AN IN DEPTH GUIDE

ANCIENT MAGAN

The Secrets of Tell Abraq

D.T. Potts

TRIDENT PRESS

ANCIENT MAGAN

THE SECRETS OF TELL ABRAQ

FRONT COVER PHOTOGRAPH: A pendant discovered at Tell Abraq lies exposed on the site, among spring vegetation (photographed by Hanne and Jens Eriksen)

BACK COVER PHOTOGRAPH: A gold figurine discovered at Tell Abraq. (photographed by D.T. Potts).

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THE SECRETS OF TELL ABRAQ

D.T. Potts

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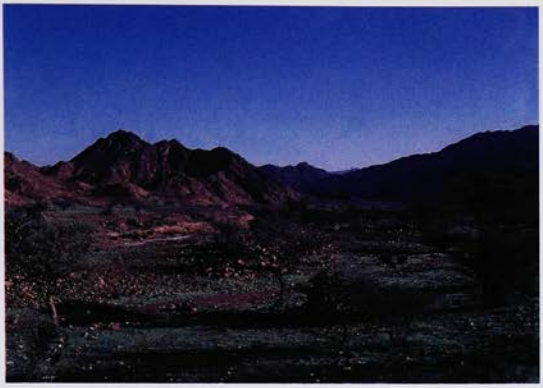
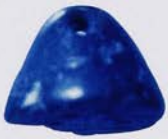
This one's for Hallam!

CONTENTS



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al-Thuqa
Ghanâdha
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Umm al-Nâr
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Sharm
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J. Buhays
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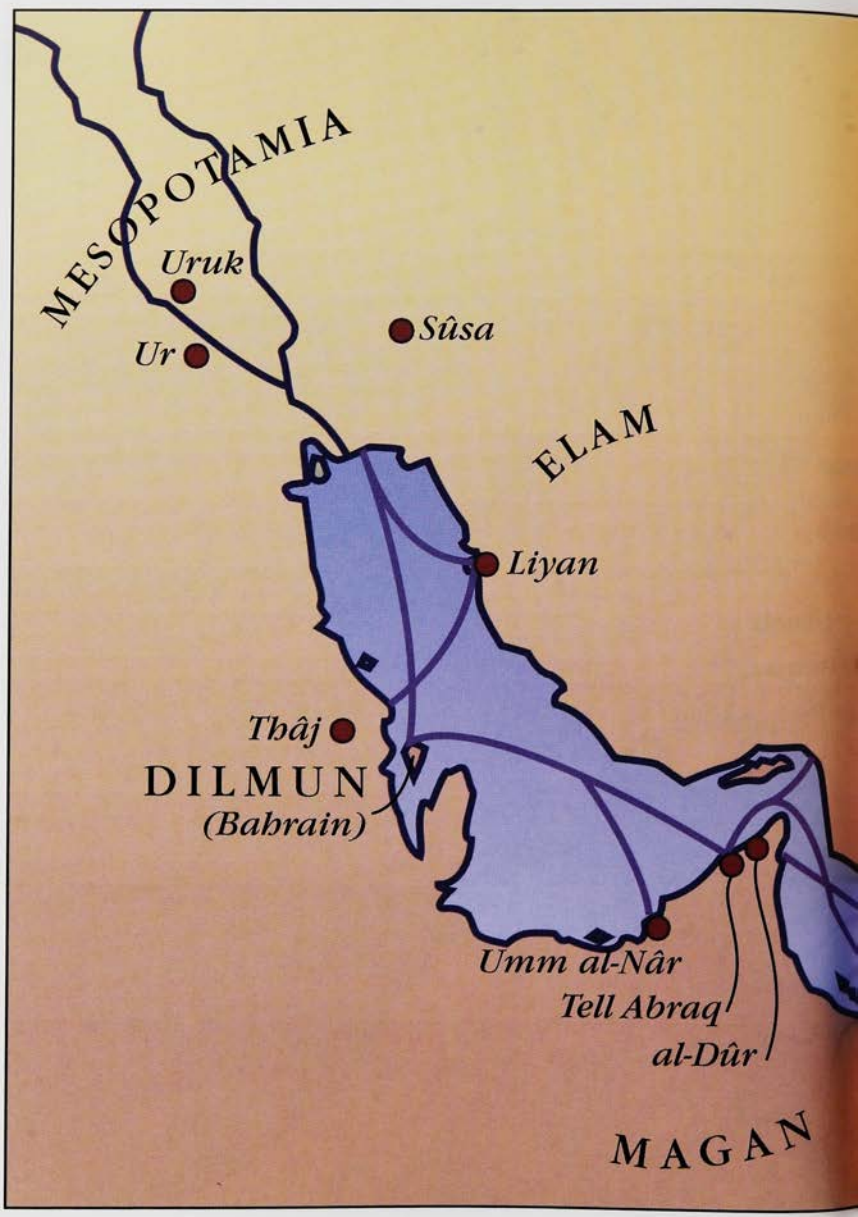

MESOPOTAMIA
Uruk
Ur
Sûsa
ELAM
Liyan
Thâj
DILMUN
(Bahrain)
Umm al-Nâr
Tell Abraq
al-Dûr
MAGAN


BACTRIA
Shahdad
Tepe Yahya
Bampur
BALUCHISTAN
Mohenjo-Dar
MELUHHA

FOREWORD

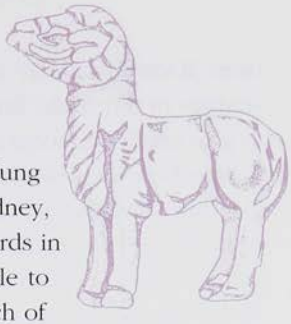
The United Arab Emirates may be a young nation, but it boasts a heritage as impressive as any in the region. Since the first archaeological investigations at Umm al-Nâr island in 1958, the number of excavations in the country has grown exponentially. Under the direction and influence of its President, HH Sheikh Zayed, the government of the UAE, including all its local departments, has supported the quest for the UAE's hidden past, a quest which now involves teams from over half a dozen foreign nations as well as scholars from the country's own museums and antiquities authorities, often working in tandem.

In recovering the UAE's ancient record, a bridge has been built to the country's future, revealing a prehistoric identity of which all citizens in the Emirates can feel proud. And, just as importantly, strong bonds have been built with universities and scholars from all over the world who have found in the UAE a conducive research environment created and supported by government, the commercial sector, and by local people.

The Emirates' early settlement is particularly well illustrated at Tell Abraq. The wide array of finds recovered there; the impressive architectural monuments; and the 2000 year long sequence of habitation all bear witness to the richness of the UAE's cultural heritage. Professor Dan Potts, whose first archaeological activities in the UAE date back to 1986, has brought with him over the years literally dozens of students and specialists, each of whom has made a contribution to the gradual unravelling of our country's past. In this volume he shares with us many of the insights gleaned from a decade of excavation and analysis, and demonstrates beyond any doubt that the archaeological heritage of the UAE is one which is of universal interest, transcending the borders of our State and forming an important part of the broader record of human achievement on a global level.

Abdullah bin Zayed Al Nahyan
Minister of Information and Culture, United Arab Emirates.

PREFACE



When my wife and I recently attended our first Kung Fu lesson with a noted Chinese practitioner in Sydney, we were told repeatedly that one must go backwards in order to go forward. This seemed to be a principle to which I could readily adhere for I have spent much of my adult life going backwards in time in order to go forward in my understanding of the past. Although I have given numerous lectures on my work to general audiences, I have written about my research largely for an academic readership. With this book, however, I hope to reach a much wider public, particularly, although not exclusively, the residents of the United Arab Emirates, in order to tell the story of one of the more important archaeological sites in a country which boasts a plethora of impressive sites dating to the past 7000 years.

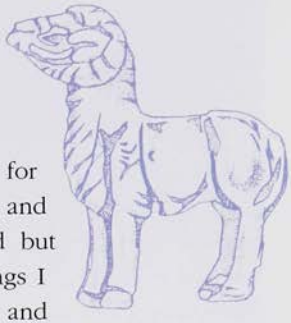
Before the establishment of the United Arab Emirates the coastal region between Sharjah and Ras Musandam went by any number of names. In the account of his travels through the Gulf in 1765 Carsten Niebuhr called it Seer (Sir), but noted that the Persians used the name Dsjulfar (Julfar). To the ancient Greeks and Romans the area was part of Macae; to the Achaemenid Persians it was Maka; to the Akkadian-speaking inhabitants of Mesopotamia it belonged to the land of Makkan; and to their Sumerian-speaking forebears it was part of Magan, a term denoting what is today the UAE and the Sultanate of Oman. We do not know what the early peoples of this region called Tell Abraq but we can be certain that, given its size and the wealth of material remains uncovered there, it must have been one of the principal towns of ancient Magan.

Archaeology is about asking questions and, occasionally, finding answers. It is about probing secret places and making recalcitrant fragments of our human past yield up their secrets. This book aims to show how one team of archaeologists has gone about the excavation of a site in the United Arab Emirates. It tries to explain why we have done certain things as well as how we have done them, in other words, what our methodology has

been. It touches briefly on the many laboratory techniques employed in the analysis of our finds. But most importantly, from my point of view, it aims to give the reader some insight into the mind of an archaeologist, revealing, I hope, how we wring from the seemingly lifeless a picture of what life was like, how we have gone backwards in order to go forward.

