or whether it lasted later in some areas. It is possible that some sites such as Shanidar Cave were abondoned between ca. 26 ka and 12 ka, (Solecki 1963) when, it will be recalled, the climate in the Zagros was at its coldest and driest (van Zeist and Bottema 1991), but of course occupations may have persisted in other Zagros sites; much depended on local conditions. In the Zagros Mountains the other Baradostian sites are Ghar-i-Khar and Bistiun near Kermanshah (Young and Smith 1966) and Warwasi rockshelter. There may be some Baradostian in the Hulailan Valley of Luristan among the fifteen Upper Palaeolithic sites surveyed but this is not certain (Mortensen 1974). Further south in Fars and Khuzistan some Baradostian sites such as Barmi Shur Cave on Lake Tashk near Shiraz (Piperno 1974), Gavi Cave near the Kur river (Sumner 1977) and sites on the Izeh Plain (Wright 1979) were reported on the basis of only surface collections, while it is by no means unlikely that these occurrences are Baradostian. There are no finds of Baradostian sites in Iran east of the Zagros towards the Caspian shore or the interior plateau. Unlike the Mousterian that is fairly widespread in iran (as already mentioned), it is found from the central Zagros to the Caspian shore and the Afghan border. The early Upper Palaeolithic (Baradostian) that immediately follows it seems to have a much more restricted distribution in Iran, having been found so far only in the western part of the country. Yet the Upper Palaeolithc, as a cultural stage, is traditionally seen as the product of people with grater adaptive powers, who were more expansive geographically with a tendency to fill all zones suitable for hunters and gatherers and to exploit the available resources more intensively than did those of the Middle Palaeolithic (e.g. Mellars 1992). The possible explanations for the restriction of the Baradostian sites can be perhaps due to the prevailing climatic conditions which were more cold and dry out side the Zagros and its slopes that may now have hindered settlement. It can be argued that outside of the Zagros where available cave sites were much rarer the exploitation of available resources would have been affected by environmental factors, and the Baradostian may have been less adaptable to life on the Iranian plateau than were the Middle Palaeolithic groups, particularly if the climatic conditions were more severe. This explanation for the Caspian shore seems to be critical, because the palynological and geomorphological data (see chapter 4) indicate this zone as a very promising territory for hunter and gatherer, but so far no the Baradostian sites have been found here. It is likely that successive fluctuations of sea level have destroyed the sites or buried them deep beneath the modern plain. Or (and this is probably the best answer) the Baradostian beyond the Zagros are still to be found and identified as such. It seems likely that in the non-mountainous regions such as the interior plateau of Iran the Upper Palaeolithic settlements probably consisted of open sites with tents or huts, at least in the colder months. Nothing of this kind is yet known, so whether the absence of Upper Palaeolithic sites in most parts of Iran is due to the paucity of field research or reflects the interior of Iran as a less favourable situation for human occupation remains to be seen.

The other archaeological problem in this respect concerns the transition from the Middle to Upper Palaeolithic in terms of continuity or discontinuity of the local cultural traditions. There is no reliable evidence to indicate a direct transition from Mousterian to Baradostian and no stratigraphic hiatuses are seen between the Middle and Upper Palaeolithic occupations. This situation here is similar to that of ambiguity represented in the Lower to Middle Palaeolithic transition. It is a fact that in Iran there are no traces of an older lithic tradition identifiable as the origin for the Upper Palaeolithic tradition. As mentioned earlier the transition from the Middle to Upper Palaeolithic in the Near East is well seen in the Levantine Palaeolithic sequences at the site of Boker Tachtit. Here there is a transitional industry which differs from the Mousterian industries by diminishing use of the flat unipolar and bipolar Levallois core reduction and appearance of a modern industry including modified blanks for scrapers, burins and the frequent use of prismatic cores (Marks 1983). Some prehistorians (e.g. Marks 1983) explain this transition as functional or technological variations of the local industries with a purely indigenous origin, while others (e.g. Bar-Yosef 1995) prefer to see it as a result of the rapid acculturation, that is its origin may be somewhere outside the region. Whichever explanation is preferred, because this transitional phase seems to be absent in Iran, we have no evidence for such a phenomenon. Furthermore, apart from ambiguity in the lithic industries, other characteristics of the Upper Palaeolithic period such as socio-economic and behavioural patterns are not clear in the Baradostian period of Iran. Ritual or religious behaviour are absent and there is no example of art in the Zagros such as painting, engraving, or sculptures on cave walls or in stone, bone or antler. Beads, pendants and other objects for personal use are very rare. Most importantly, so far, no skeletal remains of the humans who produced the Baradostian artifacts in Iran and Iraq (e.g. the fragments of human bone found at Gar-Arjaneh) have been studied. Thus, as with the Middle Palaeolithic people, whether they evolved from a local ancestor or immigrated to Iran from outside will remain as a basic problem for future research.

The term Epipalaeolithic is used to identify the archaeological periods characterised by microlithic industries. This period in the Levant postdates the Levantine Aurignacian C and predates the pre-pottery Neolithic. In the Zagros this period (from ca. 15 Ka to 8 Ka) falls into two specific phases; one is assigned to the very end of the Upper Palaeolithic and other to the very beginning of the Neolithic. The former is termed Epipalaeolithic or the Zarzian culture (Shanidar layer B2) and the latter is termed proto Neolithic or the Zawi Chemi/Karim Shahir culture (Shanidar layer B1) (R.S. Solecki 1963, Solecki and Solecki 1970, 1982, Hole 1987b). The Zarzian was first excavated in Iraqi Kurdistan at the type site of Zarzi by Garrod in 1928 (Garrod 1930) and since then at Shanidar Cave and Palegawra (Braidwood and Howe 1960).

The Zarzian sites in Iran occupy roughly the same geographical areas as the Baradostian ones. The known sites in the northern Zagros are Gar-i-Khar and Warwasi. In the Khorramabad Valley the uppermost layers of Pasangar produced Zarzian materials (Hole and Flannery 1967). Abundant Zarzian sites have been reported from the Huleilan Valley of Luristan, such as Mar Ruz, Mar Gurgalan Sarab and Ghar-i-Gogel and other additional open-air sites (Mortensen 1974, 1975, 1993). No radio carbon dates were obtained from these sites but the emphasis on geometric microliths suggests the later phase of the Zarzian (Mortensen 1993). A relatively large number of Epipalaeolithic sites have been reported from Fars and Khuzistan. The most important are two rockshelter sites on the shore of the Lake Maharlu near Shiraz (Field 1939); and an open-air site on the shore of the Lake Neyriz (Krinsley 1970). Sumner (1977), on the basis of his surface collections around Marvdasht, has reported some nineteen Epipalaeolithic sites of various forms. The same number of sites of various kinds were also reported by Wright (1979) from the mountainous zone of northeastern Khuzistan. Unfortunately, we know little more about these sites than their stone tools; they are all from surface finds, not excavations, and in the absence of any dating method their absolute date is unknown and their relative age also is uncertain.

The evidence for the Epipalaeolithic occupation of the rest of Iran is more sparse. From the vast region of Baluchistan and Makran coast only one is known (Vita-Finzi and Copeland 1980). The best evidence for the Epipalaeolithic culture outside of the Zagros comes from the three excavated cave sites of the Caspian region. Here, the caves of Belt and Hoto excavated by Coon (1957), and Ali Tepe, excavated by McBurney (1968), all date to 10.05 Ka - 9 Ka and illustrate a different variety of the Epipalaeolithic hunter-gatherer life. The ecosystem here offered abundant food resources of wild plants and wild animals such as cattle, gazelle, equids, Caspian seal, fish and snails. The stone industry at the Belt and Ali Tepe sites is microlithic in type and has a general similarity to the Zarzian of the Zagros with a somewhat local facies (McBurney 1968). How intensively the Epipalaeolithic inhabitants of this part of Iran exploited certain animals and plants which later were domesticated, is an interesting question concerning the problem of origin of agriculture. McBurney (1968) has suggested that there may have been an incipient domestication of goats or sheep and perhaps of wheat or other local grains. Unfortunately, this view point has not been pursued by researchers in favour of the abundant Epipalaeolithic sites found in the Zagros. If the suggested pattern existed here, whether it was a purely indigenous development or was influenced by contemporary developments in the Zagros region is a question which requires further field research. The other problem concerning the Epipalaeolithic of Iran is that at the moment we do not know actually where the Zarzian began and what its origin was. Hole and Flannery (1967: Fig.2) have suggested a time range of ca. 20 Ka to 10 Ka for the Zarzian but the radio carbon dates obtained from Shanidar and Palegawra are limited to the later part of this time range. The Shanidar layer B2 is dated at 10.05± 0.4 Ka and Palegawra has five dates range from ca. 12.05 Ka to 11.01 Ka. Whether it goes back further than the suggested dates is uncertain. It may have even coexisted to some extent with the later Baradostian or, as Hole and Flannery have argued (1967 see also Hole, 1970) on the basis of their work in Luristan, the Zarzian may have developed directly out of the Baradostian ca. 20 Ka. This claim is based on the typological and technological continuities between the late Baradostian and the Zarzian represented at Pasangar. Unfortunately, the absence of any radiocarbon dating for most sites in the Zagros between 25 Ka and 13 Ka prevents further exploration of the issue. Indirect evidence comes from the palaeoenvironmental pattern of the Zagros during this period. There was possibly a very cold and very arid climate with a treeless landscape which would have inhibited the human occupation of the Zagros highlands and adjoining regions (van Zeist and Bottema 1977, 1991). There is a real gap of about ten thousand years in the human occupation that is well seen in Shanidar between the late Baradostian and the earliest

Zarzian. Such a hiatus seems to occur in northern Afghanistan and central Asia under the climatic conditions around 30 Ka to 12 Ka (Davis et al. 1980, Lubin 1992). If it is the case, perhaps the missing earlier Zarzian sites are to be found in the warmer lowland zones of Iran (possibly in the southern parts of the interior plateau) and Iraq (Smith 1986: 29). Evidence for the direct development of the Zarzian cannot be seen from Shanidar, since there is a time gap of 15 Ka between the Baradostian and the Zarzian. But Solecki (1982: 126) believes that in the final stage of the Zarzian sequence in Shanidar there is evidence which encourages the interpretation of a direct development of the Zawi Chemi culture out of the Zarzian. If the above explanation of the Pasangar and Shanidar sites is correct, they suggest a local Zagros sequence from the Baradostian to the Zarzian to Zawi Chemi (from the earlier Upper Palaeolithic to the proto Neolithic). This is an issue which needs much more data before it can be resolved.

In general, to reconstruct the Zarzian we are in a better situation than for previous periods with a fair amount of information. As the environmental data indicate, at about 14 Ka a climatic pattern was established in the Zagros with higher temperature and greater precipitation (see chapter 4). It caused tree growth and diminishing cool steppe type grasses and eventually increasing populations of game animals. The settlement pattern in the Zarzian varies from quite small shelters to large cave sites such as Shanidar. Sites are characteristically located in the valleys of the Zagros Mountains at different altitudes ranging from Shanidar Cave at an elevation of about 750 m to Warwasi at over 1300 m, though possible open-air sites have also been located. All of the sites were chosen for their easy access to available resources. Most of them face south and southeast for good light and warmth (Solecki and

Solecki 1982: 124). The settlement patterns in the Zarzian functionally fall into three hypothetical categories proposed by Hole and Flannery (1967: 163-164). The largest of the three types is a seasonal base camp functioning as living place and activity area. In the Zagros the base camps in the lower mountain valleys were probably occupied during the winter months, and open camps or shelters at higher elevations were used during the summer. The second type are butchering sites. They are generally smaller than the base camps, and their assemblages include butchering and killing tools but they lack the base camp implements. At the Khorramabad sites Hole and Flannery (1967) have found remains of complete sets of bones of wild goats and sheep at the base camp, but not for wild cattle and red deer, which leads to the conclusion that the primary preparation of the large animals took place at the butchering stations and only selected parts were carried to base camps. The same is true for Warwasi where the great representation of teeth with few leg and foot bones in the Zarzian samples suggests that the carrying of carcasses (or at the very least the heads) did occur after the initial preparation at the Warwasi butchering station (Olszewski 1993: 215). The third type are transitory stations acting as a point to look out and search for game. They may also have been used for preparing new tools, hunting small animals or gathering plant foods. In the Khorramabad Valley the Kunji, Yafteh and Garmari caves probably functioned as base camps and Gar Arjaneh and Pasangar as butchering stations.

The Zarzian stone industry is characterised by regular-sized chipped stone artifacts generally smaller than the Baradostian tradition. Blades are frequent and there are also microliths of both non-geometric and geometric forms (especially scalene triangles), microburins, thumbnail scrapers, perforators, backed blades and shouldered points (fig. 12). Obsidian in small quantities is represented from Shanidar, Palegawra and Zarzi (see for further information Garrod 1930, Braidwood 1960, Hole and Flannery 1967, Wahida 1981, Solecki and Solecki 1982).

The subsistence pattern of the Zarzian is based mainly on hunting and gathering. Animal bones excavated from the various sites indicated that animals such as goat, sheep, onager, as well as land snails, fresh water crabs and turtles were hunted frequently. Also various birds including duck, stork and eagle occur (Turnbull and Reed 1974, Turnbull 1975). There is no good evidence for the wide scale use of plant food or cereal utilisation (e.g. from food processing tools such as querns, mullers and so on), although some grinding stones, possible storage pits, and a flint blade with "sickle sheen" on one edge (probably for cutting plants) are present at Shanidar and Ghar-i-Khar (Young and Smith 1966). Pistachio nuts may have been eaten but the consumption of the buckthorn seeds found at the site of Zarzi is not so certain (Wahida 1981).

In the later part of the Epipalaeolithic in the Zagros important changes took place such as semi-permanent and permanent villages, extensive processing of plant food and probably some use of domesticated cereals, some domesticated animals, elaborate burials with grave goods, worked bones, ground stone industry, and so on. Many of these traits indicate more complex socio-economic and technological patterns that lead to the "Neolithic Revolution" in this region. Comparatively few Zagros settlements of the early post-Pleistocene have been described in detail, and the chronology, distribution and internal organisation of the Zagros sites of 9-7 B.C. remain to be fully documented. In general the evidence for this period throughout the Zagros and its adjacent areas is sparse and the settlements are generally quite small. This pattern may reflect sample bias resulting from the considerable alluviation and the recent disturbance and scattering of archaeological remains that were never very large (Hole 1987a: 32-33)(fig. 10–13).

In the Zagros, somewhat later than the Zarzian, several open-air sites have been found on the Iraqi side such as Zawi Chemi Shanidar (Solecki 1981), Karimshahir and M'lefaat (Braidwood and Howe 1960) and one site on the Iranian side, Asiab (Braidwood et al. 1961). These sites have yielded little botanical material and few remains of a variety of wild animals, but a large amount of artifacts including small chipped stone tools as well as heavier chipped and ground stones. Some of these may have been used in clearing woodland and processing plant foods (e.g. querns, pestles, mullers and mortars). In addition to their zoological and artifactual remains, these sites (e.g. Zawi Chemi) have produced evidence of structures in the form of pits and perhaps pit houses (Solecki 1981, Solecki and Solecki 1982). Although the botanical and faunal remains have not yet been analysed, some authors (e.g. Perkins and Daly 1974: 80) suggest that by ca. 8500 B.C. sheep had been brought under the control of inhabitants of Zawi Chemi Shanidar and at the same time Bökönyi (1977) reported for Asiab an early occurrence of domesticated goat.

To summarise, from a review of the Upper Palaeolithic cultural processes in the Zagros region the pattern of a gradual change in stone tools, technology, subsistence and behaviour becomes more clear. It is also clear from this review that during the Palaeolithic there was a slow development of a stone tool technology from the large, multipurpose tools to smaller ones, a development that became more rapid toward the end of the Palaeolithic; also the use of a ground stone technology and of storage pits. Increasing frequency and use of such technologies document the foundation for early agriculture. The use of smaller chipped stone tools or worked microliths in combination with bone and antler hafts was a major innovation at the end of the Upper Palaeolithic. One chipped stone tool that sometimes is found hafted in a bone or antler is a series of flint blades with "sickle sheen". It has been suggested that these implements were used in reaping grains or used to cut some sort of vegetables. Their presence in the late Upper Palaeolithic deposits suggests increasing attention was paid to plant resources and development of technology leading to the subsequent agricultural way of life. The evidence for the Zagros suggests that toward the end of Palaeolithic the tradition of hunting was changed and new methods of obtaining food were developed. The hunting strategy was changed from large mammals to the smaller animals, birds, fish and land snails. Additional sources (particularly plant foods) were more available than game animals, and provided food where the game was not available. In this situation it is probable that some kinds of animals such as sheep and goats were exploited in a manner that conserved their numbers. It could be possible by selective hunting of animals (Flannery 1969: 77-80). Unfortunately, there is no reliable evidence for animal exploitation practised by the Epipalaeolithic inhabitants of the Zagros region, but Bökönyi (1977: 9) has argued for a morphological change between wild and domesticated sheep and goats, some of which were recovered from Asiab. It is reasonable to suppose that goats and sheep were controlled by the inhabitants of Asiab for a long time before such change occurred. Thus, the appearance of the morphological change at the end of the Epipalaeolithic can support the view that man exploited these species systematically during this period.

There are also no archaeobotanical analyses of the Epipalaeolithic sites to indicate the circumstances under which the early cultivation of plants among the foraging groups of the Epipalaeolithic populations developed into the agriculture of the farming groups of the Neolithic. Evidence from the Levant shows that by the end of the Epipalaeolithic (termed Natufian) plants including einkorn and perhaps other cereals and legumes were deliberately cultivated, at least by 9000 B.C. at Mureibit (Moore 1985, van Zeist 1988: 53-55). The Bos Mordeh evidence from Ali Kosh at about 7500 B.C. (Hole 1977b: 24, Hole 1987b: 34) indicates the cultivation of both cereals and pulses. If the view is correct that the inhabitants of the earlier settlements in the Zagros collected the small-seeded legumes not for human consumption, but as a fodder for goats and sheep (Helbaek 1969: 398), so it seems reasonable to argue that, as Hole (1977b) has concluded, such a many sided agricultural and herding system must have had a long history of development, starting with the early Epipalaeolithic populations of the region. As mentioned above, the formative stages of the agricultural development have not been properly documented in Iran even in the relatively well studied areas of the Zagros. In the future those who wish to explain how and why agriculture developed in Iran and its possible relationships to the other regions, will need to turn their attention to identifying more late Pleistocene sites. At the same time an understanding of prevailing environmental conditions during the late Pleistocene as well as recording and analysing of economic and social evidence will better explain the changes in the relationships between man and his environment and changes in social organisation that marked the earliest stages of agricultural development.

The final point in this presentation deals with the future prospects for Palaeolithic archaeology in Iran. Obviously in the face of such scanty primary evidence and such ambiguity in the data now available, we are still a long way from being able to speak with any confidence about processes, patterns and regularities. We are still very much in the pioneering stage of enquiry but unfortunately it is one that has been too long drawn out and even in the future we face stagnation.

We need more information about the spread of *Homo erectus* into Asia, the spread of modern man and evolution of Epipalaeolithic into agricultural societies. We also need a more accurate chronology for Palaeolithic Iran, since we do not know how early humans occupied the land or how long the various cultural periods lasted, or how much continuity there was between. It is not possible to say whether a short or long chronological framework is appropriate. We also need more regional stratigraphic lithic and climatic information throughout Iran and efforts to place the archaeological materials within these contexts. Similarly, more intensive surveys are required throughout the country to fill in the many gaps in our knowledge of the distribution and density of occupation in the various geographical zones and cultural periods, even in the areas which have been well explored. It should be mentioned here that there are many unrecognised blank spots. A study of great importance from the viewpoint of human adaptation would be the analysis of archaeological faunal materials (with several helpful techniques of investigation such as taphonomy) within a single region through the various prehistoric periods. This would establish several factors (1) whether or not there were significant changes in the type and frequency of major game species exploited through time, (2) what age and sex classes were preferred within a species, and (3) how they butchered and how the skeletal residues were disposed of. These investigations would be particularly valuable for understanding the Middle to Upper Palaeolithic change when innovation in technology and social organisation led to greater hunting efficiency and an emphasis on certain game animals. But it is important also for the evaluation of any possible change in hunting strategy and consumption of the Upper Palaeolithic cultures. Although such strategies have been conducted several times in Iran it seems that their primary concern was directed to the morphology of the different species, and what they could tell them about environment, chronology and domestication. But on the question of the interactions between people and animals, no further step has been taken than labelling animals as either wild or domestic, and the people as hunters or herders. At best, a quantified list of the species encountered in a site was provided (below). For instance, the Warwasi (late Baradostian) game animal sample as examined by Trunbull (1975) is consisted of some parts of animals such as *Equus hemonionus*, *Capra aegagrus*, *Ovis orientalis*, *Bos primigenius*, and *Canis lupus* as well as smaller rodent species such as *Meriones* cf. *Persicus*, *Allactaga* sp. *Jerboa*, *Ellobius* cf. *fuscocapillus*, *Ochotana* cf. *rufescens*, and *Lepus* cf. *Capensis*. This sample is composed almost entirely of teeth, with one horn core (*Ovis*) and a few scattered foot bones. The fact that most of the faunal sample here consisting mainly of teeth, with a few leg and foot bones. Since teeth are part of the skull component, the greater representation of these in the Baradostian sample suggest either that transport of carcasses to the rockshelter did in fact occur, with perhaps further transport of meat to other localities after initial butchering at Warwasi. A limited use of the rockshelter might also explain the lack of features in the late Baradostian. In this regard, Hole and Flannery (1967: 163-

164) who define butchering stations as those sites which lack hearths and clearly defined living floors, and which yield few identifiable animal bones, note that, in the Khorramabad Valley of Iran, animal heads and hind were brought to prehistoric butchering stations for further dismemberment and then transport to base camps. Thus, the late Baradostian occupation at Warwasi probably saw the use of the rockshelter as a game outlook and butchering station. Hunters may have passed the time waiting for game by manufacturing hunting implements. The fact that so much of the lithic assemblage reflects heavy reduction suggests that these late Baradostian hunters brought few new sources of raw materials with them each time they reoccupied the rockshelter, relying instead on picking up previously discarded lithic items and reutilising these to manufacture new tools or to resharpen these older tools for new use (intensive reduction of stone raw materials is a pattern found in the Mousterian assemblage from Kunji cave and may indicate that heavy utilisation of existing pieces is a long-term tradition for the Zagros region, see Baumler and Speth 1993). Another example comes from the study of Hesse (1984) on the animal bones to measure the sex and age ratio of the domesticated animals at the site of Gang Dareh Tepe the oldest Neolithic site in Iran. His study showed a controlled cull of goats at this site, in which most males were killed when still juvenile while females lived well into adult life. This sex and age related difference in survival, was assumed a persuasive case for a managed herd under early domestication.

Another study area concerns the analyses of the stone artifacts. Relatively little effort has been invested in detailed stylistic, typological and technological analysis that might enable us to build up local archaeological sequences. The identification of zonal styles which might reflect regional specialisation has similarly been neglected. The problem of the extent to which the local raw materials influence the typology, and particularly technology, in the earlier periods of the Palaeolithic, has been little discussed in Iran. However it seems more reasonable to make use of some technical analyses such as use-wear on stone tools for the purpose of understanding their function as a guide or target in future work. Finally we must note the threat posed by the problem of site destruction in Iran. Since there are no comprehensive maps of the distribution of Palaeolithic sites, the quantity of destruction, and the severity and extent of loss are still completely unknown, but it seems to be a fact that a large number of Palaeolithic sites have been drowned by increasing hydrological projects or destroyed by agricultural or other operations. Economic projects in general, and treasure hunting in particular, are threating the sites. Although Palaeolithic sites receive much less attention from treasure hunters than sites of later periods, the loss is no less serious.

In summary, Palaeolithic research to study fossilised remains of our human ancestors and their associated materials is being done in all the inhabited continents. Clearly, the pursuit of knowledge concerning the processes of human evolution and the longest period of the human cultural development needs to be a co-operative venture shared among scientists of all nations. However, in the Near East there are some important imbalances among the countries such as Iran in contributing to this issue. Several lines of possible action to overcome imbalances occurred in Palaeolithic research in Iran will be: (1) recruitment and training of young scientists; (2) museum and research facilities; (3) educating the public and informing government. It is clear that these lines of action are closely interlinked; for example, training cannot be successful unless the public, the related organisations, and the government become aware of and interested in Palaeolithic materials and the achievements of research. Similarly, training and educating the public cannot be possible if no encouragement by government and suitable facilities are available. It is quite important that there should be developed a sense of partnership linking scientists and the well-established traditions of research from the developed countries with those in Iran, where local involvement is just beginning. It is also a fact that during the past decades the co-operation of Iranians within the joint expeditions has often been very low, or restricted to unscientific roles. What is important to insist on for the future development, is a systematical plan to help guest scientists in this country to give classes, lectures, and providing information for newspapers, exhibitions and possibly field schools. At the same time the scientific exchange between the foreign scholars and Iranians should be encouraged. It would be beneficial if scholars from developed countries and Iran could visit each other's institutions and participate in one another's field research projects. This would provide an opportunity to Iranian organisations to supplement facilities and also help in broadening the level of knowledge.

In Iran doubtless there are now very good political, cultural and economic conditions for archaeological research, and within these contexts promoting Palaeolithic archaeology is the responsibility of Iranian scholar themselves. The development of an indigenous professionalism in Iran must be made by a greater popular appreciation of prehistory in general and of Palaeolithic archaeology in particular; to do so, several contributions from organisations such as archaeological services and academic centres can facilitate this. Offering some general information on the Palaeolithic period for the pre-university levels and creating an independent personality for Palaeolithic archaeology in the universities, where at the moment the Palaeolithic is not taught and studied (fig. 14, 15), can be an effective policy for future development. At the same time a great emphasis should be placed on training the needed professional staff as well as to plan more comprehensive approaches to the solution of certain specific problems. In terms of public interest, more organised publicity would also increase public awareness about the Palaeolithic as well as giving rise to specific questions about human cultural and physical evolution within society.

For a better understanding of what Iran's role and special character was in the Palaeolithic, when it formed one piece in the mosaic of widely varying Palaeolithic cultures throughout Asia, there can be no substitute for development programmes of multi-disciplinary fieldwork in the country.

Chapter 6

Towards a Real Appreciation of Archaeology in Iran through Managing its Archaeological Heritage

Theory, Methodology, Implementation

1. Introduction

From a review of the archaeological literature we can agree that the archaeological heritage is:

(1) a finite non-renewable resource (Darvill 1987: 11, McGimsey 1972: 24, Cleere 1984: 127);

(2) a matter of public concern (McGimsey 1972: 5, Fowler 1982: 1);

(3) governed by legislation (McGimsey and Davis 1977: 9, Fowler 1982: 4, Schiffer and Gumerman 1977: 3, Darvill 1987: 32);

(4) subject to assessment for its archaeological significance (Cleere 1984: 127, Dunnell 1984, Schaafsma 1989).

Thus, from the above description AHM can be conceived as a process or a set of practice aimed at the management of cultural heritage. In this process AHM relies on (a) its formulised practice; (b) on legislative and governmental policy and (c) on particular issues such as "who own the past", reburial issues, tourism, issues on right of access to archaeological sites, etc.

In the 1990s some authors have considered that the previous definitions of AHM to have been descriptive and to have tended to avoid placing AHM in either a disciplinary or theoretical context, resulting in a separation of AHM from archaeology and archaeological research (e.g. Carman 1991, Smith 1993). In the new definition AHM is regarded to be much more than the previous definition, and fulfills other roles and functions. AHM is conceived as fulfilling a cultural and socio-political role in societies; in cultural terms AHM is used to establish and maintain cultural and other identities. In socio-political terms, with the institutionalisation of archaeology, archaeological knowledge plays a role in State discourses to arbitrate on debates over cultural identities. Thus AHM archaeology as a discipline has become directly engaged with cultural and political debate and conflict (Smith 1993, 1994).

2. A history of development of AHM

Archaeological heritage management may be assumed to have begun with the Swedish Royal Proclamation of 1666, declaring all objects from antiquity to be the property of the Crown which for the first time acknowledged the importance of the remains of the past within a national concept (Kristiansen 1989). Juridical control of ancient remains was a matter which was encouraged by the some States of Europe during the 18th century and Denmark developed this concept in the first decade of the 19th century (Kristiansen 1984). By the end of the century the ancient monuments of most of the western countries were covered by protective legislation; for example the UK passed its first Ancient Monuments Protection Act in 1882 (Cleere 1984) and the U.S.A enacted its first antiquities law in 1906 (McGimsey and Davis 1984).

The end of World War II saw the beginning of archaeological heritage management as an integral component of social and economic planning, and the concept of 'rescue' or 'salvage' archaeology in advance of development or re-development became an important subject in archaeology. Post-war reconstruction and the world-wide economic development of the later 1950s and 1960s was accompanied by the coming to nationhood of many colonial regions particularly in Asia and Africa. Since then economic development has become the dominant issue in both the developed and developing countries, affecting natural environment, ancient landscapes, and archaeological sites by extending highways, resource exploitation, and other landscape practices. At the same time while the growth of tourism became a major industry, many coastlines were submerged under construction development, and visitor pressure caused some detrimental effects such as physical attrition in archaeological sites like Stonehenge (see Chippindale 1983, Golding 1989).

In the developing countries where the shortcomings of protection legislation were apparent the threats were more severe than in the developed countries. In these countries large-scale programmes of industrialisation were put into effect without any regard for their impact on the natural and historical environment. In Brazil for instance much of the Amazon jungle has been destroyed in recent years, and heavy mining has disturbed large areas of natural and historical landscapes (Costa et al. 1988). At the same time there was a population growth throughout the Third World countries, and a serious problem of treasure hunting and illicit trade, with international financial support, created a further source of threat to the archaeological heritage. Nevertheless, the development pressure of the 1960s resulted in an awareness of the environment which instigated relevant reactions, most of them by the developed countries or official organisations. Since the 1970s, therefore, the impact of economic development on the natural and cultural environment became a major issue to be debated in such countries. The UN Environmental Programme (UNPE) was established and funds became available to protect the impact of development; even so in some countries such as the United States the environmental protection programmes were expanded to protect archaeological heritage as well. However, in most countries (e.g. West African countries) the importance of archaeological conservation was largely overlooked and the antiquities services stood apart from other governmental environmental protection agencies (Okpoko 1988). By this time most European countries had enacted new protective legislation to replace outdated laws; this led to an increase in personnel to carry out the necessary work of recording, designation and excavation, as well as causing an awareness of the need for establishing philosophical and methodological frameworks by which the academic and social relationship and obligation can be identified.

The concept of Cultural Resource Management (CRM), public archaeology and conservation archaeology were developed in the United States over the past decades. Since the appearance of the Archaeological and Historical Conservation Act in 1974 there has been a large amount of investigation, recording, and conservation of both prehistoric and historic sites. The term CRM is thus used for official involvement for archaeological purposes. Schiffer and Gumerman (1977b: 2) have defined the business of CRM as the total preservation of scarce non-renewable resources. The management of cultural resources involves determining the least loss of information concerning past lifeways; the emphasis is upon planning research and conservation policies (see also Fowler 1982). Under this system the public interest and values of cultural heritage are thought to override matters of private concern.

3. Philosophy behind the discipline

In archaeological terms the past as a major symbolic resource can be used as a means by certain authorities to legitimise their nationalistic, ideological, or chauvinistic purposes. In such cases identification is restricted to the elements that have a direct significance to such purposes. Thus the identity of the past and present is often closely associated through special sites and the tangible remains of past human activities such as archaeological materials or intangible relics of human thought symbolised, for instance, by ritual sites (Fowler 1987; see also Kristiansen 1989, 1993). A great part of the development of museums is concerned not simply with financial gain but is motivated by a search for the roots of living civilisations. This use of the archaeological heritage, to establish cultural or national identity, is best seen from the nations established after the end of colonialism in the post-war period. An example is that of the former British colonial territory of Southern Rhodesia which took its name from its greatest archaeological monument, Zimbabwe. Another example is Mexico which, since the time of achieving its independence, has made extensive use of its pre-colonial antiquities to consolidate the sense of cultural and political identity (Trigger 1989: 130-134, 180). For other examples over the world see Gathercole and Lowenthal (1990), Kohl and Fawcett (1995).

The educational value of the archaeological heritage is an important issue in heritage management policy. The obvious way of encouraging popular support is through public education. It is generally argued in teaching history or related subjects. The use of archaeological elements can stimulate the imagination of the child more effectively than any amount of formal teaching or reading. There are many ways of implementing public education programmes in archaeology ranging from a simple display of archaeological material, to encouraging visits to sites which have been restored, or are still under excavation.. Nowadays, managing the archaeological heritage for the purpose of public education is regarded as being an incomparable strategy for increasing public awareness, and it is widely used in all parts of the world (see also Stone 1994).

The role of archaeological heritage in tourism is of growing importance in heritage management. Mass tourism is a feature of modern economic life, and it is a big business both nationally and internationally. In Britain, for instance, by 1994 it is predicted that 167 million visits (by residents and overseas visitors) to designated heritage sites will generate £24 billion of expenditure. Wales in 1989 attracted about 7 million visitors of which 4.3 million visits are recorded by paying visitors to archaeological sites, galleries, and museums (Carr 1994: 55-56).

Another important feature of heritage management is the protection of the database for the academic discipline of archaeology. A database contains a vast amount of archaeological information collected through field survey and documentary research. This sort of information can be used in heritage management policy for the following purposes; (1) conservationists and planning archaeologists are concerned with protecting the archaeological heritage from being destroyed; (2) researchers are concerned with constructing images of the past and interpreting the remains of past human activities in a way that is understandable and interesting for people; (3) educationalists are responsible for translating and transmitting these constructed images to the public from the nursery school to further education, integrating it into informal education (Fraser 1993).

4. General principles of AHM

Given the differing constraints under which archaeological management organisations have to work, it is not an easy task to outline general principles; however there is agreement on the following areas:

The first step in the identification and management of archaeological heritage is to produce an integrative management process to structure the inventory, evaluation and protection. This process can be started with the formulation of an archaeological heritage overview in the area concerned. The process continues by undertaking further inventory through assessing previously recorded sites as well as surveying for new sites. In the areas where land-altering factors may impact an archaeological heritage, this process can outline additional research required to evaluate the importance of heritage and propose preservation and protection programmes (see also Cleere 1989).

Another task of AHM is the assessment of the values of the archaeological heritage. AHM involves many judgements and decisions. Many decisions in AHM concern specific archaeological questions such as: is a site of sufficient importance to qualify for legal excavation? Should a development project be allowed to continue and destroy archaeological remains? Which sites have a priority to gain allocation of funds for excavation, preservation and protection? Do we know enough about the remains to make the required decision or is further field evaluation necessary? etc.

A central problem for several years in AHM has been how the significance of archaeological heritage is to be established, and which parts of the archaeological heritage are of significance and need to be selected for the management processes such as recording and protecting (Schaafsma 1989, Startin 1993, 1995). In some countries the procedures for determining significance are not so clear; for instance, the 1966 Historic Preservation Act of America considered only the historic monuments to be significant (Fowler 1982). Sometimes they are affected by economic and political considerations or by non-scientific standards. From this perspective it means that some things will have to be discarded. Under these circumstances the process is to identify those few resources and then ignore the rest. The rest are regarded as presumably insignificant. Numerous attempts, especially on the theoretical side, beginning in the 1970s, resulted in recognition that all archaeological materials are important for their potential contribution to scientific research. Dunnell and Dancey (1978: 2-3) identified two types of significance, humanistic and scientific, for all of the archaeological heritage (resources). The humanistic significance is a matter of cultural heritage and can be evaluated in terms of the specific legislation criteria of significance. The scientific significance relates to information in the archaeological records, and the significance of a specific archaeological heritage is its potential for providing answers to relevant research questions. Thus significance is not an absolute concept but a mechanism for structuring inquiry about cultural heritage.

At the same time, the concept of valuing the archaeological heritage is central to much of the literature concerning the management of archaeology. This is generally studied for assessment of the significance of the individual components of archaeological heritage. Green (1980: 2) makes a useful distinction between value and significance. The value of a cultural resource can be assessed in two ways: (1) whether its character is such that *in situ* preservation or adaptive reuse are merited, and (2) whether it has demonstrable scientific value. In this view value becomes a function of significance; the value of a resource is its potential of yielding data to confirm reputed significance versus *in situ* preservation. For the other specific meaning of value and significance in the American CRM see Davis (1989: 97), Schiffer and Gumerman (1977b: 31).

Concern with the concept of value, particularly in Britain, is now turning to the consideration of how that value is ascribed to archaeological remains, accepting that value is not inherent in archaeological material, but is ascribed to it through social processes. The question becomes, then, not 'what value does this have?', but "what kind of social value does it represent and where does this come from?" In spite of a common agreement on valuation, there exists a wide range of different methodologies and terminology to understand valuation. Carman, for instance, uses the term 'value gradients' (1995, 1996) and considers value as a dynamic process which is composed of two elements: the type of value, and its quality. For Carman the process of valuation is a real social fact and comes at the end of a social process of selection. Darvill (1995a) considers value to be real and to derive from a combination of the expert knowledge of the archaeologists and private interest. There is also a debate concerning the measurement of the significance of archaeological remains. Darvill emphasises the role of the concept of importance in assessing archaeological remains. Startin looks at the method for identifying material of national importance in relation to legal and other forms of protection (Darvill et al. 1987, Startin 1993).

The word 'assessment' is generally used to give value where the importance of archaeological remains is concerned. The basic reason why archaeological remains are important is for the information they contain about the past. They are fragile and non-renewable; each site contains unique information that can be lost forever unless recorded. In the AHM literature this can be termed 'academic value', because the value itself entails examination and interpretation of, for instance, totally buried sites. There are also other values; visible sites or landscapes form an important visual component, and contribute to the aesthetic values of remains. They also provide a direct educational resource and contribute to the recreational activities of modern society. Many archaeological sites also have a symbolic value for the past, or because they were intentionally created as monuments.

Principally, in recent years there have been attempts to standardise and develop a series of value criteria for archaeological remains, of which three main value systems can be identified: they are characterised as use value, option value and existence value. Their definition is based on differences in attitudinal and interest based orientation (Darvill 1995a).

The attitudinal orientation of use value is based on a number of standards and expectations of academic and scientific requirements such as archaeological and scientific research, education, recreation and tourism, symbolic representation, legitimate of activities, economic gain, and so on.

Option value concerns the idea that we have to maintain some of the resource in a virginal and unexploited state because they are not important at present but they may be in the future. It is recognised that there will always be new questions about the past to be addressed, and there will be new techniques and methodologies to investigate the past. The attitudinal orientation of this value set is based on humanistic behaviour assuming that the future will be better than present.

The existence value concerns the psychological behaviour of people interested in an impressive past. They represent their feeling of belonging to the past by having periodic festivals, celebrations, and special occasions (Fowler 1992: 44-52).

At present the main preferred option of protectionists and archaeological heritage managers concerns option value and existence value. Use value needs appropriate considerations since academic knowledge of the past always needs fresh data. There can be more important uses of space than the preservation of buried remains, and there are always new philosophies in archaeology and AHM practices to be developed through further research. However there remains an assumption that something can be measured in value terms by appropriate methods. The precise relationship between ancient material which undoubtedly exists in a physical form and the remains which can only be identified as "archaeological" as a result of social process will become the great area of debate in the future.

A challengeable area in evaluating the archaeological resource concerns the site based characteristic of the archaeological resource where the legislation mechanism of recording values such a resource as having national or archaeological importance. This means that the typical definition of archaeological sites sees them as a series of spatially bounded entities, and therefore the space between archaeological sites is assumed to be no archaeological value. Recently a number of developments within archaeological thinking has highlighted this issue. The growth of non-site archaeology (e.g. Foley 1981, Dunnell and Dancey 1983, Shennan 1985) has criticised the site based notion in regional analyses. Non-site based archaeology recognises the archaeological site as a artificial construction, and places the emphasis on archaeological remains revealed from survey and on the issues such as sampling which arise from the use of this evidence (see also chapter 3). There has also been an increasing interest in the concept of landscape (e.g. Wagstaff 1987) that incorporates the spatial manifestation of the relation between humans and their environments (Crumley and Marquardt 1990: 73). In this regard landscape archaeology aims to study the formation and transformation processes of the environment caused by either natural or human agencies, and to explore the relationship between the two. Thus, the notion of site based archaeological value in areas where a set of discrete components exists can be seen to be in conflict both with the non-site based methodology for regional analysis, and with the continuity which is embodied in the idea of landscape. This is possible only through considering the archaeological resource as a spatially continuous variable (Kent 1990: 1, Kroll and Price 1991: 1-3, Startin 1995, Wheatley 1995: 171).

Another significant management task is to determine the impact of land-use planning on the archaeological heritage (Macinnes 1993). In some developed countries there is legislation that all planning decisions should be reviewed in advance to determine their impact on the heritage. For most land-use planning, this means that archaeological heritage managers must attempt to devise possible ways for a project to avoid, or minimally damage the archaeological heritage within the planning area. It is clear that any landscape planning disturbs the human imprints, balances of biological species, and aesthetic qualities of the landscapes through altering their physical forms. There is generally a trend to conserve specific sites and monuments because of their historical and aesthetic importance. What is generally forgotten by archaeologists is the preservation of ecofactual evidence of an ancient landscape. In many countries the old fashioned notion of the single site constitutes the only legal system of protection; the alternative is the currently established notion of the conservation area practiced in some countries (e.g. Planning Policy Guidance Note 16, in Britain) through which the monuments are considered in relation to each other and to the landscape of which they form a part. In this respect, the AHM policies should be integrated into a conservation policy that covers every aspect of environmental heritage protection including wildlife landscape, coastal protection, and much more (Kristiansen 1984).

5. The kinds of threat and conservation policy

As mentioned above, what must be preserved depends on the values and research aims of the present. It is more obvious that not all archaeological sites and archaeological heritage can be preserved for the immediate future because of the unavoidable threats from natural and human agencies. In such cases the application of rescue or salvage archaeology to record archaeological remains in advance of the destruction is a common response to the endangered sites. There are two major categories of destruction: those of a natural origin; and those associated with human activities on the landscape. Natural agents include the activities of various plants, animals and erosive actions (winds, water and temperature) which affect all archaeological heritage in archaeological contexts. For discussion and description of these processes as they relate to archaeological sites see Schiffer (1987). Human-caused destruction include:

(1) destruction by large scale development projects by which the earth's surface is now being exploited for the commercial and industrial purposes more extensively than ever before;

(2) destruction by mechanised agriculture; the most extensive damage to archaeological sites is agricultural intensification. Though it is slow it is just as destructive. Mechanical ploughing penetrates below the surface and causes considerable damage to buried remains. In other areas forest plantation and tree roots are destroying sites and monuments. Elsewhere the extensive clearance of woodlands is transforming the nature of the environment so that land is being eroded and ecofacts are being lost. In such cases effective management depends not only on legislation but also on the designation of methods to reduce damage, and to the effective protection of the remains (see also Nickens 1991);

(3) destruction by vandalism and looting; the deliberate destruction of archaeological sites caused by looting and the site vandalism constitutes one of the most serious threats to the archaeological heritage. The problem is world-wide including all archaeological heritage; nevertheless the problem of vandalism is not new. Various Roman Emperors issued edicts to protect monuments; similar edicts or laws were issued by various European countries from the 16th century. The problem of protecting the archaeological heritage was exacerbated in the last century by the development of the great museums in the West. To fill these great centres the archaeological heritage of many nations were often illegally exported. It was only from the 1970s that UNESCO passed a convention to prohibit and prevent

the illicit import and export of the cultural heritage. At the same time another international development was the decision of the International Council of Museums (ICOM) to avoid acquiring artifacts without a reliable provenance (Björnstad 1989). The scale of the problem varies from one country to another according to the protective legislation, public control, level of living conditions, and the quality of land ownership. In some countries, the United States for instance, the problem is complicated by the existence of sites on private land, so that the commercial exploitation of sites is often completely legal and sometimes the exploitation by treasure hunting is carried out with the assistance of consulting archaeologists and CRM staffs (Elia 1992). In some large countries (e.g. Iran) where the exploitation of archaeological heritage even on private land is illegal, it is impossible to ensure the protection of the heritage scattered over thousands of square kilometres.

Fortunately, nowadays, all nations over the world are making anti-looting efforts a priority and are taking steps to overcome this problem, through more rigorous law enforcement, public information, and various relevant actions provided by national and international acts (see, for example, O'Keefe and Prott 1984, McManamon 1991, Hutt et al. 1992, Cleere 1993).

6. Presentation of archaeological heritage

The presentation of archaeological heritage to the general public is an essential method of promoting and understanding of the origin and development of modern societies. At the same time it is the most important means of promoting an understanding of its protection. The presentation strategy can include various techniques. These include permanent and temporary exhibitions, audio-visual presentation, demonstration, display panels, guided walk, and talks and leaflets.

The decision about which technique to use should be determined by considerations such as what is being presented for whom and for what purposes. Archaeological heritage can be presented in many way.

Many historical sites provide a demonstration of skills, crafts and activities from the period concerned. The most positive aspect of demonstration is the opportunity for visitors to become familiar with aspects of the past lifeways. The demonstration also helps to perpetuate knowledge which otherwise would be lost.

On-site presentation is an effective means of popularisation. The main objectives of on-site presentation can be: (1) improving access to the archaeological site whilst protecting the most sensitive and fragile areas of the site; (2) increasing public awareness of the historical and cultural dimension of the area; (3) involving a wide range of organisations, groups, and individuals in the protection of archaeological heritage; (4) promoting environmental and archaeological education by using technical means; and (5) providing publicity and public relation support (see also Stanley Price 1990).

Archaeological museums have an important role in the management of archaeological heritage and in the presentation of these materials in a wide range of display and interpretive projects aimed to entertain, educate and enlighten. In recent years the attitudes of museums have changed from the traditional enormous accumulation of luxury finds, to the exhibition of finds for interpretive purposes, imaginative displays of finds in context, and a reconstruction of archaeological heritage. It is argued that different techniques of exhibition in museums stimulate different kinds of understanding. The arrangement of finds within a strong axial structure, with little space between display units and a predetermined route for moving visitors, helps the relationship to be understood better than the structures with multiple circulation routes, with each display unit forming an independent aspect of knowledge (Pearce 1993).

Local museums play an important role in children's cultural education and in public awareness, by making use of artifacts and ethnographic materials. By using audio-visual instruments aspects of people's past can be demonstrated, and children encouraged to acquire knowledge.