Every archaeological project is unique and while we look at what archaeologists have done in the past, and at what our colleagues around the world are doing in the present, every director of an excavation has to make choices – where to dig, how slowly or quickly to proceed, how best to record the information gathered, where to spend scarce funds when it comes to costly analysis, etc. I hope this book will give readers an idea of how archaeology is being practised by one team, on one site, in one of the most interesting parts of the ancient Near Eastern landscape.

ACKNOWLEDGEMENTS



My wife Hildy deserves the biggest vote of thanks for being with me throughout the work at Tell Abraq and for not only managing things in our household but producing some of the best archaeological drawings I have ever seen. Our children Rowena, Morgan and Hallam all took part in one way or another and helped keep their father sane.

The Danish Humanities Research Council, the Australian Research Council and General Motors (Dubai) all contributed financially, as did the Diwan of Umm al-Qaiwain and the Department of Culture and Information of Sharjah. The sponsorship provided by General Motors, in particular, and the use of their vehicles, were invaluable and I must record my heartfelt thanks to three successive GM executives in Dubai: Gary Rowley, Jim Steinhagen and Alan Batey. It was Gary Rowley who first became excited about the possibilities of sponsoring the excavations at Tell Abraq. Much of my work with GM was facilitated by my good friend Ian Bain of Bain Communications in Dubai and my original introduction to Ian was made through another good friend, Peter Hellyer of Abu Dhabi.

The excavations at Tell Abraq have involved many students from the Universities of Copenhagen and Sydney, as well as others from the Universities of Vienna, Göttingen, Montpellier and Leiden. All have made a contribution to the success of the project and many have worked on material from the excavations in their undergraduate and PhD theses. The fact that more and more studies on Tell Abraq are appearing under more and more different authors' names (see the bibliography below) is a sign that, if nothing else, I have at least been successful in getting a large number of students and colleagues interested in the site, and in facilitating their work. At the time of writing colleagues from Europe and America working on material from Tell Abraq include George Willcox (Jalès, France) and Eta Tengberg (Montpellier, France) who are analysing plant remains; Elisabeth Stephan, Hans-Peter Uerpmann, and Margarethe Uerpmann (Tübingen, Germany), who are responsible for studying the faunal remains;

and Deb Martin and Alan Goodman (Amherst, Ma, USA) who are working on the human remains.

None of this material, however, would have left the ground were it not for the incredible excavation expertise of our field director, Anne-Marie Mortensen (Vejle, Denmark), who supervised excavations on the main mound throughout all five excavation seasons (1989–1998) and was instrumental in developing the excavation and recording system used, and in maintaining and interpreting the records of Tell Abraq's complicated stratigraphy and architecture.

Many friends in the Emirates have offered us hospitality but they are too numerous to recount here. I would, however, like to mention the efforts of Peter Hudson, Ian Bain, Mike Shepley, Peter Hellyer, Fraser King, M. Venkateswaran and Mr Bashir, my travel agent, without whom we would never have reached the site.

Tell Abraq sits astride the border between Umm al-Qaiwain and Sharjah and our work has been supported by both emirates. To Sheikh Khalid bin Rashid Al Mu'alla, President of the Emiri Diwan, and his father, HH Sheikh Rashid bin Ahmed Al Mu'alla, Ruler of Umm al-Qaiwain and Supreme Council Member; and to HH Dr Sheikh Sultan bin Muhammad Al Qassimi, Ruler of Sharjah and Supreme Council Member, I would like to extend my thanks for entrusting me with the excavation of what I consider a site of unparalleled historical significance. I would also like to express my sincere thanks to Dr Sabah A. Jasim of the Sharjah Archaeological Museum, and to all of his staff, for much help during the final season of excavations at Tell Abraq.

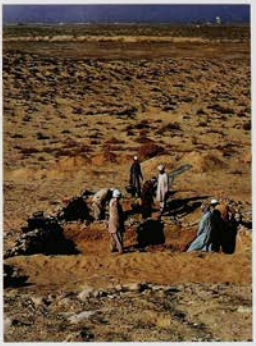
Most of the photographs in this book were taken by the author. I would like to thank John J. Nowell (Middle East Photo Library, Dubai) for permission to use his aerial shot of Tell Abraq. I have also included several expedition photographs taken in 1994 and 1998 by Georgia Britton and Michele Ziolkowski, as well as a photograph by Russell Workman (University of Sydney) of some of the Bahraini sherds brought back to Sydney for analysis. Their work is acknowledged in the figure captions.

Finally, I thank my wife Hildy for all of the beautiful drawings in this book, and Katia Davis for the original map shown on pp 8-9.

An aerial view of the excavations at Tell Abraq taken by John Nowell after the completion of our 1993 season.

ANCIENT MAGAN

There is no single formula for the success of an archaeological expedition. Different goals require the use of different strategies. If, for example, you are interested in how people adapted to their landscape through time, then you have got to look at, if not excavate, many different sites throughout an entire region. If you are interested in documenting change and development at a local level, then you will have to find a site which holds out the promise of having been lived at for a long time, and excavate it in such a way that you expose levels dating to a variety of different periods. If you are interested in finding complete pots and other goodies, and have a museum full of cases which need filling, then you had better go for tombs since settlements often lack well-preserved objects. And if you want to get anywhere with your research, you had better be



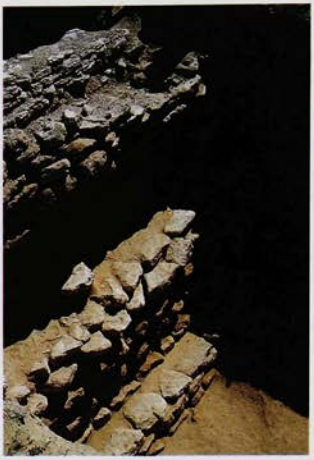
Early days in the step-trench at the start of the 1989 season.

prepared to share. This means forming a team, apportioning topics to the members, delegating responsibility, and letting go of the site so that everybody involved comes to have just as much interest in and commitment to the project as you do. Twelve people can achieve so much more than one and being a good project director means facilitating the work of others as much as, if not more than, pursuing your own particular research interests. The days when Sir Flinders Petrie, Sir Leonard Woolley or Sir Mortimer Wheeler presented themselves as 'the' excavator of a site, when in reality they had a force of 400 local workmen and a couple of cronies to help draw plans and label objects, are over. Archaeological projects are most successful when they are cooperative, inter-disciplinary and populated by interested and motivated students and scholars committed to adding to the body of knowledge about a region.

How the first step-trench looked towards the end of the 1989 season.

So what about the site? What makes a 'good' site? I hope that by the time you have read this book you will see that a site is only as good as what an archaeological team makes of it. It is not a matter of how many grams of gold or complete stone vessels you find or how high the walls stand that determines whether a site is 'good' or 'bad'. Archaeologists and their colleagues in the natural, analytical sciences have the ability to spin hay into gold, to make a silk purse out of a sow's ear.

They can turn what may look like an unprepossessing site into a veritable gold-mine of insight if they are creative in the use of their analytical firepower. A site may not yield a lot by way of 'goodies', gold figurines or new inscriptions, but if half a dozen post-graduates are unleashed on the material and discover unexpected residues left by the burning of hitherto unsuspected organic substances, or tiny droplets of copper which show that metal was being cast, or size differences in animal bones which permit the discrimination of domestic animals from wild, then they have truly taken their data, unassuming as it may have looked, and made something significant out of it. So, I suppose, the moral of the story is that great archaeological sites are made great by the archaeologists who work on the material excavated. They are not great in the first place.



Looking down on the west face of the third millennium fortification.

This book is about one site in the Emirates called Tell Abraq, a large mound rising over 10m above the surrounding plain near the junction of the coastal highway linking Abu Dhabi and Ras al-Khaimah, and the inland road from Umm al-Qaiwain to Falaj al-Mu'alla. It is a significant site for precisely the reasons outlined above, because the students and colleagues who have worked on its material have uncovered significance in their data. Tell Abraq is tiny in comparison with the enormous tells of Mesopotamia and Iran. Its sequence of some 2000 years is short when set alongside that of Troy or Jericho. Tell Abraq did not yield a lot of goodies, at least not until the final seasons when we excavated a tomb located right within the settlement. It provided us with no

The 'discovery' of Tell Abraq: p 34
Tells and *nads*: p 36

Postholes, postholes everywhere. Apart from the fortification, the tomb, the mudbrick platform and a few walls near the northern end of the site, there was relatively little standing architecture at Tell Abraq, but metres and metres of soil with numerous postholes bear witness to continuous occupation over the course of 2000 years.

inscriptions. It is not the first, the biggest, the oldest, the only anything. But it is an important site because it has been made to deliver up its secrets by the gentle cajoling of gamma-rays, scanning electron microscopes, electron microprobes, accelerator mass spectrometers and ion beams in the hands of students and colleagues who know how, when and why to deploy some fairly sophisticated science in the cause of archaeology. Tell Abraq is a site which has been taken by the scruff of the neck, in the hands of numerous undergraduates, post-graduates and professional archaeologists and scientists in the United States, Europe and Australia, and shaken until its secrets have been revealed.