In recent years *in situ* presentation of archaeological materials to enlighten the public through various excavation programmes and reconstructed archaeological sites has seen considerable efforts in various countries, for example, the Imperial Tomb at Xian in China or the Jorvik Viking Centre at York in Britain. The latter is playing an important role not only in presenting a particular excavation and explaining the sequence of archaeological discovery in an imaginative way to the public but the messages are represented within an enjoyable and dynamic atmosphere (Addyman 1990).

Popularising archaeology through media and archaeological publications has found an important place in heritage management. Though in most countries there are large numbers of archaeological reports, archaeologists often make little effort to translate dry and technical reports into popular accounts, or making their works comprehensible to the people who are ultimately paying the programme's expenses. On the other hand information is made available through publication of the results. This may not take place until long after the excavation has been completed, since there are often many specialists whose work has to be co-ordinated and whose combined findings have to be analysed. Nevertheless, it has been claimed that in

Britain, for instance, up to 60 percent of modern excavations remain unpublished after 10 years (Renfrew and Bahn 1991: 481). There are some indications that this situation is improving and archaeological information is now becoming available at least in the developed countries through publishing books and magazines as well as brochures and booklets on the more general topics of archaeology (see Canouts 1992 for detail).

The role of other media such as television and radio in this way by providing news, film and archaeological programmes is more important and more effective.

7. History of development of legislation control

Throughout the world the protection and preservation of archaeological remains by legislative control has long been recognised. The earliest laws to protect ancient monuments date back to ancient times, and were concerned with tomb-robbing, linked with religious sanctions, such as that against the grave robbers of the Pharaonic Tombs or the Royal Tombs of Ur (Woolley 1953: 91-93, Daniel 1975). However, the limited legislative acts from ancient times did not establish any important tradition in Europe. The first stage to protect archaeological heritage in the earliest European legislation was concerned with the preventing vandalism, intentional destruction and the importing of finds. In 1462 Pope Pius II ordered the protection of the ancient monuments of Rome, and a Royal Proclamation of 1666 forbade the destruction of ancient monuments in Sweden (O'Keefe and Prott 1984: 34). Considering the remains of the past as a tangible manifestation of human achievements and national cultural identity as expressed in AHM terms is a recent phenomenon. Most European countries took their first steps in this direction in the late 19th century largely as a result of the development of the modern scientific approach to archaeology and an appreciation of value of indigenous cultures (not simply classical civilisation). Outside Europe the establishment of legislation and organisational institutions for protection or preservation purposes was generally later and varied even more in content. Particularly in Africa and Asia, for instance, with the expiring of the colonial Empires in the years following World War II and the creation of the new nation states, a new generation of antiquities protection legislation was born. The role of cultural heritage in the establishment of cultural identity is a fundamental one, since it provides a base by which the proof of a distinct nationhood can be possible. As a reflection of this national feeling, many of the new states enacted legislation to control all the heritage of the past within their countries, especially a substantial control over the export of cultural material, vandalism, and destruction of national antiquities. It would be impossible in this chapter to provide a comprehensive overview of the developmental process of the issue over the world. There has been a growing literature concerning this field both regionally and internationally; more references can be found in O'Keefe and Prott (1984), Prott and O'Keefe (1989), O'Keeffe (1993), Cleere (1993).

Since the second section of this chapter deals with current situation of AHM in Iran, here, only a brief review is made on the development of the field in the Near East to see how the legislation system of Iran was developed within this context.

The greater part of the Near East was controlled by the Ottoman Empire until the First World War. The usual practice was to obtain a permit from the Sultan allowing the collection and removal of antiquities. Under this system Lord Elgin removed marbles from the Acropolis in Athens in 1799, Layard and Botta removed the Assyrian sculptures from the Tells of Mesopotamia between 1843 and 1851

(Lloyd 1980: 98-100), and numerous items were removed by Schliemann from his excavation at Troy from 1870 to 1890. In Turkey in 1874 the Antiquity Regulation brought all archaeological excavation in the Empire under control so that foreign researchers could not longer ravage and remove from the Empire what they found, but instead had to leave one-third of their discoveries to the State. At the same time the National Museum and a school to train Ottoman archaeologists and museum specialists were established. The Director of Museums permitted the British Museum's excavation at Kuyunjik and obliged them only to present to the museum copies of their archaeological publications and casts of Assyrian reliefs (Lloyd 1980: 170). After the First World War new legislation replaced the previous Ottoman law through which excavations and antiquity exports were allowed only with the approval of the government, and objects resulting from excavations were to be divided between the excavator and the government in a fixed proportion.

The situation in Iraq until 1917 was to some extent the same as Turkey. In this year Britain occupied Iraq and a British woman, Gertrude Bell, became the first Director of Antiquities and she established the first museum in Iraq. In 1924 a law was passed to control the conduct of excavations. This law reflected standards of contemporary archaeology and forced expeditions to use the most improved and up-to-date methods. According to this law, although all finds were in the first place the property of the State, at the end of work, the expeditions were given the right to select a number of objects in recompense for their pain and expense. The Antiquity Law of 1936 limited the right of foreign excavators to a share of the removable finds. The amendments of 1974 and 1975 have broadened the previous law and provided a total prohibition of export. Iraq has always had a large number of foreign excavation teams. In recent years there has also been increased co-operation between the Iraqi antiquities authorities and foreign expeditions for rescue operations such as the Hamrin and Haditha projects (see also Lloyd 1980, Masry 1981: 233).

Lebanon and Syria, as French mandates, applied the first antiquities legislation created by the French administration. The regulation was renewed in 1947; this was a complete piece of legislation on the French pattern, and provided for the classification of cultural property of special significance. It also provided a crucial control on excavation and the trading of antiquities. The current legislation in both countries is based on the older legislation; they have strengthened the provision regarding state ownership, licensing excavations and trading antiquities.

In Palestine (modern Israel and Jordan) the situation was similar to that of Lebanon and Syria. Britain was responsible for the mandate of Palestine after the First World War, and introduced an administrative regulation known as Antiquity Ordinance. Current legislation in Israel passed in 1978 has some excellent provision on site protection and underwater cultural heritage. Jordanian legislation, passed in 1975, has made provision such as the requirement of the logistic information for issuing excavation licences and provisions on the safety of the missions (O'Keefe and Prott 1984: 50).

Egypt, because of its visible monuments, has long attracted European travellers, from the 16th century. Many excavations were carried out during the 18th century and, as in Mesopotamia, a large number of excavated finds found their routes to western museums. The first regulation to protect the Egyptian archaeological heritage was created by French excavator "Mariette" who established an Egyptian

Service of Antiquities and Egyptian National Museum in 1858. In 1884 Maspero, head of the French Institute in Cairo, encouraged the Egyptian Government to allow the export of some part of the finds by excavators, and this resulted in an enthusiasm for funding of excavations in Egypt by various European institutions (Drower 1982: 14, 33). In 1889 the British Egypt Exploration Society carried out archaeological surveys in Egypt and recorded a great number of archaeological monuments. The current legislation in Egypt, enacted in 1951, uses a system of legislation similar to that of the French system. According to this act no registered antiquities can be exported, finds must be reported and all excavation must be licensed.

Archaeology in the countries of the Arabian Peninsula started very much later than in other Near Eastern countries. Antiquities legislation in these countries was adopted from other adjacent regions, particularly from Syria, in 1970.

In Iran prior to 1927 archaeology was exclusively under the control of France (see chapter 1 for details). The first Iranian antiquities law passed in 1930 provided protection over archaeological monuments. In this legislation two kinds of excavation were defined: scientific excavation for the purpose of archaeological research required special licence, and excavation for commercial exploitation purposes was permitted only on unregistered sites. According to this law all finds from scientific and commercial excavations (except 10 selected items) were the property of the excavators. The amendments of 1968 and 1973 have broadened the previous law and provided a restriction on commercial excavations, illegal excavations and antiquities exports, as well as protecting national heritage on private property (Cultural Heritage Organisation 1989: 37, 50, 55; Negahban 1997:

39-41). For a short time after the beginning of the Islamic Revolution in Iran in 1979, until the establishment of new organisations in 1985, archaeological heritage remained in an uncontrolled position in which damage to sites reached its maximum. In this year the Parliament passed a law providing the protection of the State on both national and private property, all clandestine excavation became illegal, as well as the export of relics. Only scientific institutions are authorised to do fieldwork. According to this law a new organisation known as the 'Cultural Heritage Organisation' was established as a centre to manage all archaeological activities throughout the country.

8. Development of international legislation

At the international level UNESCO (1985) has responsibility for a series of important recommendations and conventions such as the Convention for the Protection of Cultural Property in the event of Armed Conflicts (The Hague Convention 1954), the Convention for the Prohibiting and Preventing the Illicit Import, Export and Transfer of Cultural Property (1970), and the Convention for the Protection of the World Cultural and Natural Heritage (1972). UNESCO has run a number of major international campaigns largely financed by contributions from Member States; these include: the campaign in Nubia in advance of the completion of the Asad Dam; the restoration of temples at Borobodur (Indonesia) and in Katmandhu (Nepal); the excavation at Carthage (Tunisia) as well as protecting or repairing major archaeological sites over the world such as the Egyptian Pyramids (Cleere 1993). UNESCO has also been active in providing substantial material support for large national projects and in supplying experts to help in various ways with smaller projects. There has also been a series of recommendations concerning AHM issued by UNESCO including: Principles Applicable to Archaeological Excavation (1959); Preservation of Endangered Cultural Heritage (1968); Exchange of Cultural Property (1976); Protection of Moveable Cultural Heritage (1978).

In 1985 ICOMOS (International Council on Monuments and Sites) created an International Committee on Archaeological Heritage Management (ICAHM). ICAHM (1990) identified the need for an international Charter to provide the philosophical basis for protection and heritage management. This Charter was ratified by ICOMOS in Lausanne in 1990 (ICOMOS 1990). The Charter defines the professional standards and goals for AHM in fields such as protection policies, legislation and economy, fieldwork, maintenance and conservation, professional qualification, etc.

Another international body which has been active in creating rules of international law is the Council of Europe. The European Cultural Convention of 1954 established the concept of a European cultural heritage, and the Convention of 1969 covered clandestine excavations. In 1992, 20 European States signed the European Convention on the Protection of the Archaeological Heritage to replace the original Convention of 1969. The Revised Convention, through making a comprehensive definition of archaeological heritage, stresses the value of the archaeological heritage as a source of European culture and as an instrument for scientific study. The most important fields to be covered by this Convention are: protection and conservation, scientific publication and education, protection of underwater heritage, scientific exchange of experiences and experts between States, legal acquisition of finds by state museums, etc (O'Keefe 1993).

9. Archaeological heritage management in Iran

The current weakness of Iranian archaeology in theoretical and methodological terms is the broad predominance of cultural historical method, the incomplete acceptance of new techniques in fieldwork, in data analysis (palaeobotany, statistical analysis, etc), and a broad ignorance of trends in international archaeology.

Archaeology in Iran from its beginning has been structured to find and display artifacts. At no time there have been any attempts to study relationships between finds and theoretical considerations. Thus, in empirical studies such as excavation the immediate impact of finds on theory is generally neglected.

There has not yet been sufficient re-examination of the state of archaeology and archaeological research and its relation to Iranian social and political contexts (pre- and post-Revolution) in Iran. Apart from the recent work of Negahban (1997) which in his autobiography deals only very simply with the beginning of archaeology in Iran, there remains only the account of Malek Shahmirzadi (1987) who describes some aspects of Iranian archaeology without making an assessment of the political connection of archaeology or trying to analyse the theoretical base for the subject. Therefore, in the lack of the published information and difficulty in access to unpublished databanks in Iran, statements in this thesis cannot be documented in all details, but they arise from the personal knowledge and experience of author as a teaching member of archaeology in the main department of archaeology in Tehran.

From the very beginning archaeology in Iran was largely viewed as a device to support the doctrine of official nationalism in the pre-Revolution regime. The study of material remains was regarded as an instrument for promoting Pan-Iranism by emphasising the glories of the Iranian nation before the Sasanid civilisation was abolished by the invasion of the Arabic Moslems in the seventh century A.D. During the entire period of the Pahlavi Dynasty, they legitimised their authoritarianism by reference to the theoretical concept of "kingship is a divine blessing", the only philosophy declared acceptable by the Government. This led most archaeologists (because of official encouragement) to do their best to justify the Iranian Imperial past by dealing with only historical archaeology. During this period, archaeology adapted itself to the regime. It was characterised by a centralisation directed and strongly controlled from the capital by archaeologists who were to some extent loyal to the regime and interested in an interpretation of history which matched the contemporary political situation.

Although most work have been oriented around this issue, nevertheless from the 1960s there has been important discoveries of prehistoric sites, mainly by foreign expeditions. Despite the wealth of data collected from excavations which have filled archaeological stores across the country, little has been published and few scientific analytical studies have been carried out by Iranian archaeologists. As a consequence, archaeological aims (to take care of new finds, protect them, and the inspection of the work of professional archaeologists) were not defined and patchily implemented. The system relied entirely on personal ability without official support; the system also encouraged unqualified people to be appointed to archaeological posts. This sad fact is a reflection of the absence of a dynamic research strategy supported by the Government, and of the low professional ability of many Iranian archaeologists. All are problems which are being addressed at the present time (see below).

Major changes took place in the Iranian academic world at the end of the Second World War. These were reflected in the presence of a large number of intellectuals and specialists who, according to a development policy, had been educated in western countries. The availability of posts for them in governmental circles allowed the organisations formed at this time to continue with only minor changes until the Revolution. In archaeology this feature is marked by the establishment of various institutional organisations formed mainly under the influence of the European and American schools.

The Islamic Revolution in Iran in 1979 led to a re-organisation of all scientific research including archaeology, through which the various institutes of archaeology, museums, and archaeological centres were united into a single body and re-named 'Cultural Heritage Organisation' (CHO), at first under the Ministry of Culture and Higher Education, and then under the Ministry of the Culture and Islamic Guidance, while the departments and research institutes of archaeology at the universities remained in the former Ministry as before. The expansion of universities in Iran from 1984 gave a new generation of intellectuals access to academic posts, together with a greater democratic sense resulting from the Revolution, and brought an opportunity for young archaeologists to think about the social and political connections of archaeology and ultimately about its theoretical and methodological development. An optimistic view suggests that the adoption of Islamic thought in Iranian politics does not prevent genuine discussion of the basic premises on which scientific interpretation of archaeological material rests.

Fortunately, Islam itself has a positive view towards archaeology and the Holy Koran contains many Verses recommending Moslems to travel around the earth to see the relics of past generations. After about 20 years since the establishment of an Islamic regime in Iran, there can be seen no opposition to archaeology by religious scholars at an academic or public level. It is also important to stress here that there has been no conflict on highly controversial issues such as human evolution as there has been in Europe and America, rather there are signs of its general acceptance (e.g. accepting aspects of transformation idea in human evolution). Despite this, at the moment no great progress has been made, since firstly, shifts in ideological and political emphasis have not impacted on archaeology because most Iranian archaeologists deal purely with non-theoretical archaeology and have not ever had any serious ideological or political involvement. It is also true for the present time that despite the presence of a relatively large number of Islamic archaeologists working at the universities or other research institutions, there is no discussion of fundamental issues such as the impact of Islamic thought and politics on archaeology. Secondly, due to the centralised and hierarchical system of management in archaeology access and promotion of young archaeologists to posts is very limited because of the domination of the older generation. Thirdly, confining research exclusively to the archaeology of Iran produces a lack of interest in international archaeology. Finally, since the Revolution, both external and internal circumstances such as economic conditions have resulted in the effective isolation of Iranian science. This restricts the possibilities for communication with other countries and receiving new thoughts on archaeology, which leaves archaeology at its pre-Revolution level, even sometimes with a progressive drop in standards.

The organisation described above has a number of disadvantages. On the one hand, CHO is given extensive power as manager and co-ordinator for archaeological activities in Iran. This centre is responsible for undertaking various large rescue excavation projects as well as managing archaeological heritage through administrative authorities throughout the country. Other institutes such as universities have to obtain the necessary permission for their fieldwork. It means that all archaeologists are required to report their fieldwork results to the CHO and this is then filed in the centre's archive. At present the archive contains a full documentary record of fieldwork carried out during the last decades; most of this is still unpublished and inaccessible. On the other hand some archaeological institutes lost their financial independence which until then had provided adequate resources to fund their own research activities. In practice, however, this role is obstructed by the State bureaucracies, which wish to control funds for archaeological work. As a consequence many difficulties have arisen in managing archaeological fieldwork, heritage systems, and publications and so on, an intricate problem within a complex bureaucratic system. The most important disadvantage of this system is a deliberate neglect of university staffs' research potential in archaeological work, even though some teaching staff have good experience and training. This system restricts staff to do only library work or, if permission is available, to do less important trial excavations for training students. Thus, there are sometimes insufficient specialists available to carry out the work planned by CHO and the quality of work is severely affected by this problem. The inadequate co-operation between universities and CHO is one of the shortcomings of archaeology inherited by the present regime. Needless to say that for the future development of archaeology in Iran this problem should be solved by a close co-operation between universities and CHO in terms of joint fieldwork and research proposals.

10. Problems

The problems faced by archaeology in general and archaeological heritage management (described in the first section) in particular are generally akin to the difficulties encountered by Iranian society as a whole. The most important problems include:

(a) the deep economic crisis of the post-war situation and its continuation which affects the amount of funding allocated to basic science and research. In archaeology it causes a considerable restriction in field activities and the necessary heritage management strategies. Only a few research excavations with central budgeting have been carried out in the last few years;

(b) a major problem arises from the uncertainty in decision making by various authorities who are appointed generally for non-scientific considerations. The lack of a specified policy and the frequent change in the position of managers make any long-term planning for archaeology impossible. Under such circumstances even the current short-term activities are also questionable. In this respect another problem stems from the disintegration of archaeological institutes. A major controversy surrounds the capability of the CHO in managing archaeology. In fact, two rival archaeological centres (CHO and universities) each claiming the right to represent archaeology;

(c) almost all archaeological teaching and training has been centred in Tehran. The long and short specialist courses have been so few in number that is impossible to speak of there being a national programme or policy. Foreign scientific literature in related courses coming into Iranian libraries is sporadic and limited due to the absence of links with the experienced institutions in the rest of the world. Professional training for students is inadequate and deeply affects the level of their capabilities (see below);

(d) Iranian archaeological law on the protection of archaeological sites lacks a basic ability to protect sites from threats resulting from either treasure hunting or developmental projects. Theoretically, a small number of scheduled monuments are properly preserved because special permits for any alteration at such sites is needed.

11. Managing public archaeology in Iran

Within academic archaeology the interest in more extensive dissemination of archaeology to a wider audience can be seen as part of the much wider debate that has discussed the role and value of the past as an element of public heritage (e.g. Cleere 1989, Layton 1989,1990). The main emphasis of this chapter is to introduce to the archaeology of Iran the belief that an extension of the way in which the archaeology is studied and understood by students and the general public would be ideal and if this can be achieved will enhance the awareness of Iranian society as a whole (for a similar conclusion see, MacKenzie and Stone 1990; Stone 1994). What can be gained from the appreciation of archaeology by the general public will be at least a greater level of protection for archaeological sites and in general help the promotion of AHM (e.g. Stone 1994).

How the past is represented and communicated is the significant aspect here, as ideological and political processes at work in Iran affect such knowledge resources. In Iran today, as during the last regime, some versions of the past are highly visible and are highlighted; others may be hidden, overlooked or intentionally excluded. As mentioned earlier the most fundamental reason for the lack of support for education for prehistory may originate from the ideology of the previous and present States. In the pre-Revolution period the syllabus was broadly aimed at giving children the stages of human cultural processes, starting from the appearance of the Medes Dynasty at about 700 B.C. It was done only from a nationalist perspective to support the philosophy of the contemporary regime; this at its best is biased and to some extent racist. In the post-Revolution situation the tradition of dividing human history is continued by focusing only on Islamic events.

The primary concern of this chapter is to use archaeological knowledge and techniques to remove some of the dead traditions in the presentation of the past. To accomplish this, I will consider the various alternative ways used by people in modern societies, first considering how the past is confronted, illustrated and taught. In this view archaeologists and educationalists attempt to bring together the ideologies of education with the material evidence and knowledge of the past provided by archaeology. An important idea around this experience is that the conception and use of the past is necessarily accomplished by a simple change in curricula. In Iran it is obvious that, though preparing a specific curriculum may produce short-term benefits, in the long-term the concept of the past cannot be improved by simply adding more information, as museums cannot be improved by merely adding or changing displays. To achieve this, the very nature of the objects and information representing the past, as well as the forms and structure of communication and authorities' viewpoints need to be reconsidered. Most importantly, there must be change in the institutions both in the viewpoints and structures, to create a past sensitive to the new ways of society. In Iran the authorities have attempted to impose specialisation on institutions that reflect the priorities and practices of nationalism and ideology, rather than taking into account individual experiences and the practical interaction of people in specific communities and specific situations. Iran is termed a multilingual and multicultural country. What is ignored here is, however, the contribution of the various indigenous cultures manifested in many ethnic groups each with its own character and tradition. Therefore, we need to take the past back to the Iranian community to provide the real features of the past for the people for whom it is partly at least out of sight and reach. In practical terms, it will be possible only by teaching and presenting the real past with reference to the people and histories within their societies. In Iran there is an obligation for the State and all educational institutions to educate the public about what archaeologists do and why it is important. In addition to the potential benefits in informing society, further steps will need to be taken:

(1) inclusion of archaeology in formal and informal education programmes, to appreciate the vitality of the AHM and its role in modern achievements; and expansion and modernising archaeological departments in the large universities. At the moment three state universities with chairs of archaeology are not enough for a country as large as Iran with a population of 70 million and an immense archaeological heritage;

(2) emphasis on the general public's interest in archaeology through programmes provided by academic institutions;

(3) balancing the past and the present by enlightening the general public on the norms and values of Iranian archaeological heritage;

(4) a comprehensive policy for museum collection, and training appropriate personnel, as well as establishing an education office in museums to link with public interests and the educational system of the country must be one of the priorities of the State. In such a way adequate budgets and necessary equipment should be prepared;

(5) at the same time active encouragement should be given to the establishment of local authority or community museums, since the objects collected by museums in local and community levels have great popularity and archaeological significance.

12. The place of archaeology in the educational system of Iran

12.1 Formal education; all formal education in Iran is State controlled and although the State gives permission to individuals to run schools (under special conditions to run universities), the curricula, syllabuses, timetables, examination and certification as well as the general supervision of instructional programmes are the rights of the State. History is one of the subjects in the curriculum of Iranian schools. It is intended to inform students about the human past, including that of Iranian society. In Iran History for a long time was taught from a perspective which is now totally outdated for the present generation. Students in Iran commonly consider history boring, uninteresting and irrelevant in their present world. The reason for this is that most history teachers stress the record of dynasties, of kings and their wars, dates and names. Archaeology as a discipline in not taught at any level in the school educational system. In primary and secondary schools archaeology appears only incidentally as part of history; in such a case it is normally taught as part of the Iranian pre-Islamic civilisation by teachers who in most cases have not received instruction in archaeology. In addition, even the texts have been written by people who know nothing about the discipline. School texts used in Iran do not give enough importance to prehistoric culture, instead they focus their attention on historical, especially Islamic, events. Students are not made to understand that the history of Iran is a process that has gone on for thousands of years during which humans adapted in different ways to various environments. At university level archaeology is now taught in three state universities and in the two newly established archaeological departments in the Open University (Islamic Azad University) as well as in an archaeological department organised by CHO. Three of these offer a course leading to a Master's degree in archaeology. This is a three year programme and the first two years are devoted to taught courses and examination, while the third year candidates carry out research and present the result in the form of a thesis. Courses to be taken by candidates mainly include; art history, archaeology of Iran, Islamic art and architecture. The Palaeolithic is not taught in any level in universities, and prehistory generally begins with the Neolithic, see also (chapter 5and fig. 14–15). Unfortunately, the change in universities have been inadequate. It is a fact that there are more posts in universities which are occupied on political grounds. In all universities the facilities for teaching archaeology generally remain rudimentary. Basic texts are hard to come by and laboratory equipment mostly non-existent. Students are taught mainly traditional subjects. Analytical archaeology and technical skills such as computing, are poorly developed. Students are no longer guaranteed jobs based on their skills (except those are trained at CHO). Moreover, fieldwork is not sufficiently provided for in the curriculum or it is generally limited by financial problems. Thus students wishing to participate in fieldwork have to do so by joining projects run by CHO outside the university, but it is not generally possible.

Perhaps the introduction of archaeology, even as a first step, as an adjunct to history will be useful because it may help to create interest in local and regional origins and so engage the general public in an appreciation of their own past. If it is the case, we wish to see a change in the current system of education. A first step should be making a non-political, non-sectarian, and non-racial curriculum to portray the past with a modern approach to archaeology which may provide children with a more balanced outlook on the world around them. The study of prehistory should be given an appropriate place in the curriculum. In studying prehistory, students should be introduced to the techniques and methodology of archaeology which would help train the young in the scientific analysis of events and the interpretation of material culture rather than simply filling them with historical facts, as well as visiting examples of prehistoric sites in order to see the evidence of the past directly. Interest in prehistoric sites could then be easily transferred to historical monuments to see the continuation of cultural processes. Through the experiences gained in visits to archaeological sites, the student can be taught to read and interpret the social and economic contexts of the events which in historical writings are obscured and overlaid by more political and personal details. An archaeology syllabus in Iran should start with local material and move outwards to the wider world. Students should first be acquainted with their environments and then gradually introduced to archaeological sites from the earliest period in their region and then in the country as a whole. Students would then study the Near East and finally world archaeology. For a useful plan of archaeology to teach students both in classroom and on site, see Howkins (1991), Smardz (1990). To realise such a syllabus, teachers must be trained not only in archaeology but in skills to teach the subject to students. The training courses should cover simple ways of interpreting artifacts and particularly the basic concepts of AHM in the areas of informing students about the values of archaeological sites and protecting them, and include visits to museums and archaeological sites, seminars with archaeologists and museum professionals. To make this training possible the government must make money available. A department of archaeology to run programmes must be created at one of the universities with the necessary staff both teaching and supporting. Apart from university academic training, provision must be made at the 'Teacher Training Centres' for the training of archaeological teachers. Furthermore, it is also necessary for the CHO and museums to begin their archaeological programme, for archaeology education will not be possible without the influence on the general public provided by museums.

12.2 Non-formal education: non-formal education has improved since The Revolution with increased government support. This system serves the rural population (they are about half of the total population) through adult literacy programmes and other services. Most of its curricula cover subjects of particular interest to rural people such as health, farming and environmental conservation. Many people in Iran (particularly the rural population) find it difficult to appreciate the value of archaeology as understood in the culture of many people in the western countries. In such countries people devote their leisure time to visiting museums or archaeological sites. In the countries where the standard conditions of living are lower and national policies are oriented toward resolving the basic economic problems, it thus becomes more complex to co-ordinate strategies for improving the appreciation of archaeology in the same ways as occur in developed countries. If the study of archaeology is to survive and flourish in Iran, it must be popularised and made relevant to local and regional culture and educational curricula. Unfortunately, museums in Iran have not successfully carried out the responsibility of informing public. One obvious factor in this is that museums in Iran are elitist and urban institutions. Their policy is not well-defined and there is a uncertainty and disagreement about the role of museums in Iran (see below). Mass media, especially radio and television and information technology, are commonly seen as the best solution to the problem of bringing the vast amount of public in greater contact with archaeological heritage (Bender and Wilkinson 1992). Programmes about archaeology appears sporadically on radio and television, but few are systematic, well planned, researched and useable for the non-urban populations, indicating that research centres do not have a link with the media. At present in Iran, there is a hot debate on using the international network systems produced by various satellites as well as the so-called Global Computer Network. Some encourage the idea of connecting the systems, while some are claiming that the contents of these systems will conflict with the principles of Islamic morality and the beliefs of people. Needless to say, the overall implication of the arrival of such systems in Iran will have profound effects on Iranian people as they become more familiar with the world around them (apart from possible contrasts). In relation to this subject, the question arises as to what extent the new technologies of information processing can fit within the society and solve the problem of communicating Iranian cultural origins. The programmes on these new networks tend to be urban in focus, while in most of the country television programmes are not yet available. In addition, the level of programming required for the rural areas because of the differences in languages and local traditions poses further problems. Under these circumstances, information technology cannot easily accomplish its full potential for improving access to archaeological heritage in Iranian society at least in the rural areas. The possible way at the moment to improve the access of such people to information on archaeology will remain only in the help of educational institutions such as schools and museums and other related activities. If these institutions are going to succeed they must not only use modern techniques but must also become more sensitive to the realities of local situations and understanding of the concerns of a diverse public.

13. The role of museums in public education: museums play an important social and cultural role in helping to educate the public about history, and the nature of other cultures. Museums, through presenting items from the past, provide the basis from which we constitute notions of self and cultural identity. The contribution of museums to cultural life can be seen in a variety of ways. Museums are generally described as public institutions established for public education. They are responsible for managing strategies for collecting, conserving, researching, entertaining, stimulating national interests, protecting the archaeological heritage for the reconstruction of the nation's past, and providing the cultural link between peoples (ICOMOS 1986, Pearce 1990, Merriman 1991, Hooper-Greenhill 1992, Ucko 1994). In view of these varying roles museums may be regarded as a public affair. Museums in Iran have been in serious crisis in recent years. The problems have emerged from the ideological and political trends, management system, and particularly from the economic troubles. The situation of the archaeological museums in Iran is more complicated; all museums come directly under the general supervision of the CHO. The largest and oldest one is the National Museum founded in 1941, very rich in prehistoric, historical and Islamic collections. The other main museum in Tehran is Reza Abbasi, very rich in Islamic art and archaeology, but it lacks a suitable space for display and storage. In addition to the two large museums in Tehran, there is a considerable number of provincial museums, which have been grown at an increasing rate as a result of large scale excavation projects. Such museums are generally badly staffed and structured, and restoration and cataloguing facilities are insufficient. The changes that are now gradually tacking place in Iran present both a challenge and opportunity for museums as they need to attract a new audience to survive. Because the public needs to be informed, museums should be changing from their long standing position. Traditional museum practices are now being questioned both from within the museum field and from without. What is a museum for and how does it relate to other institutions in society? As mentioned earlier, Iranian archaeological museums function as a treasure store rather than doing research. They have been, and are, poorly designed, outdated on the one hand, and limited by a lack of funds on the other. Their structure is not properly suited for modern functions (except the National Museum). They are generally lacking the specialised personnel due to the inefficiency of courses offered in the training centres. Because the educational curricula have numerous gaps in covering of the past, the museums should be encouraged to develop educational links with related institutions. Also there have no been systematic attempts to encourage school-teachers and other educationalists to use the museums for teaching related subjects such as history. Traditionally, the aim of displaying material in museums is to present their aesthetic aspects, and the objects do not generally tell a more comprehensive story of human kind. A central philosophy behind museum exhibition which conveys a clear understanding of human societies must be developed in Iran. In order to develop a museum culture it is necessary to understand the place of the museum in today's society, to determine how the message about their importance to society can be disseminated, and to demonstrate how the public can realise the full benefits of museums. An important task in the new approach to developing exhibitions in Iran should be regarding the demands of the public and what they might want to see. Theoretically, Iranian culture is a living culture and there are themes and myth, religion and philosophy behind most the objects in a museum. There is no tradition of consulting ethnic or local groups prior to setting up displays for them. Thus it is more essential to have researched background information and thoughtful displays. Technically each display should follow a more functional and practical exhibition in which stories are told through the exhibits, their arrangement and their explanatory notes.

Moreover museums in Iran should actively reach out to all levels of community in exhibit planning. An effective utilisation of museum services must be a bridge between the museums and the rural populations. All museums in Iran are located in urban centres and so the rural populations rarely benefit from them. In addition, most of the cultural information is designed to inform the urban public; very little is intended to inform the others. Thus most of the AHM practices, especially concerning protection seem to have failed. Because the majority of archaeological sites are located in the realms of the rural populations where there is a lack of public interest, the protection of sites is severely hampered.

The idea of mobile exhibitions as an alternative to the more highly centralised museums in Iran should be considered. In this way the educational and cultural programmes through exhibiting planning for rural or local communities must not only be based on the collections, but closely related to the living culture, archaeology, history and art of the region concerned. Local legends, rites, and traditional festivals can provide themes for the education of the local public. With such common ground they can associate themselves directly with the museum programmes.

Suggestion for extension services to establish contacts with schools has already been made. One successful step in this respect is museum workshop activities. Museum workshops offer heritage education to engage school children through physical and intellectual activity that bring ideas and values from the past into the life of the present. If museums in Iran adopt the methodology of workshops in their education policies they will find that their educational impact improves greatly. Certainly, the handling of cultural material, prehistoric artifacts for example, in the workshop makes children aware of the fragility of the collections and the best ways to handle and keep them. When children are allowed to take part in a dynamic relationship with the past through such workshops; therefore they become aware of their own cultural roots and in the long-term it creates in them a sensitivity about the archaeological past in their region as well as an idea about how to appreciate the past and protect it.

14. Managing Palaeolithic archaeological heritage

The characteristics of Palaeolithic archaeology as well as the main factors responsible for the deficiencies of Palaeolithic archaeology in Iran have been discussed in chapter (5) and there is no need to stress them again here. It was shown that, despite substantial funding for archaeology in Iran, the field continues to be neglected; Palaeolithic sites continue to be threatened or suffer from substandard work and questionable results. In AHM terms these indicate the lack of a concrete policy (a) to inform public of the potential and value of Palaeolithic sites; (b) to enforce consistent enforcement of standards; and (c) to the critical shortage of specialised professional training. The AHM practices in Iran are generally to schedule the nationally important monuments and to focus upon the more visible, accessible and better documented archaeological sites and monuments of the prehistoric and historic periods; they do not address the needs of the Palaeolithic part of the Iranian archaeological heritage particularly those aspects which are not visible (see below). The basis for an effective management of the archaeological heritage is having clear criteria to assess the value of its different parts (Wainwright 1989, English Heritage 1991). In Iran in the absence of the contribution of current knowledge in the assessment processes, such criteria have not been established, resulting in a complete exclusion of Palaeolithic sites from legal protection on archaeological grounds, and producing the following specific problems:

The record-based inventory process to recognise and identify Palaeolithic archaeological heritage focuses upon the visible traces of humans left on the surface of the present day landscape. In this view sites and monuments are considered as the basic tools for knowing where Palaeolithic archaeological resources survive.

The main point which has to be considered is that the investigation and understanding of the Palaeolithic period depends on the analysis of evidence not caused by human activity. Geological deposits without artifacts can be investigated to provide the chronostratigraphic, climatic and environmental framework of the Palaeolithic within which the artifactual evidence can be situated. The environmental evidence plays a significant role by contributing directly to the investigation of Palaeolithic life. Sites containing faunal and floral remains help to complete our understanding of the climatic conditions of the region occupied by the early hominid populations (Wenban-Smith 1995a). It is very important that to understand the cultural development through the Palaeolithic the artifactual evidence also should be placed and analysed, along with non-artifactual evidence, within this framework (English Heritage 1991: 34-35). There are also problems associated with carrying out an inventory of sites containing artifacts which are generally accepted as an archaeological heritage. The deeply buried and non-structural nature of Palaeolithic heritage makes it inaccessible and impossible to be characterised by superficial observations. On the other hand Palaeolithic sites consisting mainly of lithic scatter (Schofield 1994) are not covered by the traditional definition of sites and monuments, since the vast majority of archaeological remains, and hence behavioural information derivable from them, are located 'off-site' (Blumenschine and Masao 1991: 456). The study of Isaac and Harris (1980: 21) confirmed that, in the Palaeolithic, artifacts are scattered between sites, and much less than 10% of all artifacts occur within excavated concentrations which could be called sites, so they are excluded from the formal legal protection policy. In other words, as mentioned above, an important part of Palaeolithic archaeological heritage is composed of the natural geological deposits associated with biological remains which cannot be scheduled as an ancient monument and protected. Many sites of Palaeolithic significance in Iran are still not recognised by old fashioned criteria, and for sites which do not achieve the status of national or international significance, there is no formal safety policy in the local or national planning processes. In Iran conservation of the natural environment is the responsibility of the 'Environmental Conservation Organisation' a centre consisting of various specialists but no archaeologist. Its legal functions relate to nature conservation such as conservation of the natural environment, flora and fauna and geological features, but with no obligation to inventory and protect geological deposits with respect to their Palaeolithic heritage.

A subsequent area for debate is the problem of mitigation, where threats are affecting the Palaeolithic heritage. In such cases where identifying and recording of a threated Palaeolithic sites have already been completed, then the next step should be to decide how to reduce the threat, to preserve or to excavate it. In this respect, academic knowledge is needed on how to mitigate the effects, the selection of areas for excavation, methods of recording, the application of scientific techniques for recovering and analysing material such as small mammals and botanical remains, and adopting an appropriate research strategy in advance of destruction. These skills are not present in the relevant archaeological organisations of Iran and result in considerable damage to the Palaeolithic heritage. What is important to stress here is the key role played by geological contexts (deposits) in Palaeolithic study; if such deposits can be considered as an integral part of the Palaeolithic resources, the threats to them can be controlled and mitigated in the same ways as for other parts of the archaeological heritage (see also Wenban-Smith 1995b).

The solution to the problems in the basic areas of the management of Palaeolithic heritage will depend upon greatly improved AHM programmes, but given the general deficiencies of the archaeological system and the principal weakness of Palaeolithic archaeology within this system which both affect the processes of AHM, achieving the goals will not be easy. If no such efforts are made in this respect, it is likely that the Palaeolithic heritage of Iran will be lost in the immediate future.

In summary, since the concepts of AHM have not been introduced into the archaeology of Iran, and Iranian archaeological organisations are still not familiar with the processes of AHM, so in the lack of any local experience relating to the issue, putting forward any recommendation inevitably will be based on the knowledge and experiences of foreign countries contributing to the field. A set of ideals and principles to inform any future Iranian Palaeolithic management system is adopted here from the experiences such as those created for example by the ICOMOS and ICAHM Charters, European Conventions, practices carried out by English Heritage in Britain (e.g. English Heritage 1991, 1992), and CRM in the USA (e.g. Smith and Ehrenhard 1991, McManamon 1994).

The necessary important strategies to manage the Palaeolithic heritage in Iran (they also can be used for heritage of other periods) are as follow:

(1) it should be widely recognised that a knowledge and understanding of the origin and development of human societies is of fundamental importance to humanity in identifying its cultural and social roots. The Palaeolithic archaeological heritage

consists of the basic record of past human activities. Its protection and proper management is essential to enable archaeologists and other scholars to study and interpret such records;

(2) defining and identifying Palaeolithic archaeological heritage as discussed above. It is important to stress here that an accurate definition and identification of what is to be protected helps to improve protection of the Palaeolithic heritage. Elements of Palaeolithic heritage are not just objects that are important; any evidence of whatever nature that can throw light on this period is important;

(3) the Palaeolithic heritage is a fragile and non-renewable cultural resource like other archaeological heritage. Because of the non-structural nature of Palaeolithic sites and the greater fragility of their objects, human and natural agencies, land use practices, for instance, would damage them more severely than the heritage of other periods. Such effects must therefore be controlled and developed in order to minimise the destruction of such heritage. Providing the necessary protective legislation and provisions is an effective way to reduce human effects and provides support for heritage management. Legislation should forbid the destruction, degradation, alteration through change of any Palaeolithic sites and their associated natural environments. Legislation should offer protection not only to identified Palaeolithic heritage such as cave sites for example, but to the areas where the recovery of Palaeolithic sites can potentially be expected;

(4) managing Palaeolithic heritage for protection and for other management purposes needs a wide range of information about the extent and nature of such heritage. It is possible only by the application of successful surface survey strategies in the whole country. At the same time a computerised resource database

consisting of knowledge of any Palaeolithic heritage for protection purpose and for scientific study and research should be compiled;

(5) the overall objective of Palaeolithic heritage management should be the preservation of Palaeolithic sites *in situ,* except under some circumstances when preservation by record should be implemented. In such cases a sample of sites is excavated before total excavation. Excavation priorities should be focused on threatened sites while the excavation of non-threatened sites for research goals must be preceded by many scientific considerations. However, excavation for non-rescue purposes should leave a portion of the site undisturbed for future research;

(6) in terms of long-term conservation and curation policy of archaeological heritage, Iran has relatively little experience. Unlike the outstanding buildings which are well preserved, prehistoric heritage, particularly heritage from the Palaeolithic period, has not attracted official support; it is facing serious losses (e.g. by major hydrological and mining projects near Palaeolithic sites). Archaeologists traditionally learn some aspects of excavation and collection techniques, but training in the areas of site conservation, including post-excavation conservation techniques, is not usually part of an archaeologist's education. The lack of professional training causes generally a substandard performance of work in the field such as research, data acquisition, analysis, interpretation, and reporting. Thus, the training of an adequate number of qualified professionals in the various fields of Palaeolithic archaeology and in the relevant specialised fields should be an important objective for the educational policy in Iran. At the same time effective quality control should be made on the work being done by any responsible organisations. An important task for such organisations is to guide archaeologists through a number of published

standards in the performance of their work. A number of special skills needed in this field include, in addition to strictly Palaeolithic knowledge: an understanding of the relevant law, regulation, and policies; awareness of fundamentals of administration, management and business; and an understanding of the ethics and principals applicable to the general public. For a number of other useful academic training programmes in this field see Alexander (1989), Stanley Price (1989), English Heritage (1991), Darvill (1995b);

(7) the presentation of the Palaeolithic heritage to the general public by various means as outlined before, is an essential component of promoting an understanding of the value of Palaeolithic archaeology. At the same time its effective presentation promotes understanding of the need for its protection.

Finally, there is a need for international assistance and a co-operative programme for Palaeolithic heritage management. It requires the assistance of professionals dealing with this issue from the developed institutions of various countries. At the same time the notion of organising international seminars and conferences, as well as international exchange of professional staff, should be developed as a means of raising standards of Palaeolithic management strategies.

15. Prospects for the future

Iran, as a signatory to the UNESCO World Heritage Convention, has already declared some places as possessing world heritage status. One of these is the central part of the city of Isfahan, and another is Takht Jamshid in Shiraz; both possess immense archaeological significance. During the past few years there has been professional activity concerning the preservation and restoration of historical monuments. Such activity is designed to integrate the architectural, engineering conservation, and archaeological aspects of preservation. While higher professional standards of management are based on a firm understanding of AHM policies, the values of conservation philosophy and much greater participation of archaeologists are needed. It will prove disadvantageous if disparate approaches are adopted for prehistoric sites. There is a need on a national basis for policies to co-ordinate management strategies between various institutions, to involve greater participation of archaeologists, and to encourage a positive dialogue between specialists on the strategies concerned, and to relate professional works to public education issues.

It is worth mentioning here that while major art galleries spend more money on building and acquisitions, many prehistoric and historical sites of potential importance are permitted to disappear unrecorded and unprotected. It is urgent that archaeological concerns, both prehistoric and historical, should be assigned legitimate and higher priority than that accorded at present by government. It is also a fact that the general international conservation issues in the field of the environment such as the protection of wildlife or plant life, have reached in Iran only recently. Consequently, it has received less attention in environmental procedures. Indeed, while magnificent historical sites have attracted political considerations, those small prehistoric remains which did not seem to possess contemporary relevance were bulldozed unknown and unrecorded. This situation is also seen more or less at present. At the moment archaeological sites commonly are the last resources surveyed, and only after decisions have been taken by government or industries, which ensures that discoveries cannot alter the planning processes. Under such circumstances, discovery or rescue excavation occurs so inconveniently late, because of the lack of advance warning that neither personnel or suitable funding are made available. It is more likely that if major archaeological surveys had preceded the planning for the industrial or economic projects (e.g. the construction of a new airport near Tehran in recent years), because of the potential archaeological resources in the area, site location may have been different without any adverse effect on the project concerned. Such long-term considerations of archaeological potential should be provided for areas subjected to future developments. Such is the situation with the important issue of land use practices, particularly mining. It cannot be denied that in some places vegetational regeneration and eventually environmental balances are affected by various factors of economic development. The forested shoreline of the Caspian Sea is an outstanding example. Its landforms and geomorphological structures are of major interest in Iran, while its forest covers many archaeological sites. The relationship between prehistoric occupation and the rapid formation of the soils after deliberate obliteration of about one third of forests requires systematic investigation. The environmental data which this area contains may be crucial, particularly where a meaningful and complete pattern of prehistoric landscape is concerned. The same principles apply to the built environment, when significant historical and prehistoric sites, demolished in the name of development (or by looting), or when they are restored without essential considerations for their archaeological integrity. Evidently Iranian archaeological managers are less familiar with the concept that prehistory and history are valuable economic resources. For a country so intent on the development of tourism, this failure is sadly apparent. It can be accepted that managing archaeological heritage in a country such as Iran where economic underdevelopment and its consequences exist, affects society's economy by increasing money spent by tourism on the one hand, and reduces unemployment and crime rates on the other. Because of the frequent shocks to the international prices of crude oil which is the basic source of Iranian foreign exchange, there has been in recent years a trend to substitute it by developing the tourism industry. Archaeology still has little place in this strategy, but for the future Iran's abundant archaeological heritage can make for a rapid and intensive development in this field, if the detailed strategic planning takes archaeology into account more seriously than it is at present.

Such consideration does not imply that archaeologists wish to preserve all archaeological sites; it is impossible, but their destruction should be based on systematic prior research and essential evaluation. The prerequisites are a proper research design, funds, qualified staff, adequate time to record, investigate and to decide conservation priorities. Archaeologists in Iran, however, are likely to be constrained by more than these pressures. They must accept obligations. In the first place those working in academic positions should accept the fact that their discipline does not consist of a small association of scholars doing their own things. They have an important educational role to play, involving some form of public archaeology. They should face the challenge of public archaeology, for instance, in developing the received preconceptions of authorities and institutions.