What brought me to Tell Abraq in the first place? p 38

When I first visited Tell Abraq in 1986 with several colleagues I was not particularly impressed. It was a hot day and I remember feeling pretty jet-lagged. Two years later I was back on my own, prowling over the surface of the mound, looking for signs that this was a site that would tell me what I wanted to know. I had conducted two seasons of excavation at al-Dûr, a first century AD site located a few kilometres away, and was

frankly bored with working on such a restricted period of time. I longed for a site which would allow me to push back the local sequence into the earlier periods in the Emirates' past. I thought, by the look of some of the sherds on the surface, that Tell Abraq's sequence ought to extend back into the early first millennium BC at the very least. I had a very skilled Danish archaeologist, Anne-Marie Mortensen from Aarhus, joining me for the 1989 season at al-Dûr and I decided I would put Anne-Marie on Tell Abraq and see what happened. It would be an understatement to say that I was not prepared for the result. For several days into the excavation I found myself staring at pottery typical of the period c. 2300–2000 BC.

A view of the tomb after the completion of excavations in 1998.

Anne-Marie opened up what is called a 'step trench', a series of 5 x 5m squares stretching from the top of Tell Abraq down to the base of the mound along the west side of the site. It quickly became clear that the mound was formed largely out of a single, massive fortification, 40m in diameter and preserved to a height of some 8m, which was built of a combination of stone and mudbrick. A stone-lined well ran straight through the centre of the building down to the ancient water table.

Stratigraphy: p 40

Circular, fortified buildings of this sort were already known from sites such as Hili and Bid'îya in the Emirates, and Bat, Amlah and Maysar in the

Where's the water? p 44

This massive stone wall, uncovered in 1993 within the confines of the third millennium fortification, was part of the modification to the structure which was instituted during the mid-second millennium BC.

Sultanate of Oman. They represent the typical fortification of the late third millennium BC in the region. We have a number of carbon-14 dates from the deposit at the base of the fortress which cluster around 2200 BC making it clear that the building was originally constructed about that time.

Dating and use of C14: p 46

The first people at Tell Abraq? p 49

Faced with stone and with a massive mudbrick foundation, the fortress at Tell Abraq would have towered over the shoreline like the original Martello tower on the coast of Corsica. It is the largest Bronze Age building discovered anywhere in the Arabian peninsula and it was probably the seat of a local lord in the land known to the ancient Mesopotamians as Magan.

Mesopotamia: p 51

Magan: p 53

With its added role of protecting the site's water supply the Tell Abraq tower must have had huge symbolic as well as functional significance. It probably afforded space to retreat to for members of the community in times of crisis, and it may have functioned as the residence of the community's leaders and their families. As metres of earth punctuated by post-holes all around the tower attest, however, the rest of the population outside the fortress probably lived in palm-frond

houses (*'arish* or *barasti*). These soil deposits contained literally thousands of animal bones, fish bones, shells and carbonized date-stones, as well as dozens of grinding implements, the refuse of two millennia of food preparation and consumption. In addition, tens of thousands of fragments of pottery, hundreds of copper and bronze artifacts, both broken and complete, as well as miscellaneous objects, all of which throw light on unexpected aspects of life in the past, have been recovered from all levels of the site.

When the people of that earliest settlement died, they were buried along with their fellow Tell Abraqians, men and women, boys and girls, old and young, in an impressive circular stone tomb, just 10m to the west of the fortress.

That they lived hard lives is pretty clear from a study of their bones. That they had access to luxuries as well, however, is borne out by the presence of rare fragments of linen in the tomb, elegant pendants of gold, and objects of ivory.

As time went on the Tell Abraq tower was modified. We have evidence of structural modification in the early second millennium BC and of a major stone wall built inside the fortress several centuries later. Eventually the fortress became hidden from view when it was 'capped' with a massive mudbrick platform covering the entire top of the structure and today visible just beneath the surface of the upper part of the site. This platform, through which we made an exploratory cut some 5m deep, is made of mudbricks identical in size (60 x 30 x 5cm) to those known at a number of sites in Central Asia and eastern

Faunal remains: p 59
Fish remains: p 62
Shellfish: p 64
Seed impressions and charcoal: p 65
Groundstone and starch: p 70
Ceramic analysis: p 72
Metallurgical analysis: p 75
Documentation and registration: p 78
The lateen sail: p 82
The tomb at Tell Abraq: p 83
Human remains: p 90
Work and play: p 95

Textile remains: p 97
Ivory: p 100
Conservation: p 104

ABOVE: *Peeping out alongside a bone in the tomb deposit, this exquisite gold pendant in the shape of a ram was the first piece of gold I ever found. As I said facetiously at the time, 25 years of excavation in the Near East had finally paid off! The approximately 2 cm wide ram was probably cast in an open, unifacial mould. This is suggested by the very flatness of its backside. Two small semi-circular rings have been added on to the ram's back for attachment.*

BELOW: *A second gold pendant discovered in the tomb shows two long-horned caprids, perhaps ibex, tail-to-tail on what appears like a groundline. The flatness of the back, and the two rings for attachment, are so like those seen on the ram that manufacture in the same workshop seems likely. These very modelled animals are reminiscent of, but much more plastic than later, double animals of beaten sheet gold from second millennium BC sites elsewhere in the Emirates, such as Qattâra, in Al Ain; Bid'îya, in Fujairah; or Dhayah, in Ras al-Khaimah.*

The massive mudbrick platform which caps the mound of Tell Abraq.

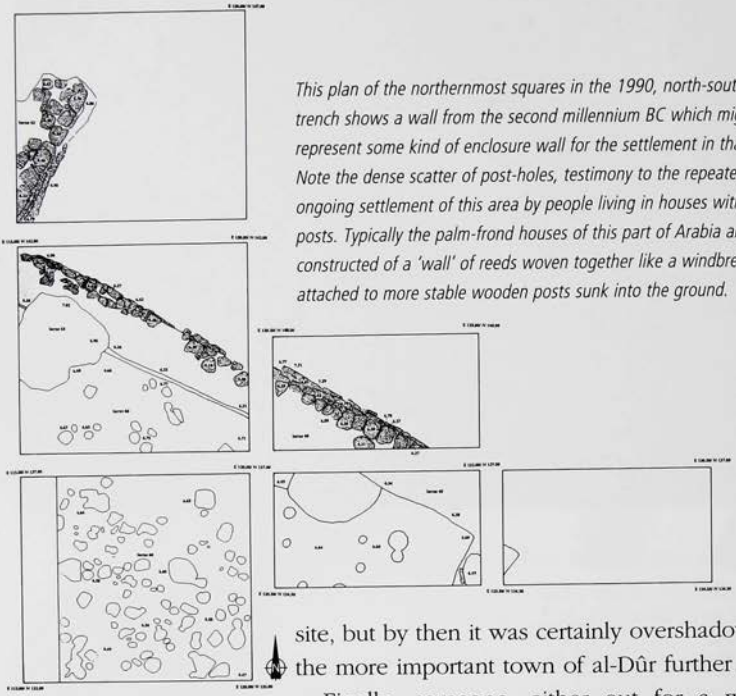
Iran in the late second millennium BC. Although the significance of the platform is unclear, the scale of its construction is impressive.

Tell Abraq continued to be inhabited throughout the late second and early first millennia BC. We have thick layers of post-holes containing masses of Iron Age pottery and other objects, including dozens of grinding stones, which date from the period c. 1300–300 BC.

Where's the iron in the Iron Age? p 108

Eye makeup: p 110

There are other bits and pieces of architecture at the site, most notably a stone wall near the northern end of a trench opened in 1990 which might be some kind of enclosure wall for the community. Sherds, stone, and shell from the site can be found up to several hundred metres away. But that, in broad outline, is the story of Tell Abraq's main occupation. Several centuries after Tell Abraq was abandoned, during the first century AD, a few families may have lived and died at the



This plan of the northernmost squares in the 1990, north-south step-trench shows a wall from the second millennium BC which might represent some kind of enclosure wall for the settlement in that period. Note the dense scatter of post-holes, testimony to the repeated, ongoing settlement of this area by people living in houses with wooden posts. Typically the palm-frond houses of this part of Arabia are constructed of a 'wall' of reeds woven together like a windbreak and attached to more stable wooden posts sunk into the ground.

site, but by then it was certainly overshadowed by the more important town of al-Dûr further north.

Finally, someone, either out for a walk or perhaps enjoying the view from the high mound, must have visited the site in the fourth century, dropping a Sasanian coin in the process which constitutes the latest evidence of pre-modern activity at the site.

Tell Abraq in the first century AD: p 111

The Sasanians: p 114

The site's size and the scale of its fortress suggests it must have been one of the main towns in ancient Magan. When, in the late third millennium BC kings from Mesopotamia campaigned against Magan, they may well have visited the site for the account of one of their campaigns says that the Akkadian king, Manishtusu, encountered the 'lords of 40 cities and their people'. Since the Akkadian word for 'city' could equally mean

'village' or any place of habitation, there is every chance that this text refers to a united force drawn from the region's major settlements, each of which may have been ruled by a local lord whose power was visibly manifested in his tower.

That people from far and wide may have visited Tell Abraq, moreover, is indicated by the staggering array of foreign goods found there. Pottery from Mesopotamia, southwestern Iran, Bahrain, southeastern Iran, Bactria (northern Afghanistan and southern Uzbekistan), and the Indus Valley; tin, perhaps from Afghanistan; and ivory, from Bactria and/or the Indus Valley, all reflect a prosperous site which participated in a wide web of interaction with the outside world.

Elam: p 116
Dilmun: p 119
Baluchistan and Seistan: p 124
Bactria: p 128
Harappan civilization: p 131

Unfortunately, we know neither the ancient name of Tell Abraq nor what language its inhabitants may have spoken. Indications from elsewhere in eastern Arabia are that the indigenous population of the region spoke a Semitic language. Some of the personal names found in texts from Failaka island off the coast of Kuwait and from

A view from the north, looking south, of the retaining wall which supports the north side of the platform. In the upper lefthand corner of the photograph you can see that we have stripped off a rectangle of the mud plaster on the wall, revealing the stone behind it.

The regularity of the brickwork in the platform is impressive.

Qalat al-Bahrain on Bahrain's main island can be compared with those identified as 'Amorite' in Mesopotamian sources. Traditionally, the Amorites have been seen as desert-dwellers to the west of the Tigris-Euphrates valley, and their presence around Mari in Syria is well-attested in records from the early second millennium. But recently scholars have emphasized that the language of the Amorites was not monolithic. There were different dialects, just as there were different Amorite tribes. Amorites were settled in Mesopotamia by the late third millennium BC and were present in south-western Iran slightly later. They were not all tent-dwellers. Certainly some were sedentary and not nomadic. All of this suggests that across a broad swathe of Western Asia, from Syria and the Levant in the west to Arabia and Iran in the east, there were people speaking a variety of Semitic dialects recognized today as 'Amorite' who were,

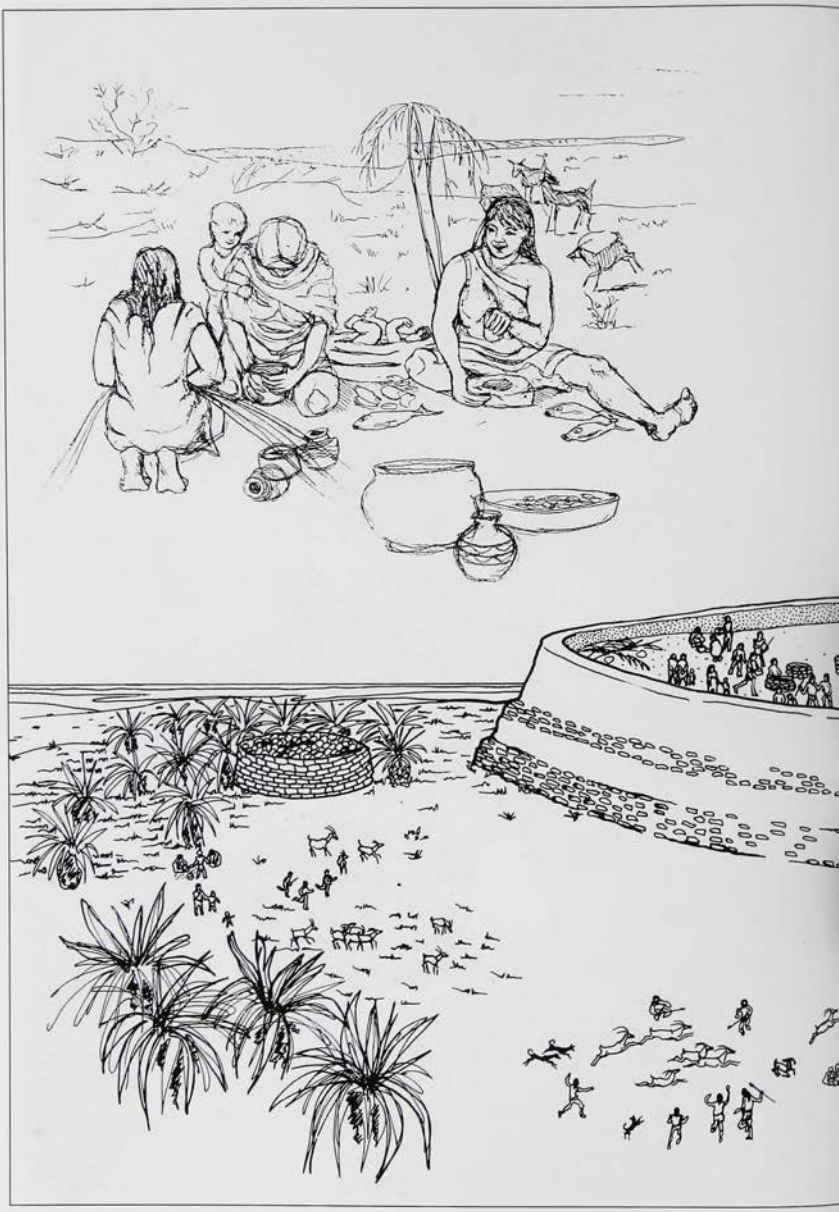
however, far from homogeneous. Beyond that, there is little we can say about the ethnicity of the ancient population of Tell Abraq.

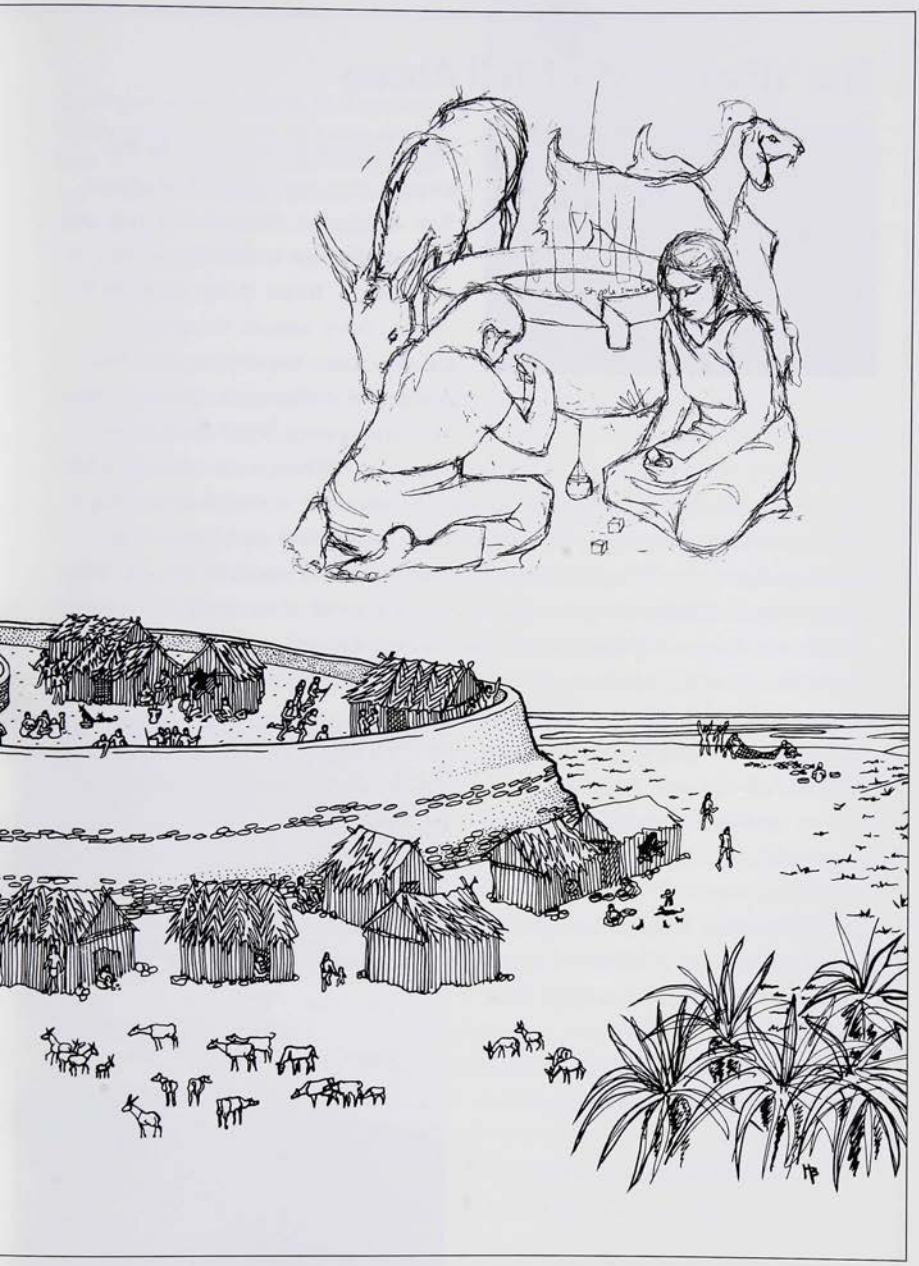
Tell Abraq covers an area of over 4 hectares and I am often asked whether I intend to go on excavating. The fact is, after five seasons of excavation (1989, 1990, 1992, 1993, 1997/8) we have such a quantity of material that I can see no real reason to dig any further. We have an architectural and occupational sequence of roughly 2000 years which more than fulfils my initial desire to extend the archaeological sequence of the area well beyond the confines of al-Dûr's limited period of occupation. We have material enough for a dozen PhD theses. And yet we do not have so much that I despair of ever getting it all published. One could go on and on digging at Tell Abraq, and one would probably keep finding interesting things, provided one knew what to do with them. For my part, I would prefer to quit while I am ahead, get stuck into the final publication of this extraordinary site and acquit myself of the responsibility of publishing what I have excavated. This means not only writing myself, but making sure all of my colleagues and students move along and complete whatever work they have begun on Tell Abraq, pulling it all together in a series of final publications. That is my plan for the next five years. If I can succeed then I will move on to another project with a clear conscience and a light

A cut through the platform in 1993 convinced me that there was no way we could remove it, much as I was tempted to do so in order to enlarge our exposure of the important third millennium fortification which lay beneath.