Fortunately, the Iranian government in recent years has encouraged the idea of decentralisation. Free economy is sometimes encouraged and sponsorship is assumed to have a greater importance. It would be best for the archaeological system to shape itself within a regional framework under a centralised body. In such a way the dominant role of the State in controlling archaeology will be weakened if funds for archaeological fieldwork and heritage protection can be provided by the appropriate private centres. In such cases archaeological organisations such as CHO will maintain their role as a national co-ordinator and organiser of archaeological work throughout the country. Unfortunately, at present the Iranian archaeological heritage is suffering greatly from looting of sites and the illicit export of archaeological materials. This is due to a lack of judicial protection, the opening up of the country's borders, economic and social problems, and in general by the lack of a progressive management system. It is a major catastrophe for Iranian cultural heritage. It is the responsibility of the State's archaeological centres to provide a new conceptual approach in terms of AHM strategies in order to overcome the problem, not just by warning, but also by creating respect for cultural heritage values. Modern techniques of protection must be introduced and at the same time an effort must be made to update protective legislation and increasing public awareness.

Finally, discussion on Islamic philosophy and its relationship to archaeology needs a special background in this field, which is beyond of the aims of this present thesis. However, it seems clear that the question of the future of archaeology in Iran cannot be solved by a single-sided approach to its ideological problems, but must be considered within the framework of the total development of society.

Conclusions

A review of the archaeology of Iran showed that archaeology in Iran has been viewed as it is elsewhere in the Near East as a branch of history rather than anthropology. One consequence of this position is that attention to the remote past has been focussed largely on Iranian nations. Questions of ethnic origins have thus been paramount in terms of approaches to the national history in Iran, and in the past answers have been found with reference to mythology and by appeal to ancient texts.

Generally archaeology has been asked to supply some answers to ethnic questions or in more cases archaeology has been used to validate the established mythological or legendary constructs regarding the original ancestors. At this intersection of mythology, history, and archaeology lie many problems for the interpretation of the past. Political and nationalistic motivation for preferring one interpretation over another are at the heart of these problems.

This research also revealed that the political position of archaeology in Iran, has tended in the past to give a false impression of uniformity to what has been termed as Pan Iranism. This conveniently ignores the very different histories and cultural and economic traditions of the peoples who have participated in the construction of Iranian civilisation. Most governmental and scientific structures in Iran were compelled to conform with this model and to pay lip-service to Iranian nationalism. Archaeology was no exception to this process; indeed, it was cynically used by nationalist politicians to reinforce their ideological message (and in so doing often benefited from resources to encourage this role). The sudden collapse of the

Iranian Royal regime in 1979 and its aftermath have therefore been a difficult experience for archaeology in this country. Over fifty years of domination by such rulers forced Iranian archaeology into this ideological and political direction. A study of the Iranian archaeological literature shows that this idealisation and politicisation hindered the application of basic concepts. Archaeology students have been exposed at universities to a single philosophical system and actual steps have been taken to prevent them from exposure to other doctrine and theories. University teaching has been the Cinderella of archaeology and because of the many limitations of resources in terms of specialised staff, funding and an advanced training policy, they have been involved only marginally in research. However, during the second half of the present century Iranian archaeology underwent considerable development mainly by foreign scholars. It was also institutionalised as a science and many excavations were carried out. Central governmental funding was the exclusive source for excavations and publications in order to increase its own glorification.

During this period the culture-history paradigm dominated all archaeological approaches and archaeological work has been concentrated on two subjects: first, the material aspects of the pure Iranian culture; and secondly, the transition from the Indo-Iranians to the early historical Iranians. Although most work has been oriented round these poles, there have been quite unprecedented prehistoric discoveries, notably from the Neolithic, Bronze and Iron Age, because large scale excavation projects provided the opportunities for discoveries. Although discovery is an important component of archaeology, archaeological practice does not end there. In order to evaluate the total archaeological achievement of Iran the following three fields should be considered: the scientific nature of the guiding theory; the creativity of the study; and the advancement of research facilities and methodology. I maintain that during the whole of the pre-Revolution period deficiencies in these three areas undermined some of the importance attached to the material discoveries. Problems affected development in all three areas. In the area of theoretical concepts, along with the many reasons discussed, the central one must be the negative influence of the dominant culture-history approach supported by ideological and political pressures. In order to demonstrate Iranian cultural superiority, most work carried out by archaeologists was restricted to the materials themselves with a heavy concentration on historical data. Such approaches made archaeology remain anti-theoretical, and ignored the importance of the prehistoric period; for example, the study of social, economic and cultural patterns through archaeological data in order to discover the laws of the development of human society has not been a real interest. Thus even now many Iranian archaeologists still avoid discussing theoretical problems, let alone developing new theories. In fact, in a country such as Iran with its vast land, various ethnic groups, and diversity of social types, researchers, if they managed to liberate their thinking and free themselves from the above constraints, could use the abundant finds to obtain more reliable conclusions about the ancient societies of the different peoples inhabiting the disparate ecological regions. Regarding fieldwork, the lack of a concrete guiding theory and valid testable scientific hypotheses meant that the excavation programmes, the selection of materials, and the type of record keeping, all followed an undeveloped pattern. Many valuable phenomena were ignored. Some research data were totally discarded, especially material concerning the natural environment such as floral and faunal remains, as well as other materials not considered to be cultural relics. The above problems seem also to have resulted from the absence of a serviceable guiding theory rather than to technical problems. There has also been little improvement in terms of research facilities, tools and methodology. Techniques and implements used in fieldwork virtually stagnated at the level of the early 1950s. Consequently, all the archaeological teams remained very backward in terms of excavation techniques, digging tools, laboratory equipment, and restoration and storage methods, as well as explanatory methods. Even relatively low-cost procedures, such as flotation or computer data processing and analysis, could not be popularised owing to the ignorance of the administrators. A necessary role of research should be to report newly explored archaeological material, completely and expeditiously. But for several reasons Iranian archaeologists frequently could not do that; thus archaeological materials were discovered so rapidly and in such quantity that the work of processing and analysing could not keep pace. These circumstances produced critical consequences; the vast amount of data was not quickly processed; or only a brief description was provided, lacking precise detail; excavated material was packed away in store rooms year after year. As time passed, labels became mixed and original records were lost. From the scientific perspective much important data was eventually reduced to indecipherable rubbish. Such problems were becoming more prevalent during the Revolution and after, since successive political campaigns occupied most of the working times of archaeologists who were already short-handed.

The Islamic Revolution brought a deep change in the structure of Iranian society in 1979. The transition from dictatorship to democracy in Iran is more than a simple mechanical change from one system to another. The process is a more complex one, and it is difficult to make a definitive statement about it. It is still too early to assess to what extent democratic changes in different areas of life have been adopted. It is clear that the Iranian situation has certain peculiarities that need not be detailed here. One clear thing is that Iranian society in regaining its democratic and human identity, and this should create the conditions needed for integration with dignity into the human cultures. There can be no doubt that today in the field of human sciences many concepts which resulted in stagnation and a lack of validity attributable to the pre-Revolution system are being rejected. Some characteristics of the system are reflected in scientific knowledge. We must now carry out genuine analysis, so that we may free our science once and for all from non-scientific totalitarian concepts. This is especially important in the historical sciences which are more heavily influenced by such concepts. In the post Revolution period, despite many changes in the humanities, archaeology saw no great change. The reasons, which I have discussed in the relevant chapters are:

archaeology has generally been used as a support for the ideology of the previous regime; a uncertainty in its real place among the humanities; an uncertainty in its ideological and political relations to the dominant Islamic thought; public unawareness of its potential; the domination of the traditional archaeologists; the lack of involvement of archaeologists in the serious ideological and political debate; a lack of interest in international archaeology; the isolation of Iranian science (archaeology) from World Archaeology because of the economic and political conditions; the absence of any development in its highly centralised and hierarchical management system.

The general structure of archaeology still remains as before; now Iranian politics exercise tremendous power over archaeology through the auspices of the Iranian government, though I do not believe this socio-political context of archaeology completely controls the organisation of the discipline, or the research of archaeologists. Nevertheless, in the case of Iran, the government has always shaped the kinds of research archaeologists do, the way they structure and organise their work, and the use of archaeological results in the public realm, particularly the use of archaeology to define Iranian national identity. As mentioned earlier, in the pre - Revolution period this control was obvious. It was manifested through the encouragement of an official version of history, based on the myth of Imperial sanctity. In the post-revolution period, it is clear that archaeology under the control of the Iranian authorities has begun again to feed into a new ideology, an ideology that is not focussed on the Imperial one, but which has as its central theme, the notion of the Muslims as a cohesive and homogeneous ethnic group. We see in this period a reformatting of the ideological system, the creation of a sense of cohesion and homogeneity among Muslims to deny internal social conflicts. The new ideology has been transformed from a system of belief based on the notion of a national body in which the Iranian people were seen as a family linked to the Royal family in a paternalistic bond, to a vision of the Iranian people as a member of the great Islamic family. Paralleling this general ideological transformation, we unfortunately see a transformation within the field of archaeology from neutral work that did not threaten the Imperial myth to work that feeds into the myth of homogeneity. At the present time control on archaeology manifests itself on two levels; on the first level, the themes that archaeologists explore and the way archaeology is used in the public realm of the mass media and the tourist industry is actively controlled by the Iranian authorities. This control is manifested through the funding for research, focussing on Islamic art and architecture, and the preservation of specific sites linked to this theme. The second and more subtle level at which the Iranian government controls archaeology is through its policy of funding empirical research. This is seen in the rescue orientation of the archaeological administration instead of research, which favours total site excavation and detailed description of data. The overall result of this emphasis on detailed empirical work rather than theory is that Iranian archaeology is losing its critical edge; archaeologists, particularly those who are working in the administrative system of CHO, are becoming technicians, unable or not interested to look at their data with a synthetic or critical eye.

However, at the present time, Iran is in a transition period, when democracy is still a tender plant, and democratic institutions are still in the process of being created. I believe that these developments leading to economic and social stability will bring about a reformation, a re-organisation for archaeology and a spiritual and material renaissance for it.

This present thesis is aimed at providing a critical review of the archaeology of Iran on the one hand (as the first attempt in this respect), to understand the potential and the important weak points of Iranian archaeology with reference to World Archaeology. On the other hand it provides a series of practical suggestions for the archaeology of Iran to release it from its pitfalls. In this regard my suggestions as the conclusions of this thesis concern in brief the following areas of archaeology.

1-(a) archaeology should be free of political and ideological constraints; (b) archaeologists should attempt to provide a critical evaluation of archaeology in the past, for a better understanding of the mechanisms of the various political, social, economic, and ideological factors affecting the formation of archaeology in the present; (c) archaeologists should be aware of the misuse of archaeological evidence and interpretation; (d) they must challenge the domination by traditional archaeologists; (e) they must equip themselves with the new thoughts on archaeology both in theory and in field methods.

2-Iranian archaeology to be released from its present situation, needs to adopt the new ideas on archaeology from World Archaeology. It can be done by translating the relevant issues into the Iranian language and sending students of archaeology to the West. At the same time archaeological training programmes in the country itself should be revised to reflect such interests.

3-Archaeologists should attempt to bring archaeology into the public realm. This kind of consideration will have some advantages: (a) archaeology has a role in the social, economic, and political debates in society; (b) archaeological researches relate to public needs; (c) public awareness of archaeology will preserve archaeological material and will salvage it from the present dangerous threats of destruction; (d) publicly funded archaeology will free archaeology from the above mentioned controls; (e) it will promote the role of archaeology in education. Thus the concept of Archaeological Heritage Management must be given a top priority; for this the following are needed: (a) inclusion of archaeology in formal and informal education programmes; (b) expansion and modernising archaeological departments in the large universities; (c) emphasis on the general public's interest in archaeology, through programmes provided by academic institutions; (d) balancing the past and present by enlightening the general public on the norms and values of archaeological heritage; (e) providing a comprehensive policy for museum collections and establishing an education office in museums to link with public interest and the formal educational system; (f) providing link between mass media and archaeology to popularise archaeology.

4-Archaeology in Iran lacks technical aspects of archaeology in its fieldwork strategies; for example, archaeologists of this country are not familiar with the concept, aims, potential, and the utility of contemporary surface survey. Through this thesis I tried to introduce a methodology and application of such a method to the archaeology of Iran, according to the propositions that: (a) a majority of Iranian territory is still archaeologically unknown; (b) survey data can represent a wide range of perspective of regional patterns, (c) large scale excavation may destroy the sites especially in the areas where the excavation teams are unprofessional, but survey does not; (d) survey data is equally important and reliable as excavation data; (e) collecting survey data is more economical than excavation data.

5-The case study chosen to evaluate the potential of Iranian was the Palaeolithic, the present state of this period in Iran shows that, in comparison to the other periods of archaeology, Palaeolithic archaeology has attracted less attention, in terms of excavation, research, training programmes, and publication. Regarding the Palaeolithic period, there are exist several important problems: (a) except a small portion of the country located in the Zagros area (Western Iran), in terms of Palaeolithic data, the other parts of the country are still completely unknown; (b) the study of environmental and palaeoenvironmental data has not found its way into any archaeological research circulation; (c) uncertainty in the chronological sequences of Palaeolithic data; (d) the absence of any advanced dating methods; (e) destruction of Palaeolithic sites and the lack of a meaningful definition of Palaeolithic sites; (f) the failure to teach the Palaeolithic as an independent unit at universities; (h) a complete isolation of Iranian Palaeolithic archaeology from the advanced methodological and theoretical issues of World Archaeology.

In fact, any development of Palaeolithic studies need to be seen in connection with the general development of archaeology in this country which will remove some of those problems. Top priority in Palaeolithic research should be given to the study of human origins in Iran and of early Homo, to solve problems of human evolution. Such interest has long been developed in the areas neighbouring Iran such as the Levant, Central Asian countries, Pakistan and India, pointing to the Near East as the geographical crossroads between Africa, Asia, and Europe as certainly a main route for the dispersal of the earliest hominids. A major problem in human evolution is whether the earliest hominids evolved in Africa and spread eastward, or evolved independently in Southeast Asia and perhaps spread westward, or both. Answers can only be speculative until reliably dated materials are found in Late Pliocene or Early Pleistocene deposits in Southeast Asia, but the suggestion of human migration and contact between Africa and India is a strong one (particularly in the Acheulian period). If it is the case, Lower Palaeolithic sites must exist in the area. The country of Iran presents a obvious corridor; a connecting link between the Far East, and the Near East and beyond. The similarity between mammals and primates (including hominids), of Africa, Europe and Asia from, at least Miocene times onward, is strongly suggestive of international migrations. From Plio-

Pleistocene time the likely land-link is Iran. In the historical period migratory movements and warrior's campaigns have frequently swept across its border.

6-Another problem that strikes at the heart of the matter, is the need for contact and interaction with fellow archaeologists and those working in related disciplines. Regular interaction and discussions are essential if knowledge of current research is to be maintained. The Iranian government should encourage joint research programmes between Iranian institutions and research teams from Western countries. These researchers often provide the funding and equipment for the programmes which will lead to further training of Iranian archaeologists. This, I feel, is the most practical way to help Iranian national institutions and professionals.

7-Another matter deserving attention is the need for regular and prompt publication of research results, in particular, in international journals. There has not been much of this outside of Iran. Clearly there are some difficulties in the provision of funds for printing and publication of journals, which is frustrating. Publication is however, the best way to let others know of work being done and it is essential when seeking funds for further work. Obviously, today, publication record in an European or American university is, perhaps, the most important part of a regular promotion and funding of research proposals; this should be the case in Iran as well.

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Figures

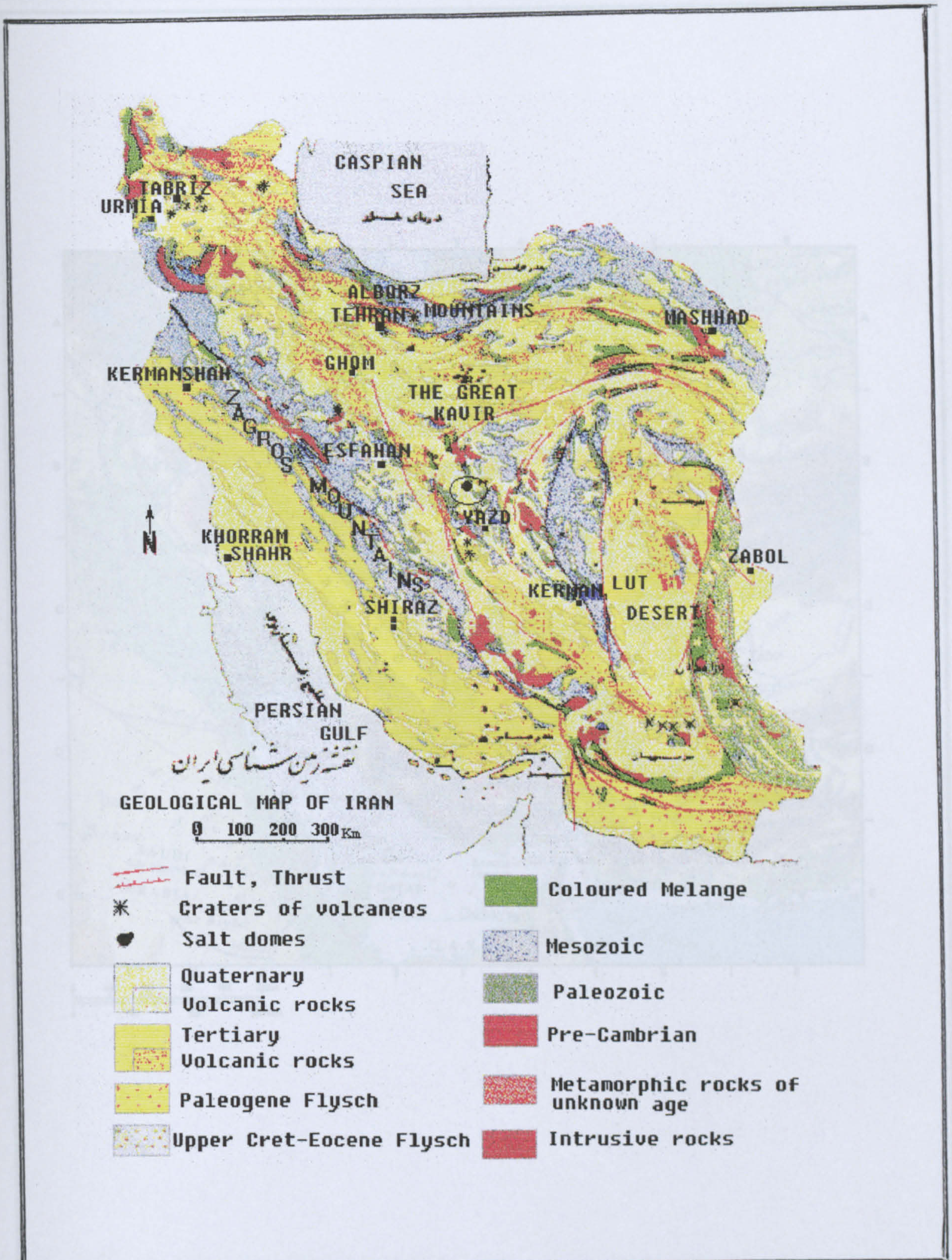


Fig.1a Geological map of Iran (From Berberian 1976)

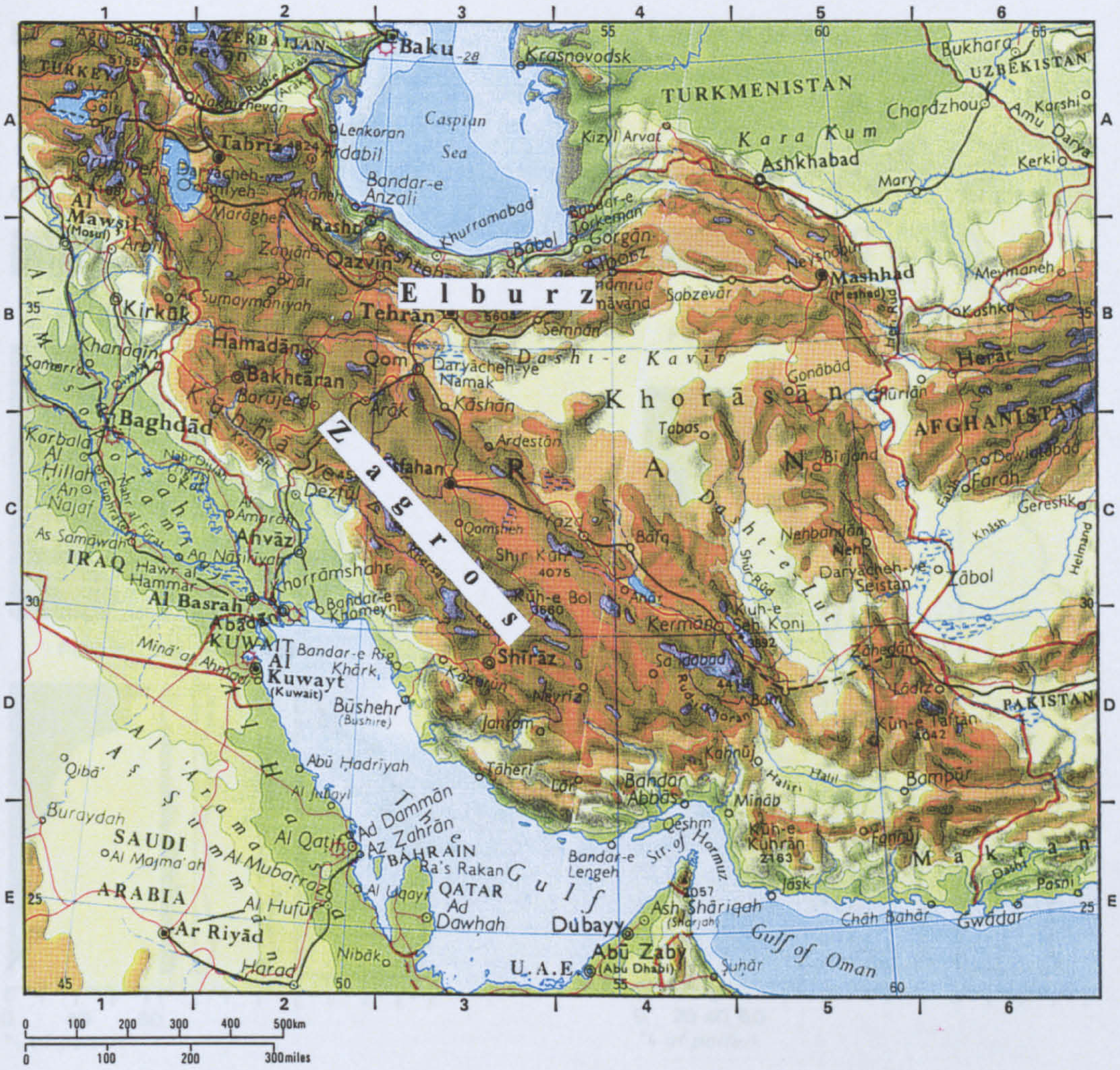


Fig. 1b Physiographic map of Iran indicating the extent of the Zagros and Elburz mountain ranges (From Philip's Encyclopedic World Atlas 1992)

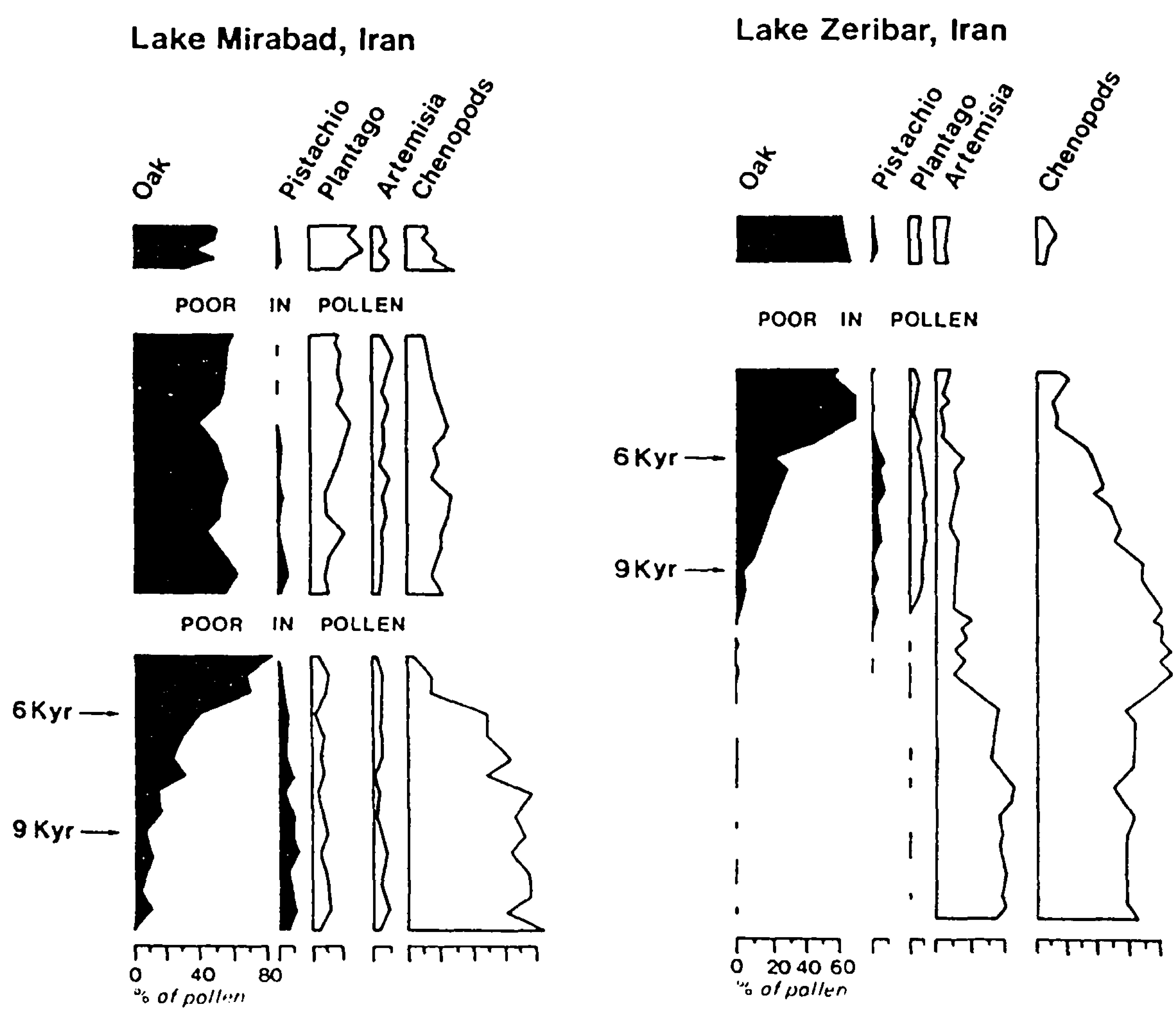


Fig. 2 Lake Zeribar and Lake Mirabad pollen diagrams (from van Zeist 1967)

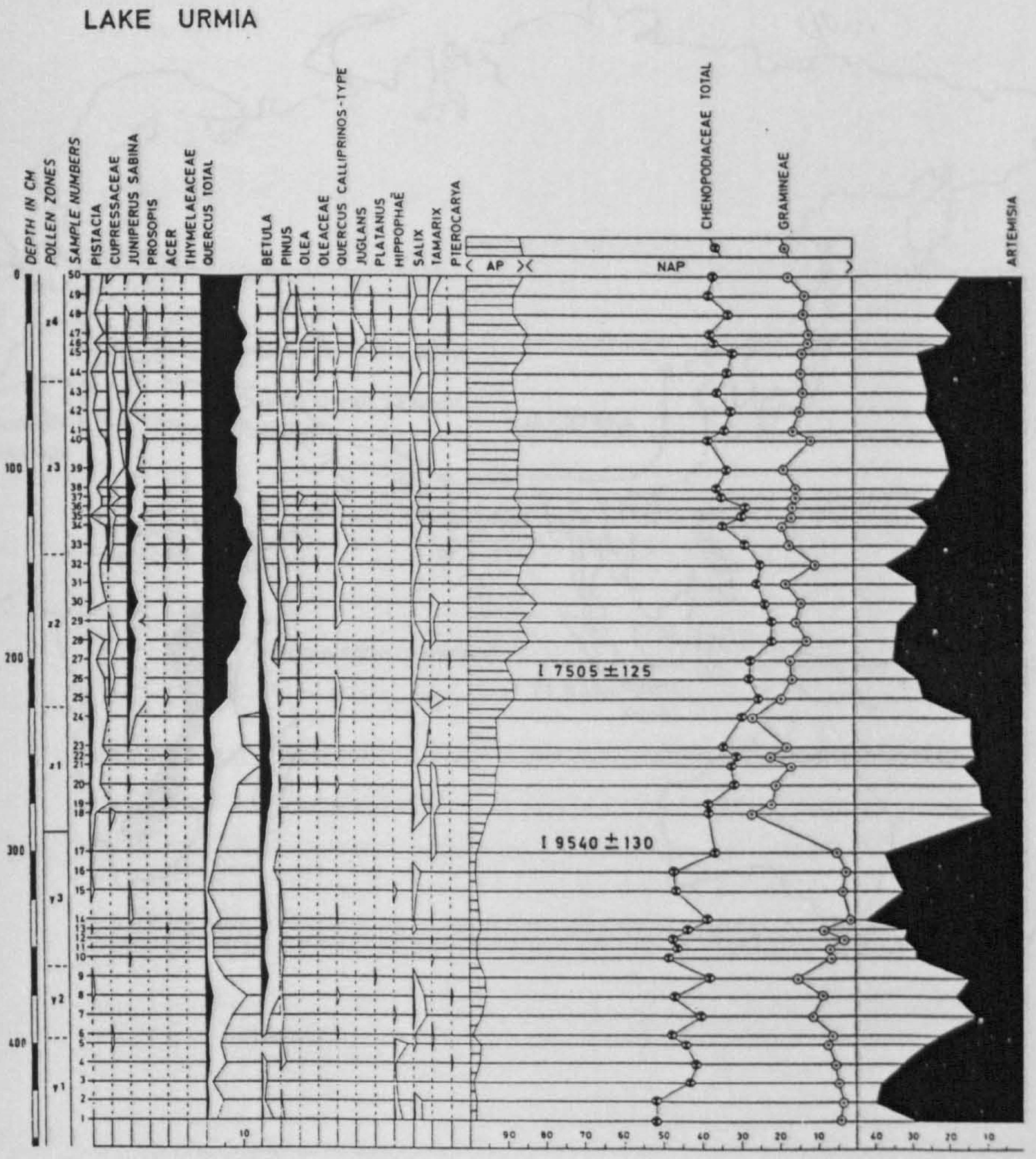


Fig. 3 Lake Urmia pollen diagram (from van Zeist and Bottema 1991)

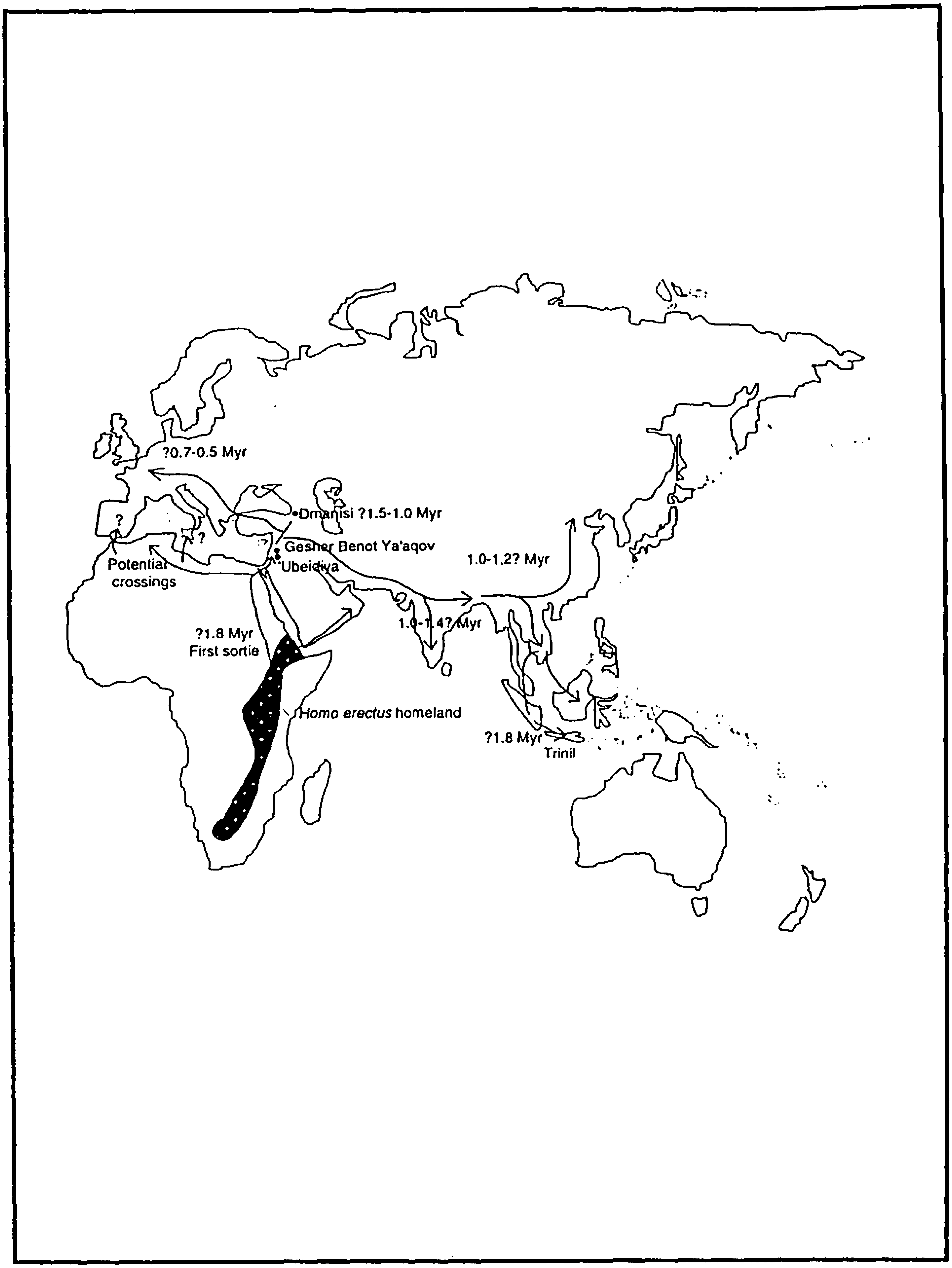


Fig. 4 A map of the Old World indicating the dates of early *Homo erectus* sites including several controversial ones (from Bar-Yosef 1994)

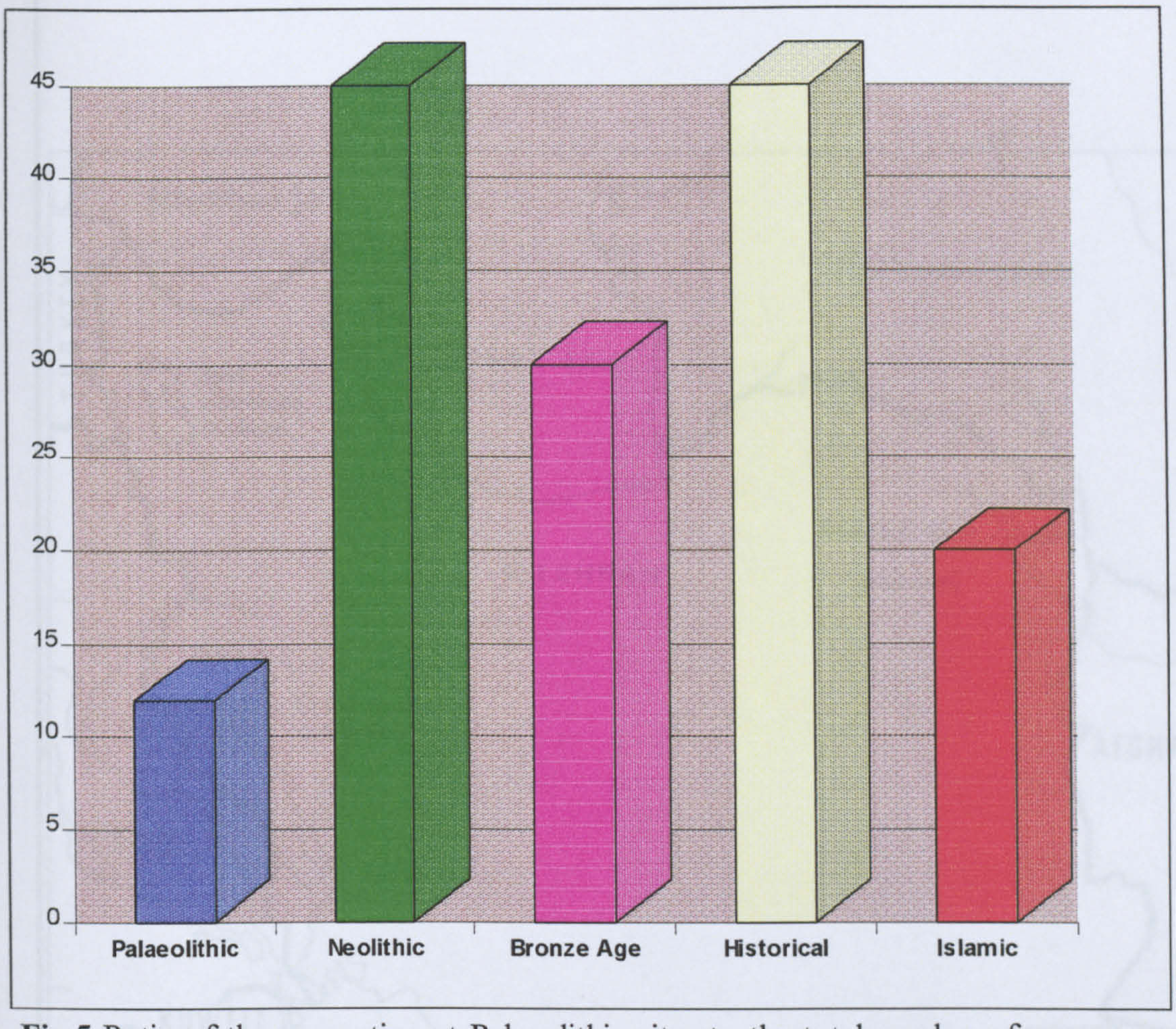


Fig.5 Ratio of the excavation at Palaeolithic sites to the total number of excavation at all periods

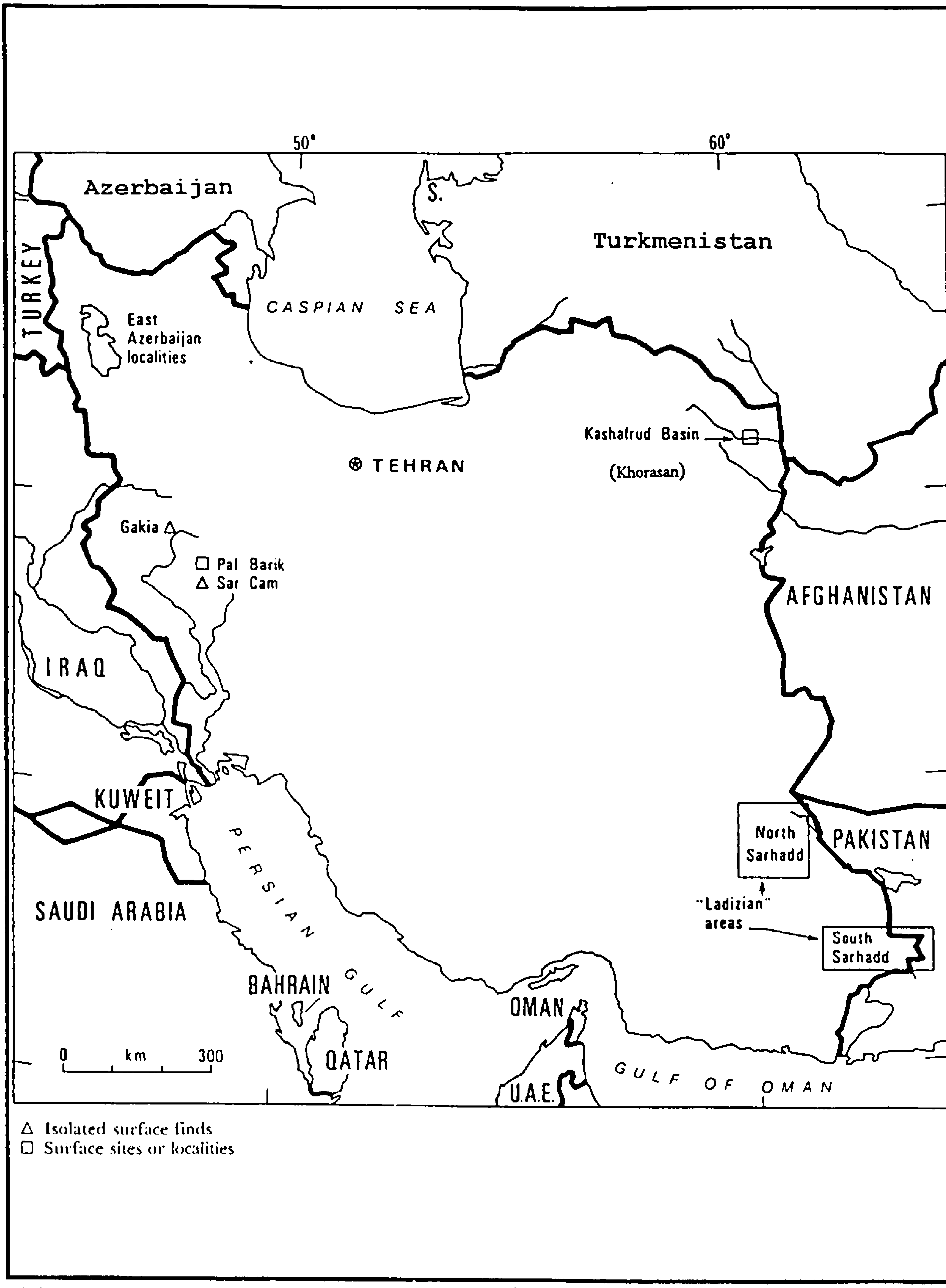
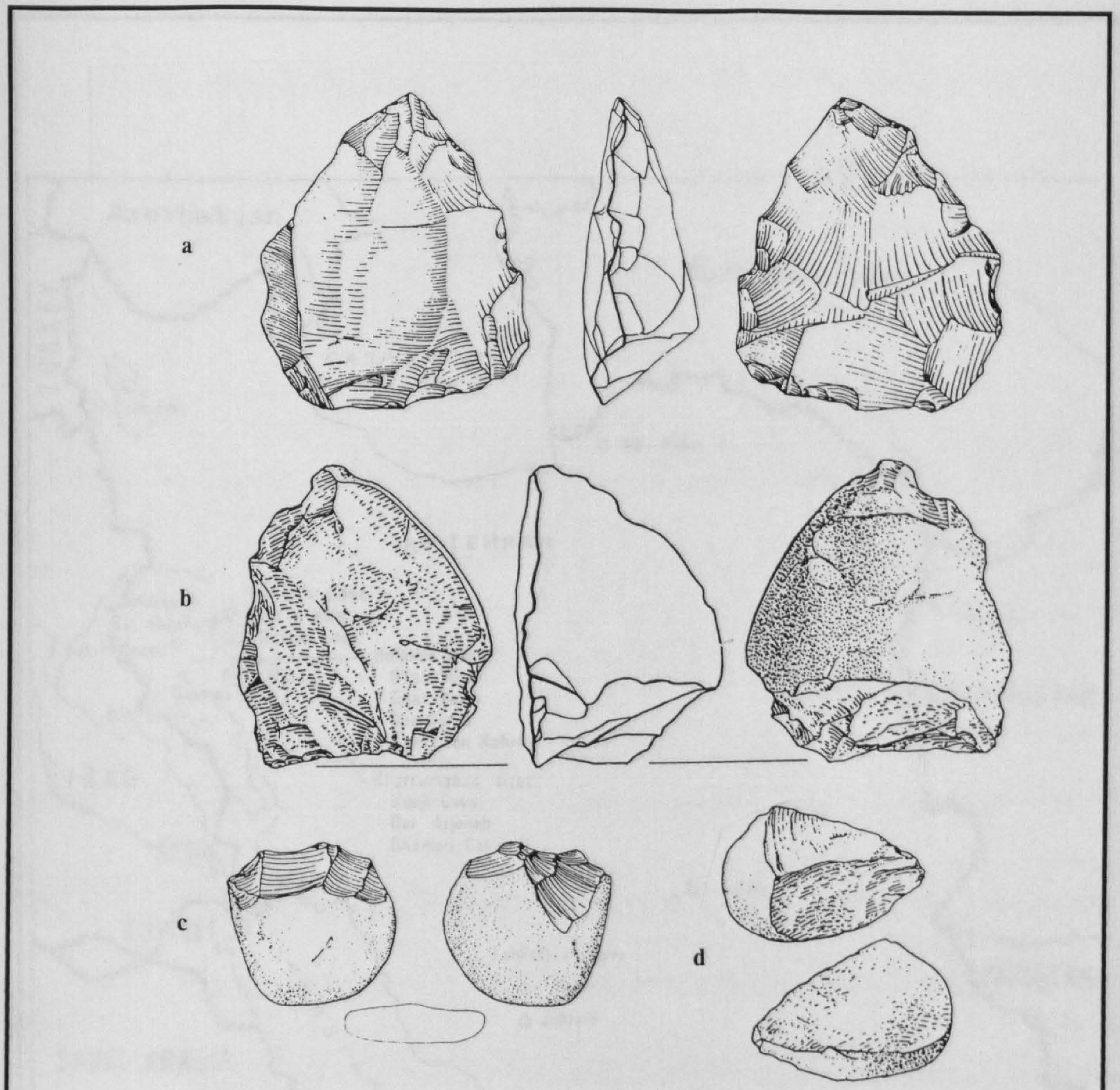


Fig. 6 Lower Palaeolithic finds in Iran (From Smith 1986)



Fi.g. 7 Selected Lower Palaeolithic artifacts: (a) hand axe (bifaces) from Pal Barik; (b) core from Kashafrud Basin; (c,d) choppers from Kashafrud Basin; (e) flake with irregular retouch from Pal Barik. (From Ariai and Thibault 1977, Mortensen1993)