We cut through about 5m of mudbrick and still had not reached the interior floor of the third millennium building before we called a halt to our exploratory excavation. Although I would have dearly loved to get a better look at the earlier structure, I could never justify destroying the second millennium platform in the process.

heart. Far too many archaeological excavations end up being published not by the people who conducted them, but by a second or even a third generation, long after the death of the original excavator, and I would rather that didn't happen to me. If you dig you must publish. If you don't wish to publish, or don't like writing, or don't know how to go about organising a publication, then you shouldn't dig. Excavation is only the tip of the archaeological iceberg. The really hard work begins when the digging is done.





The 'discovery' of Tell Abraq

Tell Abraq as it appeared in December 1988, from the northwest.

ARCHAEOLOGISTS PORTRAYED in the movies may occasionally discover 'lost' cities, but what they rarely tell their audiences is that the local population, those living near such places, have almost invariably known about these allegedly lost centres of civilization all along. Was Tell Abraq ever 'lost'? If so, who 'found' it ? When a site rises roughly 10m above the surrounding plain in what is otherwise a very flat landscape, and is covered with bits of broken pottery, stone, shell and bone, it is highly unlikely that it is not known to the people living closest to it. Tell Abraq was probably always known to the local inhabitants of the Hamriyyah, Umm al-Qaiwain and Falaj al-Mu'alla area, indeed to anyone who rode up the track between Sharjah and Ras al-Khaimah, or travelled between Umm al-Qaiwain and Falaj al-Mu'alla.

But if, by the question, who 'discovered' Tell Abraq, we mean, when did the site first become known to archaeologists (often the last to know, of course, and hence rarely those who 'discover' anything), then the answer is probably in 1973. A few lines in the 1974 volume of the Iraqi journal *Sumer* (Salman 1974) describe the 'scientific and historical responsibilities for uplifting the cultural heritage in our Arabian homeland', which prompted the government of Iraq to sign a memorandum of 'technical and cultural cooperation' with the UAE soon after the state's foundation. On 11 November 1973 a team of archaeologists was sent

Looking back towards the mound from the north in 1990.

According to one local informant, the municipality of Umm al-Qaiwain nearly erected this white water tower on top of the site just around the time of the Iraqi investigation. Luckily they decided to move it further east. Our workmen here are engaged in opening up an area to the east of our main north-south step trench.

'to conduct excavations and restoration works' and the group deputed to investigate the area near Umm al-Qaiwain 'concentrated its work in several archaeological sites (such) as al-Abrak, al-Dûr and al-Ukhimur site. The latter two contained several settlements'. Such is the extent of the first published reference to Tell Abraq in the archaeological literature.

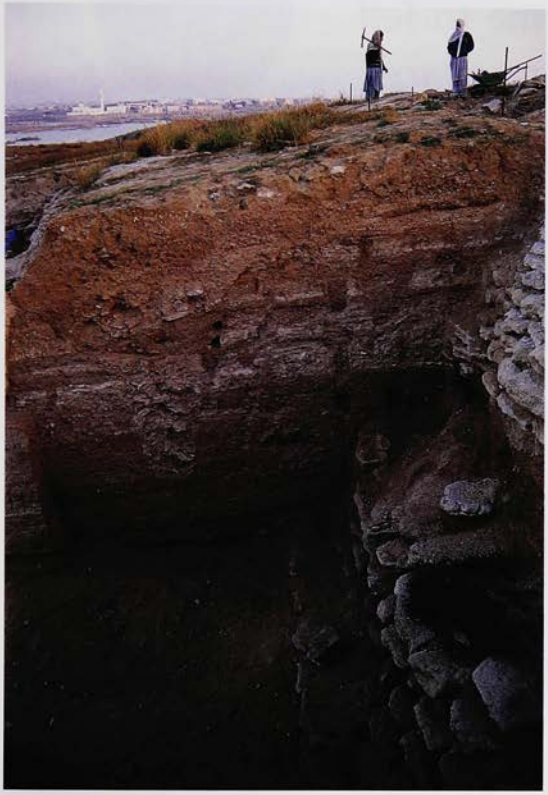
The Iraqi account is terse, to say the least. From it one would never know that excavations actually took place at the site. Our own excavations, however, uncovered a small, roughly 2 x 2 m square trench, opened on the top of Tell Abraq by the Iraqis who, in good archaeological fashion, had kindly deposited an empty can at the base of their test trench before back filling it with clean sand. In this way, any future excavator who came upon the can would realize that excavation had already occurred on the spot and know, therefore, that the sand deposit through which he'd been digging was not natural but artificial. We were tempted to send the can to Germany whence it came, with a request to a certain manufacturer of sparkling, yellow beverage (it was lager, not bitter) for a precise date based on the design on the can (it pre-dated barcodes) but in the end discretion prevailed.

Approached from the south, along the Falaj al-Mu'alla road, Tell Abraq looks quite different than it does from the north. The tent where we kept our tools appears here. Behind it is one of the oil storage tanks of Hamriyyah.

Tells and *nads*

In most parts of the Arabic-speaking Middle East, any archaeological site which takes the form of a raised hill is called a *tell*. In the UAE another term, *nad (nud)*, is used as well. People in the region call our site Tell Abraq or Nad (al-)Abraq interchangeably (cf. Nad al-Sheba, the race course in Dubai, or Nud Ziba, an archaeological site near Khatt in Ras al-Khaimah).

It has become increasingly clear over the years that an understanding of the sedimentary processes which cause tell formation can help archaeologists understand the long-term history of a site. Several entire disciplines have grown up, the practitioners of which dedicate themselves in large measure to understanding site-formation processes. The general term for this field of study is geoarchaeology (Rosen 1986), an understandable name when you consider the fact that geoarchaeologists try to understand the natural and human-induced processes which give rise to site-formation much as geologists try to understand the history of the earth's formation. A more specialized area of study, known as micromorphology, looks at thin



FAR LEFT: *A view from the west, taken from the end of our east-west step trench. This gives a good impression of the relationship between the fortification tower, on the right, and the tomb, on the left.*

LEFT: *A view looking north which shows, on the right, the western face of the fortification tower. Note the build-up of successive strata of occupation running horizontally up against the tower.*

sections of sediments from archaeological sites in an effort to derive, for example, information on ancient climate from the specific type of sediments within an archaeological site. Tell Abraq, which consists of a series of accumulated layers of occupation around an original tower dating to the late third millennium BC, is not a 'classic' *tell* in that it is not, by and large, composed of an accumulation of collapsed mudbrick houses built one on top of another in successive levels of habitation. Instead, it is a high mound, the core of which is the third millennium tower, ringed by metres and metres of soil build-up containing the tell-tale signs of human occupation.

What brought me to Tell Abraq in the first place?

A silver tetradrachm from al-Dûr. Coins such as these first aroused my interest in al-Dûr and led to my working there between 1987 and 1989.

OVER THE YEARS MANY PEOPLE have asked me how I came to excavate at Tell Abraq. If I really stop to think about it, I have to go right back to my first experiences in archaeology because that's where the road to Tell Abraq actually began for me.

When I started my undergraduate studies at Harvard in 1971 I happened to stumble into a course on the rise and fall of civilizations taught by a charismatic young professor of anthropology, Karl Lamberg-Karlovsky. Karl is a noted specialist in the archaeology of Iran during the third millennium BC. Within a short time I was drawn into the group of students working with him and the summer of 1973 saw me excavating at his site, Tepe Yahya, in southeastern Iran. I wrote a BA honours thesis on the site in 1974/5, excavated there again during the summer of 1975, and went on to write a PhD on Tepe Yahya as well. In 1977 Karl sent me and several other post-graduate students off to do a survey in the Eastern Province of Saudi Arabia and I became interested in what for me was then 'the other side of the Gulf' Ultimately, I was invited in 1983 to excavate at an important Hellenistic site called Thaj. While there I became intrigued by the virtually unknown, local coinage minted in the third and second centuries BC in the area.

When I saw this jar with its plaster lid in Area Z at al-Dûr I thought, optimistically, that we might have stumbled upon a coin hoard. Unfortunately, the jar was full of nothing but sand.

When, several years later, I was shown photographs at the British Museum of coins from Umm al-Qaiwain which included some of the same types, I was certain they must have come from al-Dûr, the main site of the late pre-Islamic era on the Gulf coast of the UAE. Finally, in 1987 Rémy Boucharlat (Lyons), Ernie Haerinck (Gent), Carl Phillips (London) and I began excavations at al-Dûr, but by 1988 I was hankering after something earlier and in December of that year decided that, with a couple of members of my al-Dûr team, I would start test excavations at Tell Abraq. Here, I hoped, we would find something earlier than al-Dûr and extend the local sequence back in time. Little did I expect that within days of opening our first trenches we would be deep into third millennium BC material and I would be staring at types which, familiar to me from my work at Tepe Yahya 'on the other side of the Gulf', were in fact old friends. I knew then that I wanted to spend several years at Tell Abraq, long enough to obtain a complete sequence of the site's occupation.

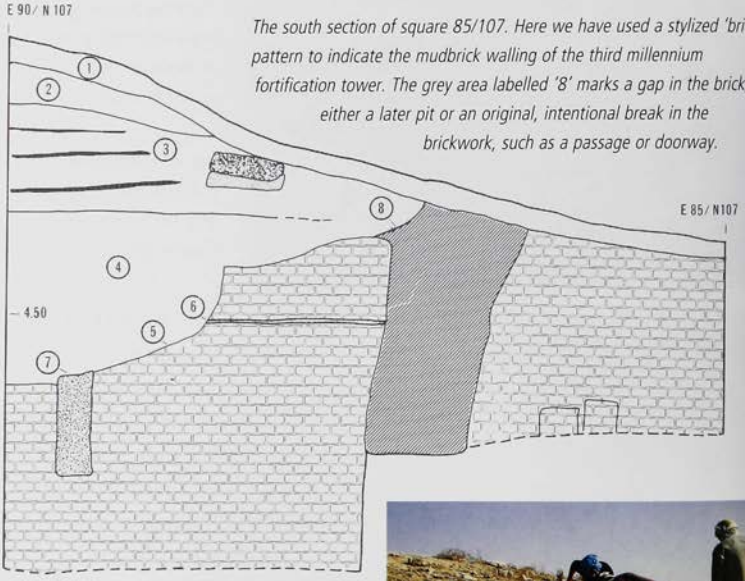
These two female figurines were found in a small, private house excavated in 1988, our second season at al-Dûr.

LEFT: *A large house in Area E at al-Dûr excavated by my team from the University of Copenhagen.*

No straight path led me to Tell Abraq. It was a journey from the third millennium BC in Iran to the third century BC in northeastern Saudi Arabia and to the first century AD in Umm al-Qaiwain which finally brought me to the site on which I have worked now for over a decade.

Stratigraphy

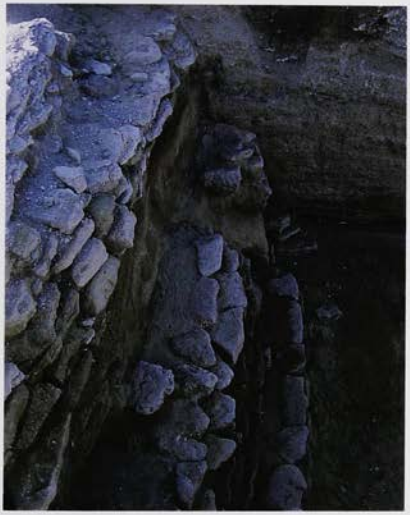
MOST SITES, IF THEY HAVE BEEN OCCUPIED for more than an 'instant' of time, archaeologically speaking, display a build-up of different types of soil deposits. These can be made up of the remains of tumbled down walls, wind-blown sand, rubbish and debris brought in to level off an uneven area, areas of burning, middens containing the bones of fish and animals from thousands of meals, etc. In the nineteenth century, under the strong influence of the burgeoning field of geology, archaeologists applied the principles of stratigraphy outlined by such pioneers as Sir Charles Lyell (1797-1875) to the understanding of archaeological sites.



The south section of square 85/107. Here we have used a stylized 'brick' pattern to indicate the mudbrick walling of the third millennium fortification tower. The grey area labelled '8' marks a gap in the brick, either a later pit or an original, intentional break in the brickwork, such as a passage or doorway.

By 1993 the excavation had expanded beyond the original limits of our two step trenches.

The principle of superposition, first recognized by British geologist William Smith (1769–1839), states that, in the absence of evidence for tectonic upheaval, a series of rocks which lies above another must have been formed sometime after the lower one. Put another way, the lower series must be older than the upper one. This same principle has been applied to the dating of archaeological strata (pl. of Latin ***stratum***, defined by the Oxford English Dictionary as literally 'something spread or laid down (in classical use with the senses 'bed-cover', 'horse-cloth', 'pavement'), as has the study of stratigraphy, the stratified sequence of rocks and their sequence through time.



The third millennium tower was built of mudbrick, faced with stone. The lowest part of the stone facing was stepped out a bit, giving the building a slightly stepped look. The uppermost stonework, on the left of the picture, is a later addition put on in the second millennium.

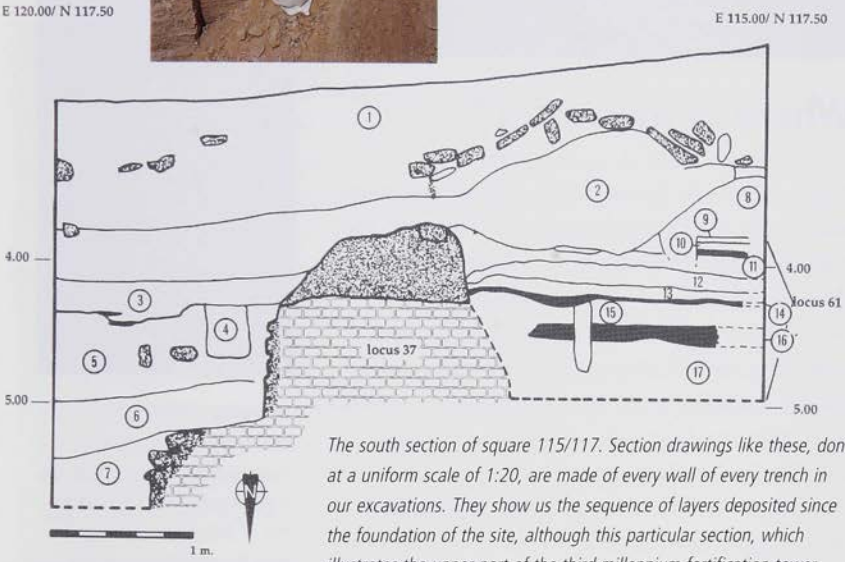
The circular mudbrick tower of the third millennium was constructed much like a wheel with a ring of mudbrick, 40m in diameter, and a series of internal crosswalls. The areas between the crosswalls were filled with clean gravel. here we have a view, looking north, through the mudbrick ring wall which we've cut so as to get a good look at it in section. The white gravel in the spaces between the crosswalls appears in the bottom right of the photograph.

Unfortunately, even without earthquakes and landslides, the stratigraphy of an archaeological site is often much more complicated than that of a geological formation. At Tell Abraq, as the walls of our trenches clearly show, human activities, such as building walls, digging foundations, knocking down old walls and compacting the rubble, digging pits to use for trash or to get soil for the manufacture of new mudbricks, etc. have all altered the clean, sequential series of strata which one might expect to find in a stratified site. Nevertheless, by establishing the sequence of deposition on the site, from the earliest, natural soil on which humans first lived, to the latest graves dug into the surface of the mound, we have been able to construct a sequential, stratigraphic outline of the site's history. Anne-Marie Mortensen's careful excavation, coupled with her scrupulous recording of stratigraphic features, has allowed us to reconstruct the sequence of deposition and to link that to changes in ceramics and other types of material culture through time. This gives us what is probably the best prehistoric sequence in the entire region.

LEFT: *One of the main achievements of the 1992 season was coming to a better understanding of the anatomy of the fortification tower. As all great cooks know, you can't make an omelette without breaking some eggs. We couldn't see that the late second millennium retaining wall – the white, plaster-like wall which appears here on the right – which supported the mudbrick platform on top of the mound was built up against the much older, brown brick of the third millennium tower's interior walls – seen here on the left – until we cut through it at one point. Here the white walling of the second millennium appears like a skin stuck over the brown brick of the third millennium BC.*

RIGHT: *I got down on my knees in order to take this worm's eye view of the tower before all of the sand which had accumulated to the west of it had been removed. Areas such as this one, where sand has built up, are exactly those segments of a tell's sedimentary history which can tell a geoarchaeologist much about climate during different periods in the life of an archaeological site.*

When people in the past dug pits – perhaps to bury trash, or to get soil for the manufacture of mud-bricks – they necessarily cut through older deposits. It is important therefore, when excavating a pit, not to mix the soil it contains with that of the surrounding earth since they belong to two different periods in time. Here the workmen are excavating the contents of a pit prior to taking the entire trench down.



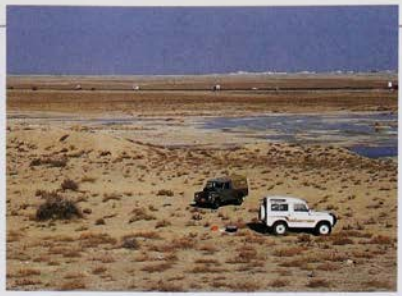
The south section of square 115/117. Section drawings like these, done at a uniform scale of 1:20, are made of every wall of every trench in our excavations. They show us the sequence of layers deposited since the foundation of the site, although this particular section, which illustrates the upper part of the third millennium fortification tower (locus 37) does not extend down nearly to the base of the site's archaeological deposits. With every season of work in the same trench drawings such as these are extended downward so that we end up with a complete record of the stratigraphic evidence in visual form. The numbers in the circles identify distinct soil or structural deposits, each of which has a locus number (note: the numbers here, e.g. 1, 2, 3 etc., are not the original locus numbers but simpler, shorter numbers given to make the drawing less cluttered. The original locus numbers and a description of the soil characteristics are recorded on the section drawings and would be used in a complete publication of the architecture and stratigraphy).