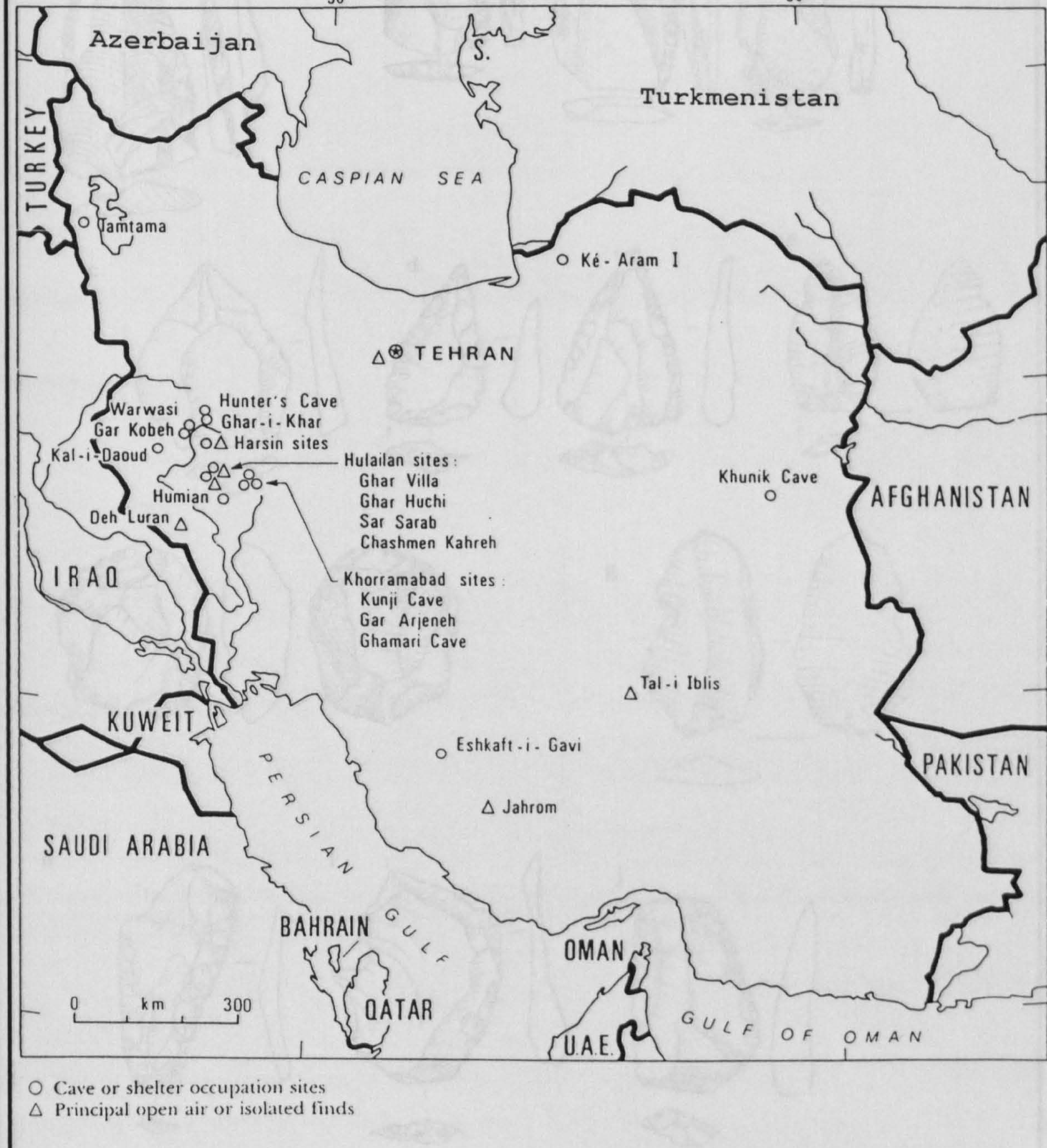


Fig. 8 Middle Palaeolithic finds in Iran (From Smith 1986)

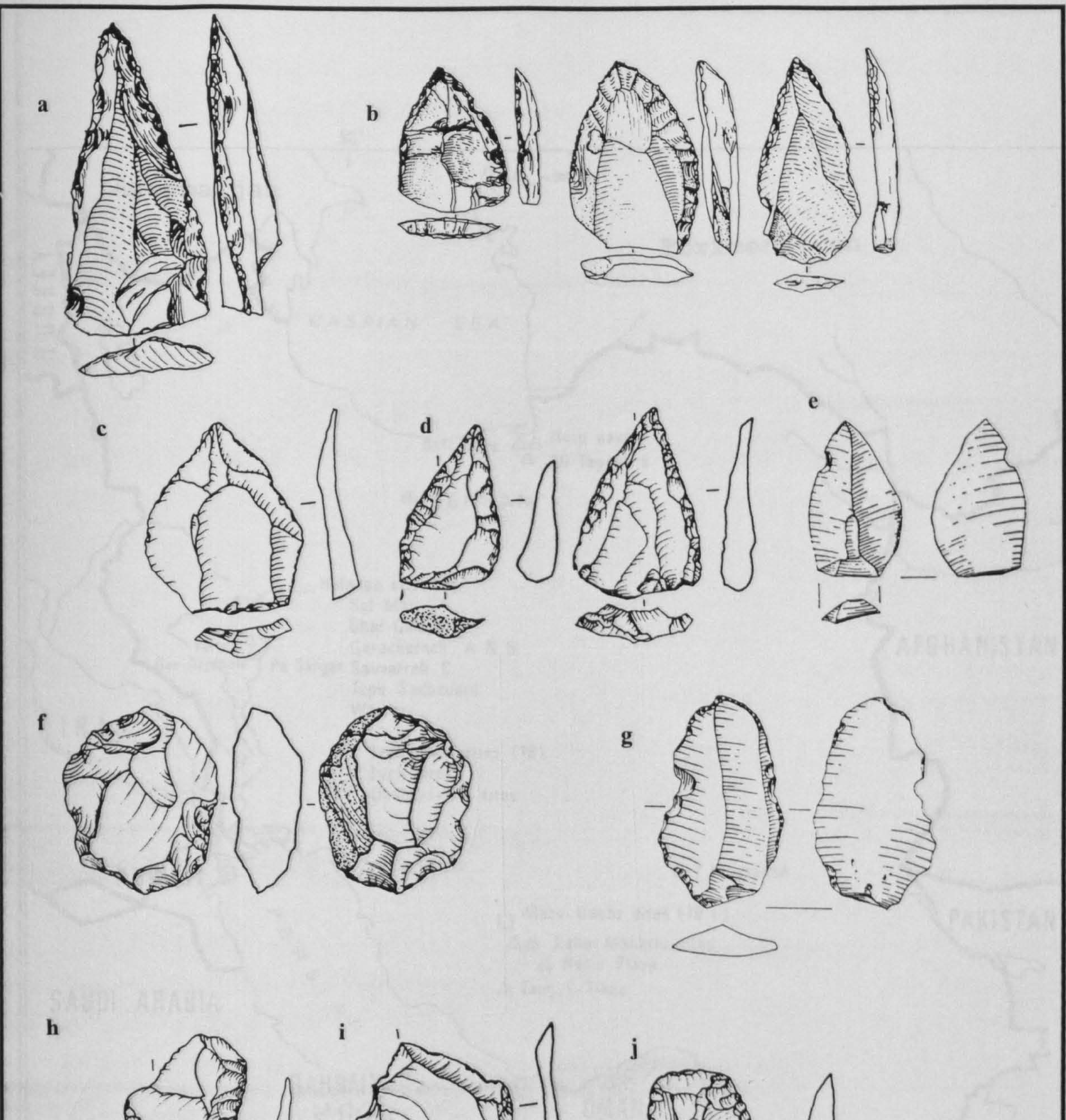


Fig. 9 Selected Middle Palaeolithic artifacts: (a) elongated Mousterian point from Shanidar; (b) typical Mousterian point from Gar-i-Khar; (c,d,e) Levallois points from Hulailan Valley, Gar-i-Khar, Kunji Cave; (f) core from Hulailan Valley; (g) notched flake from Hulailan Valley; (h,i,j)scrapers from Kunji Cave. (From Mortensen 1993, Hole and Flannery 1967; Smith 1986)

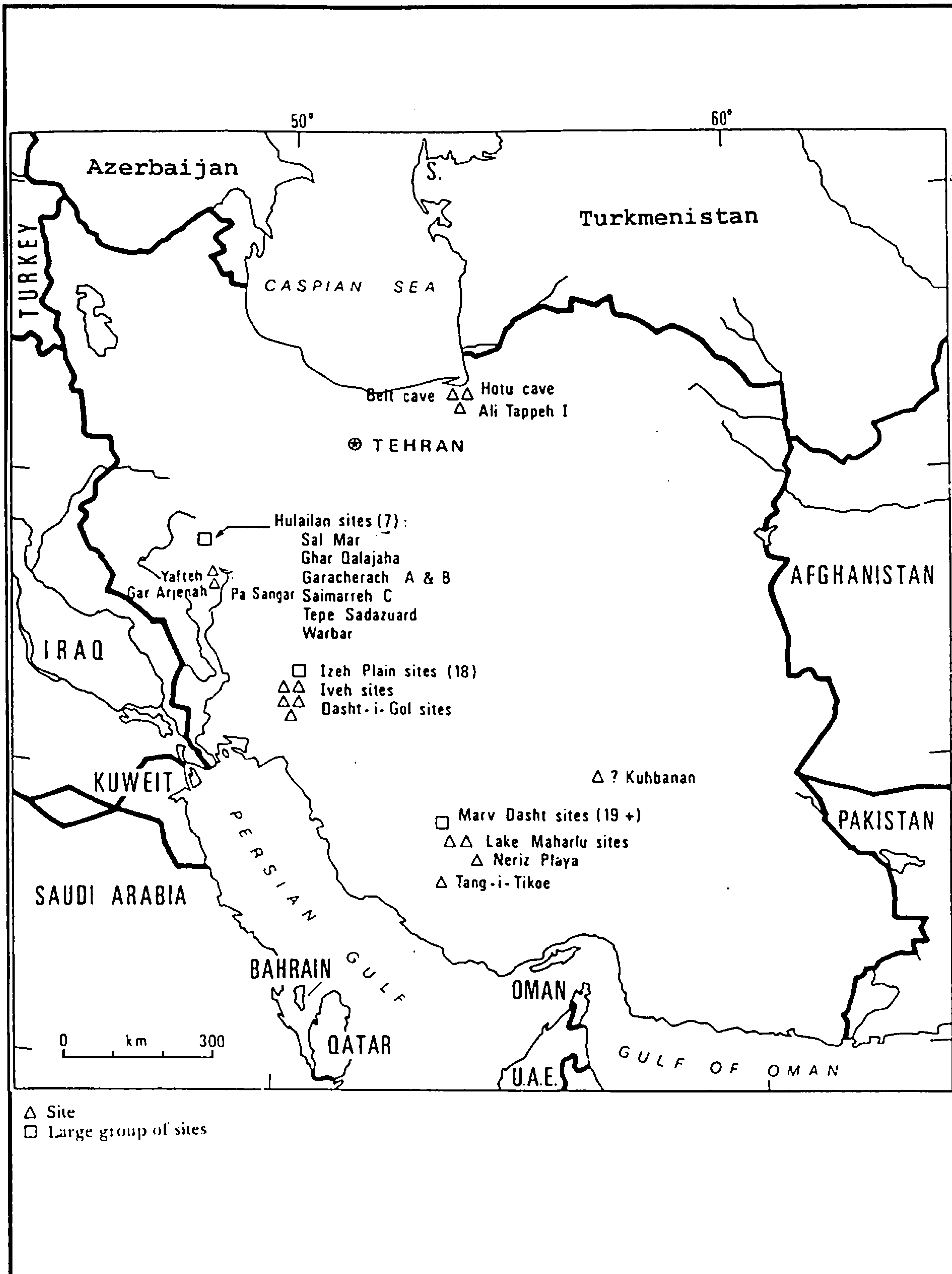


Fig. 10 Upper and Epi-Palaeolithic finds in Iran (except Zarzian) (From Smith 1986)

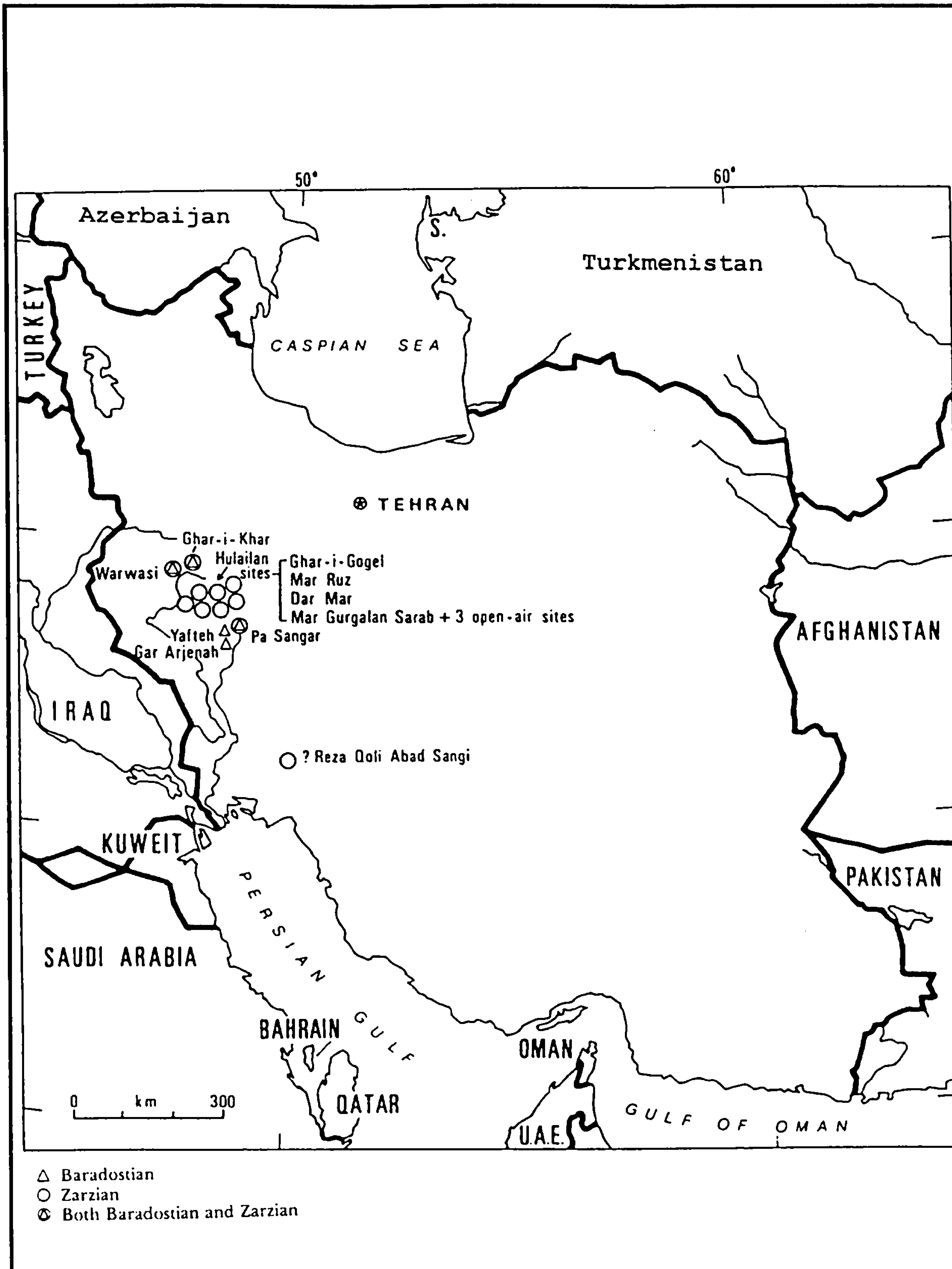


Fig. 11 Upper and Epi-Palaeolithic finds in Iran (Baradostian and Zarzian) (From Smith 1986)

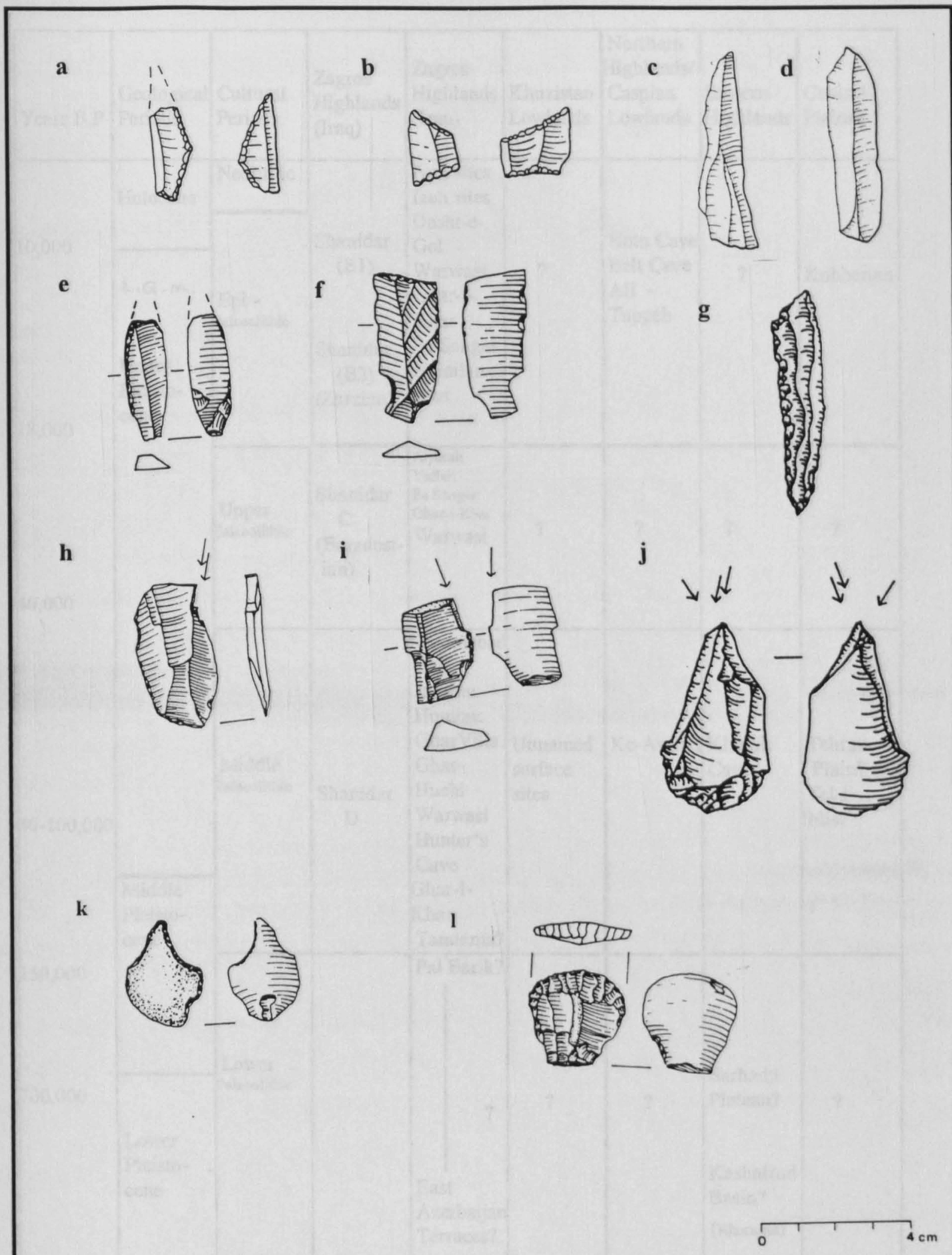


Fig.12 Selected Upper and Epi-Palaeolithic artifacts: (a,b) geometric microliths from Hulailan Valley; (c,d) micro blades from Warwasi; (e) backed bladelet from Khorramabad sites; (f) retouched blade from Khorramabad sites; (g) denticulated blade from Warwasi; (h,i,j)burins from Gar-i-Khar, Warwasi); (k) borer from Hulailan Valley; (l) scraper from Warwasi..(From Mortensen 1993, Olszewski 1993, Hole and Flannery 1967, Smith 1986)

Years B.P	Geological Periods	Cultural Periods	Zagros Highlands (Iraq)	Zagros Highlands (Iran)	Khuzistan Lowlands	Northern Highlands/ Caspian Lowlands	Eastern Highlands	Central Plateau
	Holocene	Neolithic						
10,000 18,000	L.G.M. Upper Pleisto-cene	Epi - Palaeolithic	Shanidar (B1) Shanidar (B2) (Zarzian)	Iveh sites Izeh sites Dasht-e-Gol Warwasi Ghar-i-Khar Pa Sangar Hulailan-sites	?	Hotu Cave Belt Cave Ali - Tappeh	?	Kuhbanan
40,000		Upper Palaeolithic	Shanidar C (Baradost-ian)	Arjenah Yafteh Pa Sangar Ghar-i-Khar Warwasi	?	?	?	?
80-100,000	Middle Pleisto-cene	Middle Palaeolithic	Shanidar D	Khramabad sites Jahrom Humian GharVilla Ghar-Huchi Warwasi Hunter's Cave Ghar-i-Khar Tamtama?	Unnamed surface sites	Ke-Aram I	Khunik Cave	Tehran Plain? Tel-i-Iblis?
150,000 700,000 1,800,000	Lower Pleisto-cene	Lower Palaeolithic		Pal Barik? ? East Azerbaijan Terraces?	?	?	Sarhadd Plateau? Kashafrud Basin? (Khorasan)	?

Fig. 13 A synthesis of the Iranian Palaeolithic. Chronological subdivisions are not to scale and positions of individual sites within the cultural periods are only approximate.