The well at Tell Abraq remained in use right up to the end of the site's occupation. Here it appears in the upper righthand corner of the photograph, surrounded by the much later mudbrick platform.

Where is the water?

WATER IS THE KEY TO LIFE in an arid environment such as the UAE. Anyone who has lived in the region knows that, whilst the occasional winter shower may cause torrential flooding in the Hajar mountains and in the streets of Ajman, aggregate rainfall is generally low and inter-annual variability high. Months can go by without so much as a drop. Nevertheless, all human communities require a reliable source of water and in this arid part of the world that most often means dependence on water drawn from wells. In fact, a well runs straight through the centre of our third millennium fortification, and in 1993, when Australian hydrogeologist Phil Macumber visited Tell Abraq, brackish spring water was found to be seeping out of the edge of the high ground bordering the *sabkha* just north of the site. Phil, the author of *Interaction between ground water and surface systems in Northern Victoria* (Melbourne, 1991), knows a thing or two about H_2O and is of the opinion

Excavating the well in 1993 proved difficult, not to say dangerous. None of the workmen enjoyed going down the well for fear of falling stones (though I think the wall of the well was quite solid), even with a hard hat, and snakes. The tripod in this shot was used to haul buckets of dirt up from the well. We went down about 5m but would have had to dig for another 10m in order to have reached the water table. As it happened we stopped the excavation of the well because of other priorities.



that 'at the time of occupation a thin freshwater lens occurred overlying the denser saline groundwater of the coastal plain. This is often the case in coastal settings where localized groundwater recharge into the dunes permits the development of freshwater lenses'.

The presence of a substantial source of fresh water at Tell Abraq, literally beneath the site as shown by the well which runs through it from top to bottom, surely explains why Tell Abraq was settled for far longer than many other sites in the Emirates and Oman. It used to seem as though virtually all of the ancient settlements in the region were single-period sites, places inhabited for only a few centuries. After talking with Phil about water supply at Tell Abraq I am convinced that this is because the short-lived sites had access to very small reservoirs of well water. Once exhausted, the local population had to move on and establish a new site. Tell Abraq's water supply was, relatively speaking, much larger, allowing for permanent settlement over the course of some 2000 years.

ABOVE LEFT: *An animal had fallen into the well, quite high up in the deposit. We never reached the bottom and so have no idea what may have lain in wait for us.*

ABOVE RIGHT: *The* sabkha *to the north of Tell Abraq as it appeared in 1989. Generally, there was always some standing water in the* sabkha *during the winter months.*

LEFT: *A view of the* sabkha *taken during Phil Macumber's visit in 1993.*

Dating and use of C14

When visitors to Tell Abraq are shown a wall or a piece of pottery and told it dates to the late third millennium or the early second millennium BC, the most common response seems to be a wary, 'Says who?' Dating an archaeological object or the stratum in which it was found can be done in a number of ways. Relative dating depends on comparing an object with similar ones from another site and thereby establishing that they are both so similar as to make an equivalent date, whatever that might be, highly probable. Absolute dating, however, is possible using a range of different analytical techniques which include radiocarbon, dendrochronology, luminescence, electron spin resonance, uranium-series, potassium-argon, fission track, amino acid racemization, etc. Because we are not dealing with objects of vast antiquity (for example, electron spin resonance can date things up to a few million years old), radiocarbon is the method employed for absolute dating at Tell Abraq.

Burnt reed matting found just west of the base of the fortification tower in 1989.

All organic matter contains carbon-14 (variously written 14C, C-14 or 'radiocarbon'), a weakly radioactive form of carbon created by the interaction of cosmic-ray neutrons and nitrogen in the earth's upper atmosphere. This is absorbed during an organism's lifetime but that absorption ceases when an organism dies. The carbon-14 in an organic substance (e.g. charcoal, shell, bone) then decreases through radioactive decay at a fixed rate of 1 per cent every 83 years. This means that in 5730 years the carbon-14 concentration in, for example, a piece of charcoal, will be half what it was when that charcoal was a living piece of wood. This is called carbon-14's 'half-life'.

A fine concentration of charcoal, including an entire branch, excavated in our first season.

Various techniques exist for measuring the carbon-14 content of organic matter. The issue becomes messy, however, since 'radiocarbon years' are not precisely the same as calendar years. This is because the carbon-14 concentration in the atmosphere has varied from decade to decade and century to century. Therefore a radiocarbon date has to be 'calibrated' to take into account this variation in atmospheric carbon-14. Hence, 'calibration curves' have been worked out for converting 'raw' dates in radiocarbon years BP (i.e. before present) into 'calibrated' calendrical years BC.

Some archaeologists, however, seem to spend rather a lot of time rejecting their carbon-14-dates because they don't fit their preconceived notion of what the correct date ought to be (why do they even bother, you ask, if their minds are already made up? Good question). If a level or an object is thought to date to 2000 BC and a date comes back from the lab of 2500 BC, an archaeologist may reject the date as 'contaminated' or 'bad' rather than adjusting his own relative chronology. It is true that material submitted for dating may be contaminated. For example, if a piece of charcoal comes from a wooden box which was sealed with bitumen, the very old (geologically speaking) bitumen may make the much younger wood seem very old, and a box which was thought to be 1000 years old may come up with a date of 28,000 years BP.

But there is another problem which must always be borne in mind. Samples chosen for radiocarbon dating may be either 'long-lived' or 'short-lived'. Substances which are long-lived include wood. For example

A small, apsidal room (or large fireplace?) within the third millennium fortification tower was absolutely full of burnt date stones and fragments of broken pottery.

beams used in houses, palaces, temples or boats may be hundreds of years old before they are eventually burned and enter the archaeological record as charcoal. A reed mat, or date stone, however, is the sort of vegetal matter which probably had a very short life. Therefore, archaeologists are constantly exhorted to choose short-lived samples for dating purposes, rather than long-lived ones. At Tell Abraq we have well over 40 carbon-14 dates from all periods (Potts 1997a, in press) which make us confident in our dating of the various strata. Overall, the site dates to c. 2200 to 300 BC with a small amount of occupation in the first centuries AD. But there are a couple of dates which are much earlier, falling around 2500 BC. Not surprisingly, these were run on wood charcoal (perhaps from an old ship's timber?), while the samples yielding dates around 2190 or 2170 BC, which we think serve to establish the date of the foundation of the site, are all derived from short-lived samples, such as date stones and burnt reeds.

The first people at Tell Abraq?

OVER THE YEARS WE HAVE RECOVERED a very small number of nicely pressure-flaked stone tools at Tell Abraq, the sort of object normally associated with the earliest inhabitants of eastern Arabia. Margarethe Uerpmann, a German archaeologist who has worked with us on our fish bones, has established a clear picture of the development of the stone tool industries of the region beginning around 5500–5000 BC (Uerpmann 1992). But was Tell Abraq settled at such an early date? Not very likely, since we have nothing but sterile sand, i.e. clean sand without any artifacts, underneath our earliest architecture and living surfaces.

Most of the coast between Sharjah and Ras al-Khaimah must have been inhabited in the sixth and fifth millennia BC, however, and it is not improbable that the few pieces of flint recovered at Tell Abraq were dropped by early hunter-gatherers at the place where a community would eventually settle late in the third millennium BC. Were stone tools actually used during the lifetime of Tell Abraq? Maybe yes, maybe no. I tend to think not. This is not because stone tools necessarily went completely out of fashion once metal ones (e.g. those of copper and later bronze or iron) became available. But the fact is, if tools of flaked flint were used at Tell Abraq with any regularity we would expect to find both

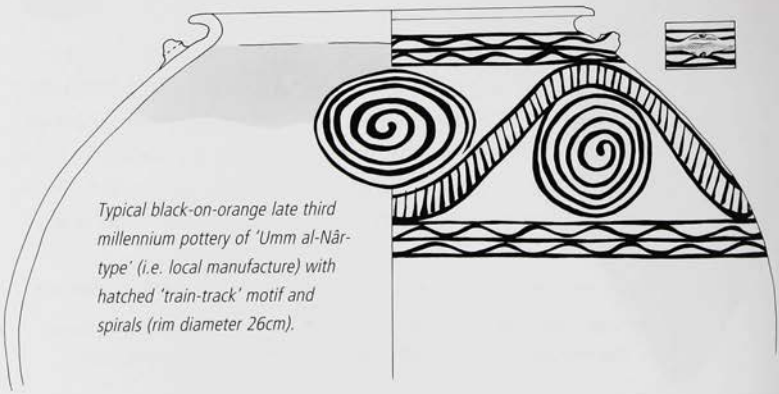
LEFT: *A leaf-shaped arrowhead from a second millennium context at Tell Abraq.*

ABOVE: *One of our most diagnostic pieces of flint, and one of the most mysterious. This knife with a notched tang finds very close parallels in pre-Dynastic Egypt.*