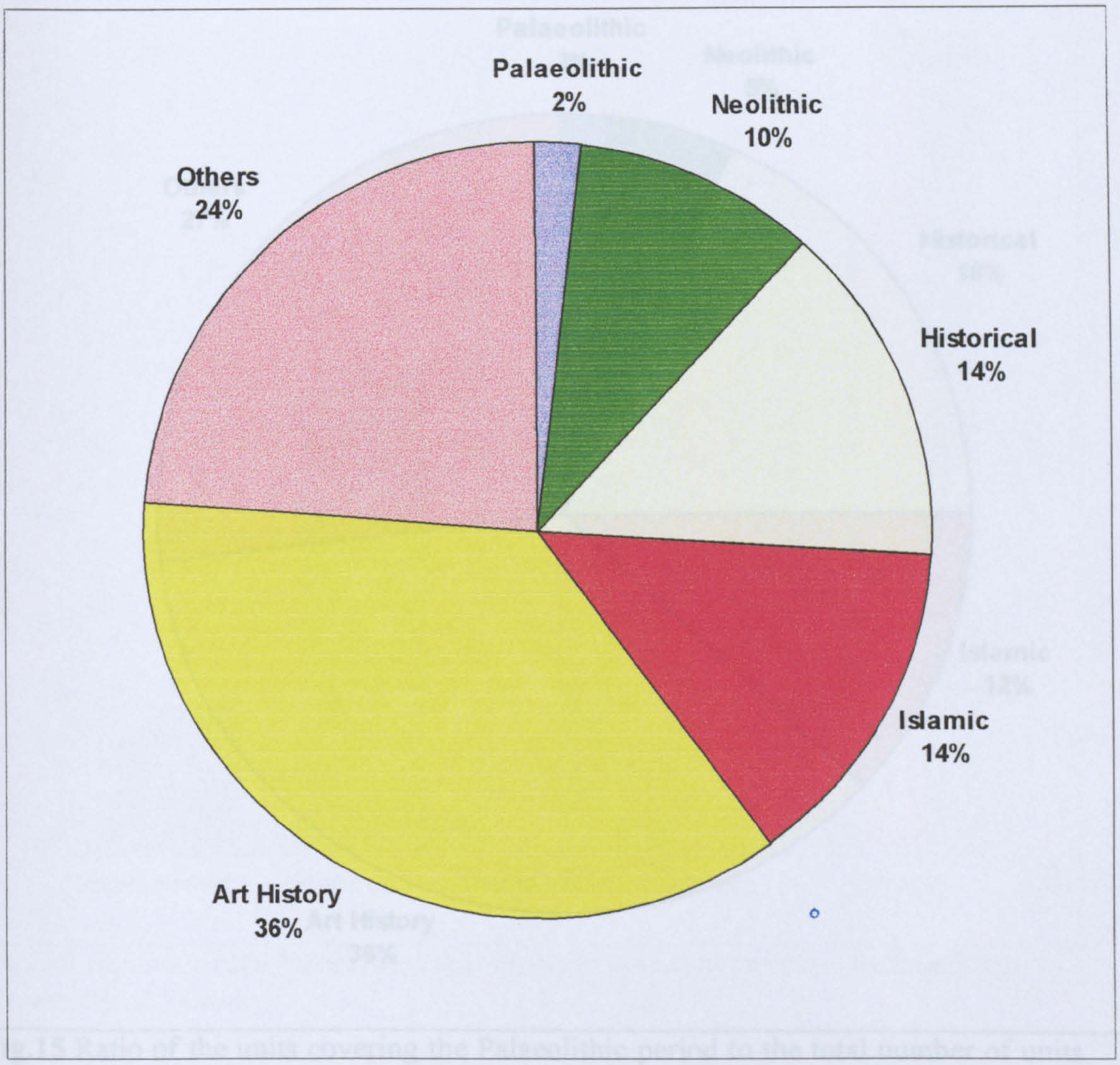


Fig. 14 Ratio of the units covering the Palaeolithic period to the total number of units taught for M A students in the Department of Archaeology- University of Tehran

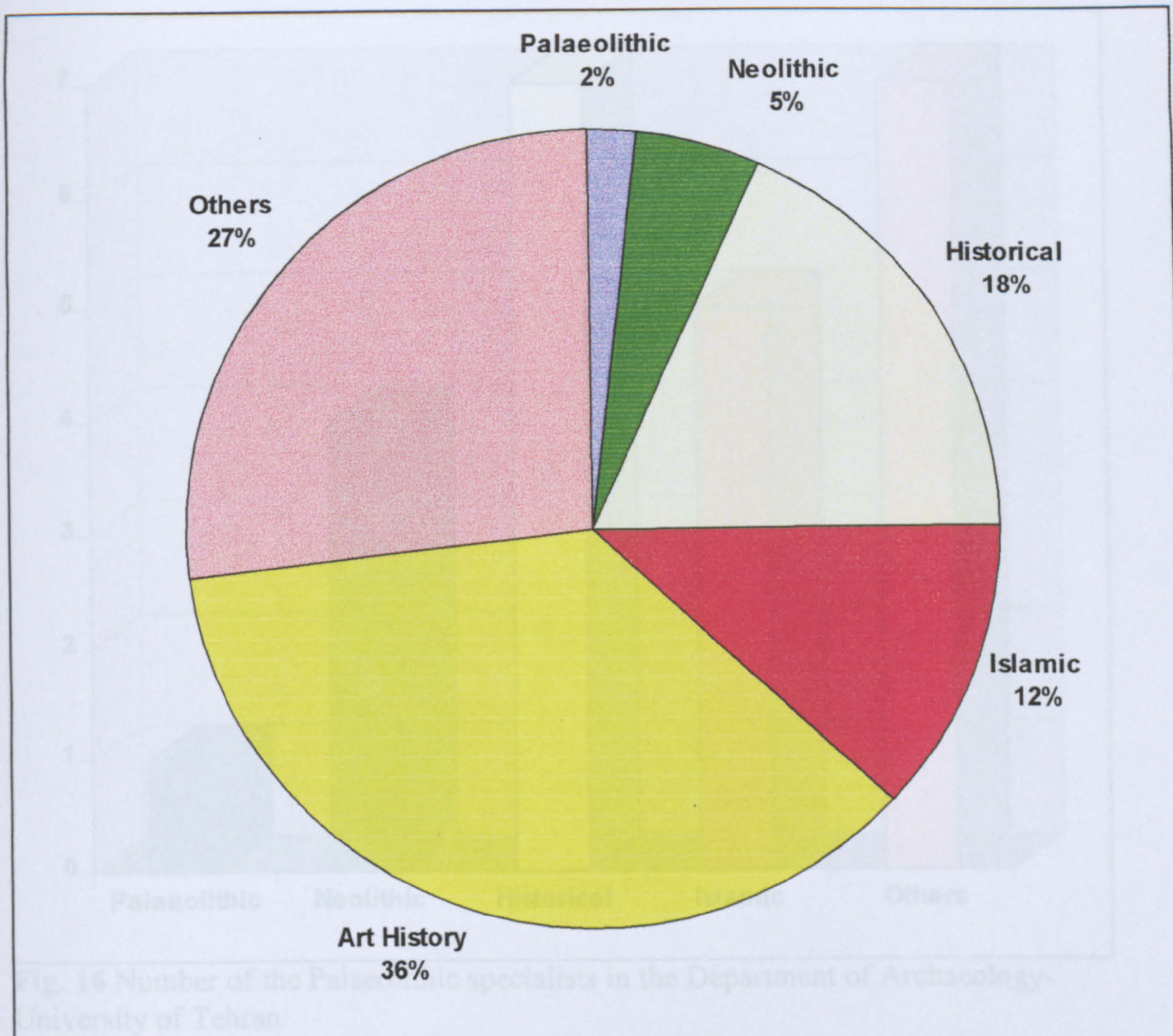


Fig.15 Ratio of the units covering the Palaeolithic period to the total number of units taught for B A students in the Department of Archaeology- University of Tehran

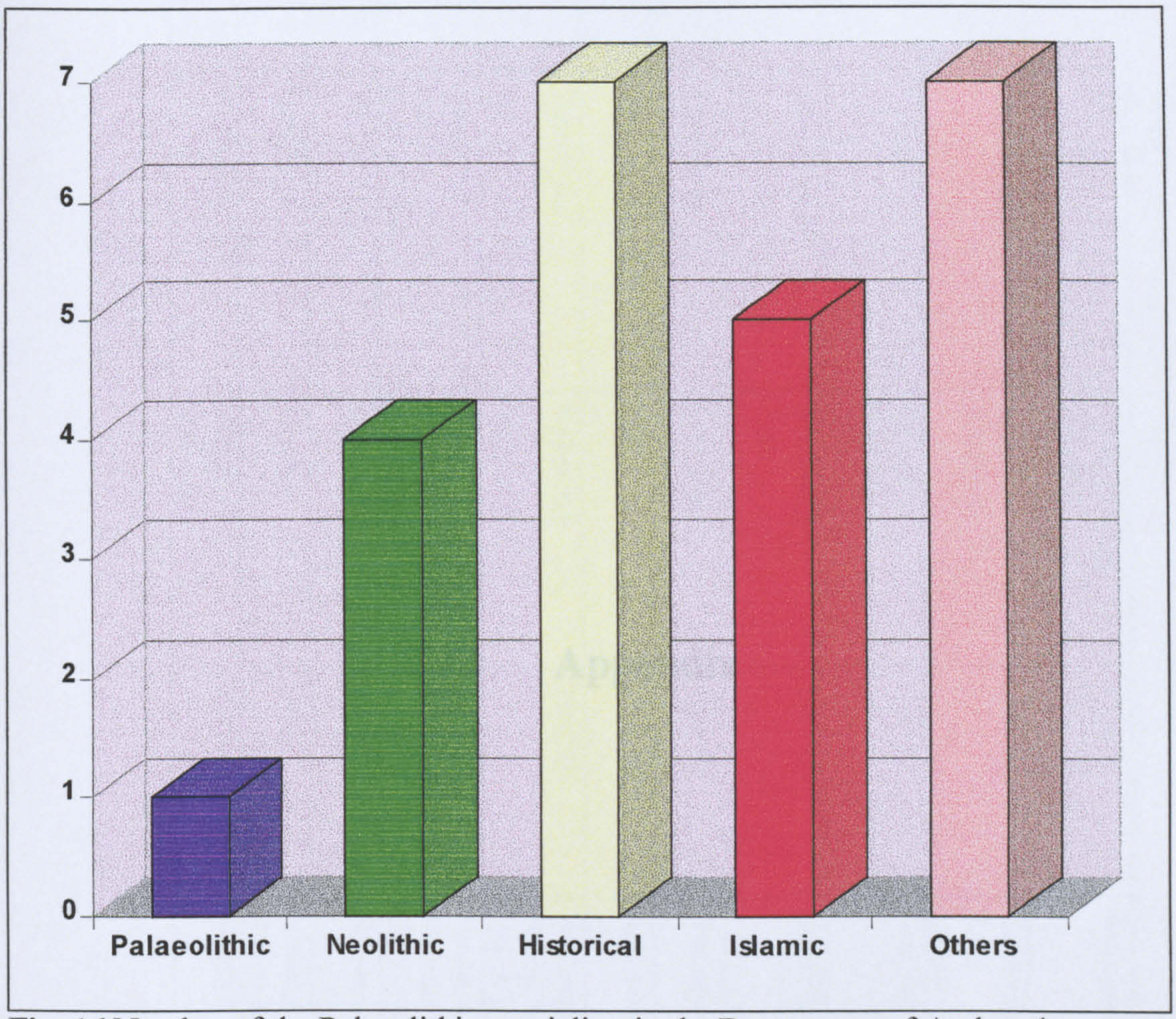


Fig. 16 Number of the Palaeolithic specialists in the Department of Archaeology-University of Tehran

Appendix

Table 1 Major excavation programs in Iran from 1898 to 1978 (From Negahban 1997)

	Site	Geographical Location	Date of Excavation	Archaeological Periods	Organiser and Funder (Universities; Institutes; Museums)	Excavation Director(s) and Nationality
1	Ancient Susa	Susa Khuzistan	1898-1940	Achaemenid (550-331 B.C.) Islamic	Delegation Française en Perse	deMorgan deMaquenme French
2	Musian	Musian Luristan	1905	Neolithic	Delegation Française en Perse	Gautier, Lamper French
3	Tell-e-Bakon	Marvdasht Fars	1928-33	Neolithic	Oriental Institute of Chicago University	Herzfeld (German); Langsdroff and McCown (American)
4	Tepe Hissar	Damghan	1931-36	Neolithic	University Museum of Pennsylvania	Schmidt American
5	Takht-i- Jamshid	Fars	1935-39	Achaemenid	University Museum of Pennsylvania	Herzfeld , Schmidt American
6	Tepe Giyan	Nahavand	1931-32	Neolithic Bronze Age Iron Age	Louvre Museum	Ghirshman French
7	Djuvi Bohlan Djaffar Abad	Khuzistan	1931-37	Neolithic Elamite (2200-640 B.C.)	Louvre Museum	Le Breton French
8	Turang Tepe	Gurgan	1931	Bronze and Iron Age	University Museum of Pennsylvania	Wulsin American
9	Shah Tepe	Gurgan	1932	Neolithic Bronze Age	Swedish Institute of Natural History	Arne Swedish
10	Nishapour	Nishapour Khorasan	1932-34	Islamic	Metropolitan Museum	Wilkinson American

11	Takht-i-Abounasr	Fars	1932-34	Sasanid (224-624 A.D.)	Metropolitan Museum	Wilkinson and Upton American
12	Tepe Sialk	Kashan	1933-34	Neolithic Bronze Age	Louvre Museum	Ghirshman French
13	Cheshmeh Ali	Ray Tehran	1934-36	Neolithic	Boston Museum of Fine Art and University museum of Pennsylvania	Schmidt American
14	Bishapour	Kazeron Fars	1934-40	Sasanid	Louvre Museum	Ghirshman French
15	Estakhr	Fars	1935	Achaemenid Sasanid Islamic	Oriental Institute of Chicago University	Schmidt American
16	Ray	Tehran	1935	Islamic	University Museum of Pennsylvania	Schmidt American
17	Susa	Susa Khuzistan	1946-51	Elamite Achaemenid	Louvre Museum The French National Research Centre (C.N.R.S)	Ghirshman French
18	Takht-i- Jamshid Pasargad Naghsh-i- Rostam	Fars	1939-51 1968-73	Achaemenid Sasanid	Archaeological Centre of Iran	Ravanbod; Behnam; Sami; Tadjvidi Iranian
19	Hassanlu	Naghadeh West Azerbaijan	1947	Bronze and Iron Age	Archaeological Centre of Iran	Hakemi and Rad Iranian
20	Goy Tepe	West Azerbaijan	1948	Bronze and Iron Age	University of Manchester	Brown British
21	Gang Tepe	Karaj Tehran	1949	Iron Age	Archaeological Centre of Iran	Hakemi Iranian
22	Hoto, Kamarb and Tamtameh Caves	Caspian Shore Mazandaran	1949-51	Palaeolithic; Neolithic	University Museum of Pennsylvania	Coon American

23	Marvdasht; Teymoran; Jari; Shogha	Marvdasht Fars	1951-55	Neolithic	Gent University	Vanden Berghe Belgian
24	Choghazanbil	Haft Tepe Kuzistan	1951-62	Elamite	Louvre Museum and C.N.R.S	Ghirshman French
25	Kurvin; Agin Dojin Tepe	Karaj Tehran	1954	Bronze and Iron Age	Gent University	Vanden Berghe Belgian
26	Tell-e- Bakon	Marvdasht Fars	1956	Neolithic	University of Tokyo	Egami Japanese
27	Hassanlu	Naghadeh West Azerbaijan	1958-1975	Bronze and Iron Age	University Museum of Pennsylvania	Dyson American
28	Tepe Djalian	Fars	1958	Neolithic Bronze Age	Archaeological Centre of Iran	Tavalloli Iranian
29	Tepe Ismail Abad	Abyek Karaj	1958-59	Neolithic	Archaeological Centre of Iran	Hakemi Iranian
30	Hassanlu	Naghadeh West Azerbayjan	1958-78	Bronze Iron Age	University Museum of Pennsylvania	Dyson American
31	Turang Tepe	Gurgan	1959 1964-78	Achaemenid Sasanid	University of Lyon	Deshayes French
32	Takht-e- Soleiman	Tekab West Azerbaijan	1959 1968-1978	Iron Age; Achaemenid Sasanid; Islamic	Upsala University and German Archaeological Institute in Iran	von der Osten; Noumann; Huff German
33	Tepe Asiab and Sarab	Kermanshah	1960-61-	Neolithic	Oriental Institute of Chicago University	Braidwood American
34	Papilah; Pahvandeh; Zaghee	Luristan Khuzistan	1960	Palaeolithic Neolithic	Oriental Institute of Chicago University	Field American
35	Yarim Tepe	Gurgan	1960	Bronze Age	British Archaeological Institute in Iran	Stronach British
36	Ghale Kuti	Deylaman Gilan	1960	Iron Age	University of Tokyo	Egami and Fukai Japanese

37	Kabr-e- Sheykhan	Dezful Khuzistan	1960	Neolithic	University Museum of Pennsylvania	Weiss American
38	Tepe Guran	Luristan	1961-67	Neolithic		Mortensen Danish
39	Ali Kosh	Dehluran	1961-63	Neolithic	Rice University	Hole American
40	Choghamish	Kuzistan	1961 1964-78	Neolithic Bronze Age	Oriental Institute of Chicago University	Delougaz and Cantor American
41	Yanik Tepe	West Azerbaijan	1961-62	Bronze and Iron Age	University of Manchester	Burney British
42	Pasargad	Pasargad Fars	1962-63	Achaemenid	British Archaeological Institute in Iran	Stronach British
43	Goben Calouraz	Roudbar Gilan	1963-68	Bronze and Iron Age	Archaeological Centre of Iran	Hakemi Iranian
44	Tepe Aghrab	West Azerbaijan	1964	Bronze and Iron Age	University Museum of Pennsylvania	Muscarella American
45	Shahr-e- Sokhta	Zabol Sistan	1964-78	Bronze Age	I.S.M.E.O	Tosi Italian
46	Susa	Susa Khuzistan	1964-78	Elamite Achaemenid Islamic	Louvre Museum and C.N.R.S	Ghirshman; Stive; Parot French
47	Haft Tepe	Haft Tepe Khuzistan	1964-1979	Elamite	Archaeological Centre of Iran and University of Tehran	Negahban Iranian
48	Gang-e- Dareh	Harsin Kermanshah	1965-74	Neolithic	University of Montreal	Smith Canadian
49	Luristan Cemeteries	Luristan	1965-78	Bronze and Iron Age	Gent University	Vanden Berghe Belgian
50	Ghale-e-Yazd-e-Gird	Rijab Kermanshah	1965-78	Parthian (250 B.C.-224 A.D.) Sasanid	Royal Ontario Museum	Keal Canadian

51	Sarmasjid	Masjid Soleiman Khuzistan	1965-69	Achaemenid	Iranian Oil Company	Ghirshman French
52	Kunji and Pasangar ... Caves	Luristan	1965-69	Palaeolithic	Rice University	Hole; Speth American
53	Ke-Aram I;Ali Abad Humian survey	Caspian Shore Mazandaran Zagros Area	1964, 1968 1969	Upper Palaeolithic Middle Palaeolithic	Cambridge University	McBurney British
54	Tell-e-Iblis	Bardsir Kerman	1965-67	Neolithic Bronze Age	Illinois State University	Caldwell American
55	Bampour	Sistan	1966	Bronze Age	University of Cambridge and Royal Asiatic Society	de Cardi British
56	Bistun	Kermanshah	1966-67	Achaemenid; Sasanid Islamic	German Archaeological Institute in Iran	German
57	Siraf	Bushehr	1966-74	Sasanid Islamic	British Museum and Royal Ontario Museum	Whitehouse British
58	Godin Tepe	Kangavar Kermanshah	1967-78	Bronze and Iron Age	Royal Ontario Museum University of Toronto	Young Canadian
59	Tepe Sehgabi	Malayer	1967-77	Neolithic	Royal Ontario Museum University of Toronto	Levine Canadian
60	Haji Firouz Tepe	West Azerbaijan	1967-74	Neolithic	University Museum of Pennsylvania	Dyson; Young (American); Voight (British)
61	Shahr-i- Qumis	Damghan	1967-78	Parthian	British Archaeological Institute in Iran British museum	Stronach and Hansman British
62	Tepe Yahya	Kerman	1967-78	Neolithic Elamite	Peabody Museum University of Harvard	Lamberg-Karlovsky American
63	Bishapour	Kazeron Fars	1968-74	Sasanid Islamic	Archaeological Centre of Iran	Sarfaraz Iranian

64	Masjid Jamae Esfahan	Esfahan	1968-75	Islamic	I.S.M.E.O	Galdiri Italian
65	Haftwan Tepe	Salmas West Azerbayjan	1968-78	Bronze and Iron Age Medes (Iron Age); Achaemenid Sasanid	University of Manchester	Burney British
66	Dasht-i-Deh	Kerman	1968-72	Islamic	Peabody Museum , University of Harvard	Williamson American
67	Shahdad	Kerman	1969-74	Neolithic	Archaeological Centre of Iran	Hakemi and Kaboli Iranian
68	Geytariyeh	Tehran	1969	Iron Age	Archaeological Centre of Iran	Kambakhsh Fard Iranian
69	Masjid Jamae Saveh	Saveh	1969-73	Islamic	Archaeological Centre of Iran	Mousavi Iranian
70	Tepe Abdolhossain	Luristan	1969-78	Neolithic	University of London	Pullar British
71	Tepe-e-Sohz	Behbahan Khuzistan	1969	Neolithic	Berlin Open University Oriental Institute of Chicago University	Nissen American
72	Bastam	Khoy West Azerbayjan	1970-78	Urartu	German Archaeological Institute in Iran	Kleiss German
73	Ghubayra	Bardsir Kerman	1970-75	Sasanid Islamic	University of London Percival David Foundation and Royal Ontario Museum	Bivar and Fehervari British
74	Sagz Abad	Ghazvin	1970-79	Neolithic	Archaeological Centre of Iran and University of Tehran	Negahban Iranian
75	Zagheh	Ghazvin	1970-79	Neolithic	Archaeological Centre of Iran and University of Tehran	Negahban and Shahmirzadi Iranian

76	Ghabrestan	Ghazvin	1970-79	Bronze and Iron Age	Archaeological Centre of Iran and University of Tehran	Negahban and Madjid Zadeh Iranian
77	DjaffarAbad Djuvi Bohln Bendebal	Susa Khuzistan	1970-78	Neolithic	Louvre Museum and C.N.R.S	Dollfus French
78	Choga Gavaneh	Islam Abad Kermanshah	1970-71	Bronze and Iron Age	Archaeological Centre of Iran	Kordovani Iranian
79	Bandak Siyah	Borazjan Boushehr	1970	Achaemenid	Archaeological Centre of Iran	Sarfaraz Iranian
80	Tepe Hissar	Damghan	1970	Neolithic	University Museum of pennsylvania	Dyson American
81	Tepe Sang-e-Caxmag	Shahroud	1971-78	Neolithic Bronze Age	University of Tosokuba	Masuda Japanese
82	Tepe Malyan	Fars	1971-78	Neolithic Bronze Age Elamite	University Museum of Pennsylvania	Sumner American
83	Kordlar Tepe	Urmia West Azerbayjan	1971-78	Bronze and Iron Age	University of Insbrug	Lippert Austerian
84	Gurgan	Gurgan	1973-78	Islamic	Archaeological Centre of Iran	Kyani Iranian
85	Masjid Jamae Ghazvin	Ghazvin	1974	Islamic	Archaeological Centre of Iran	Shahid Zadeh Iranian
86	Hormoz Island	Hormozgan	1974-78	Sasanid Islamic	Archaeological Centre of Iran	Bakhtyari Iranian
87	Siraf	Boushehr	1974--75	Sasanid Islamic	Archaeological Centre of Iran	Bakhtyari Iranian
88	Sang-e- Shir	Hamadan	1974-75	Parthian	Archaeological Centre of Iran	Azarnoush Iranian

89	Ancient Esfahan	Esfahan	1974	Islamic	Archaeological Centre of Iran	Kordovani Iranian
90	Bibi Shahrbano	Ray Tehran	1975-78	Sasanid Islamic	Archaeological Centre of Iran	Adl and Kosari Iranian
91	Eshkaft Gavi	Fars	1975	Palaeolithic		Rosenberg American
92	Ziwiye	Sakez Kurdestan	1976-78	Iron Age	Archaeological Centre of Iran	Motamedi Iranian
93	Tepe Nour	Soltanyeh Zanjan	1976-78	Islamic	Archaeological Centre of Iran	Gandjavi Iranian
94	Halimajan	Roud Bar Gilan	1976-78	Bronze and Iron Age	University of Tokyo	Fukai Japanese
95	Sang-e-Syah	Borazjan Boushehr	1977	Achaemenid	Archaeological Centre of Iran	Yaghmaii Iranian
96	Bistun	Bistun Kermanshah	1977-78	Sasanid	Archaeological Centre of Iran	Rahbar Iranian
97	Elam Cemetery	Khuzistan	1977	Elamite	Archaeological Centre of Iran	Kordovani Iranian