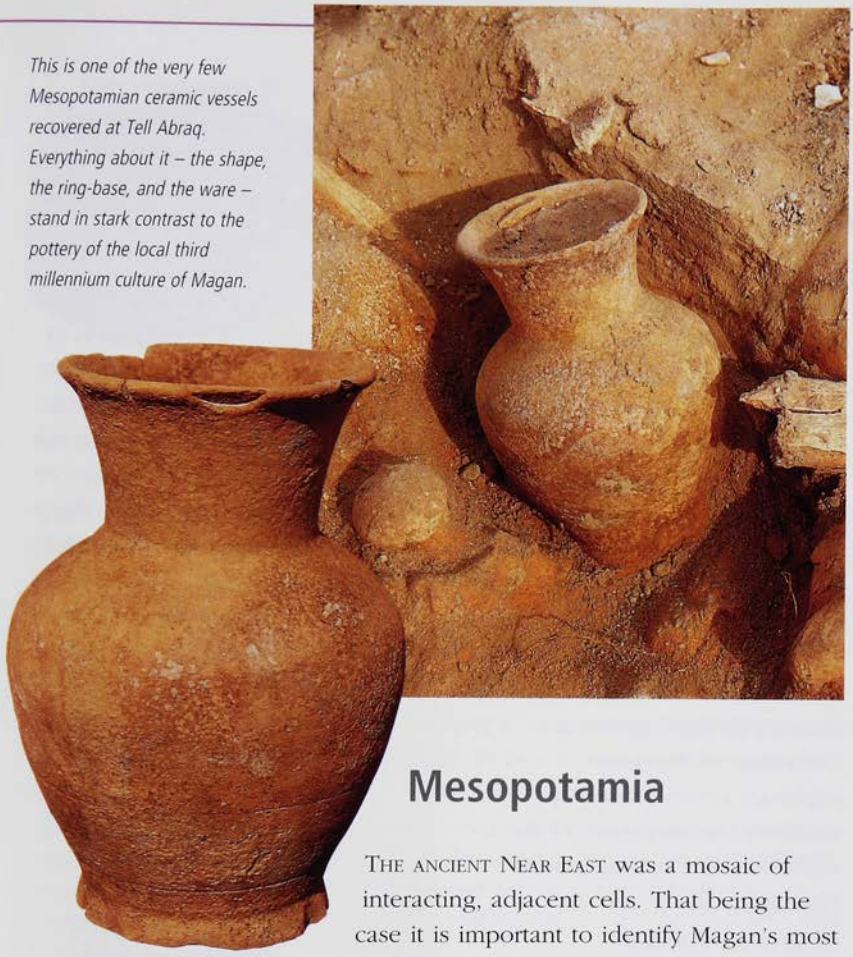
This beautifully crafted flint arrowhead was discovered in the late third millennium tomb. It must have been picked up from the surface somewhere and could have been over 2000 years old by the time it was eventually buried. (photo: Michele Ziolkowski)

more tools and evidence of manufacture, such as small flakes of flint or débitage which fly off a tool or a core (the raw flint from which a tool is fashioned) when it is being made. The fact that we have very few tools and no débitage makes me suspect that flaked stone tools played no significant role during the occupation of Tell Abraq.

Still, somebody appreciated a good stone tool when he or she saw one. The tomb at Tell Abraq, which dates to c. 2100–2000 BC, contained a unique, pressure-flaked flint arrowhead which probably dates to the fifth millennium BC. More likely than not, someone found this artifact two to three thousand years after it had been made. How it entered the tomb is another matter. Conceivably it may have been the property of someone who died and was buried, or it may have been put in by its owner as a symbolic offering on the death of a friend or loved one. That it was an antique by the time it wound up in the grave, however, is beyond doubt.



Typical black-on-orange late third millennium pottery of 'Umm al-Nâr-type' (i.e. local manufacture) with hatched 'train-track' motif and spirals (rim diameter 26cm).

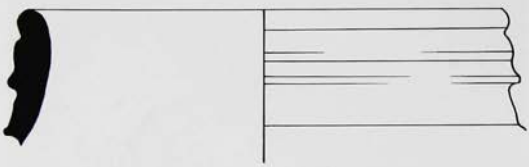


This is one of the very few Mesopotamian ceramic vessels recovered at Tell Abraq. Everything about it – the shape, the ring-base, and the ware – stand in stark contrast to the pottery of the local third millennium culture of Magan.

Mesopotamia

THE ANCIENT NEAR EAST was a mosaic of interacting, adjacent cells. That being the case it is important to identify Magan's most important neighbours, or those with which it seems to have had the most interaction. These would have been (not in order of importance) the Harappan civilization to the east, the cultures of Iran to the north, including Elam in the northwest, Dilmun (Bahrain and eastern Saudi Arabia) and Mesopotamia (modern southern Iraq).

Mesopotamia is a convenient term borrowed from the ancient Greeks for the 'land between the rivers', meaning that area between the Tigris and Euphrates which is today located in Iraq (and extended by some



Rim of an unpainted vessel reminiscent of Mesopotamian types from the early second millennium BC with complex ridging around rim (rim diameter 14cm).

scholars to include upper Syria and lower Turkey east of the Euphrates as well). In reality, Mesopotamia was not a cultural monolith, but a region in which a number of different ethno-linguistic groups (Sumerians, Akkadians, Babylonians, Kassites; later Assyrians, Aramaeans and Chaldaeans) lived over the course of several millennia. Mesopotamia was a land of tremendous agricultural productivity (Potts 1997b), fuelled in large measure by a mammoth irrigation system. What it lacked in natural sources, particular semi-precious stones, some timber and stone for building and sculpture, and most metals, it imported from the outside.

Managing a burgeoning economic system in the late fourth millennium created the impetus for the creation at Uruk (one of the most important urban centres in southern Mesopotamia), of the world's earliest writing system. Fortunately for us, the vast majority of writing in Mesopotamia was done on clay tablets, tens of thousands of which have survived to this day. These provide us with an unparalleled source of information on a wide range of beliefs, activities, industries and historical developments in Mesopotamia from c. 3400 BC to c. 100 AD.

Magan

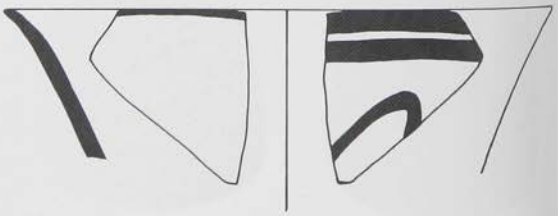
THE TITLE OF THIS BOOK certainly suggests that we know where the ancient land of Magan lay. In fact, we are in no doubt whatsoever about Magan's location. In Mesopotamia clay tablets written during the last few centuries of the third millennium BC refer to a land called Magan in Sumerian and Makkan in Akkadian, the two principal languages used in ancient southern Mesopotamia (modern day Iraq below Baghdad). Ships from Magan, along with those of Dilmun (Bahrain and the adjacent coast of Saudi Arabia) and Meluhha (the Harappan civilization of the Indus Valley?) docked at the quay of Agade, capital city of Sargon (2334–2279 BC), founder of the Akkadian empire.

Magan was later attacked by two of Sargon's successors, Manishtusu (2269–2255 BC) and Naram-Sin (2254–2218 BC). It was named as a source

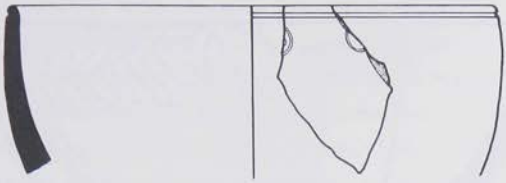
From the late third millennium through the end of the Iron Age (c. 300 BC) the manufacture of soft-stone vessels was one of the hallmarks of the societies of the Oman peninsula. These examples, all of which come from the tomb at Tell Abraq, represent but a few of the types which we know were exported to sites in Mesopotamia, Iran, Bahrain, eastern Saudi Arabia and the Indus Valley. More likely than not, however, it was their contents which were of interest, not the containers themselves. One colleague has suggested to me that the beehive-shaped vessels may have contained honey. Certainly stone vessels, whether of steatite or alabaster, were prized in antiquity as containers for fatty, oil substances. They may have been used to hold unguents or aromatics.

Gold dust from the king of Magan? A small number of gold objects was recovered in the tomb, and a few gold beads have come from the settlement at Tell Abraq. Where the gold may have originated is uncertain, but there are gold deposits in the Sultanate of Oman around Lasail, Rakah, Al Ajal, Wadi Andam and Mullaq, according to a Ministry of Petroleum and Minerals map from 1985. (photo: Michele Ziolkowski)

of timber in an inscription of Gudea (2144–2124 BC), governor of the city-state of Lagash. In 2069 BC a king of Magan sent gold dust to the city of Ur, and in the years 2027–2025 BC a merchant named Lu-Enlilla, living at Ur, was charged with purchasing copper, ivory, semi-precious stones and ochre from Magan on behalf of one of the major temples at Ur. These goods were paid for with Mesopotamian textiles, hides, oil and fish.

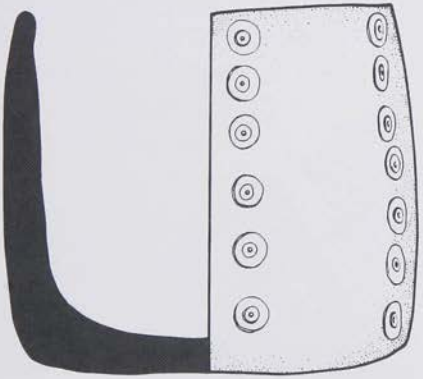


Red-painted rim of an early second millennium BC beaker (rim diameter 14cm).

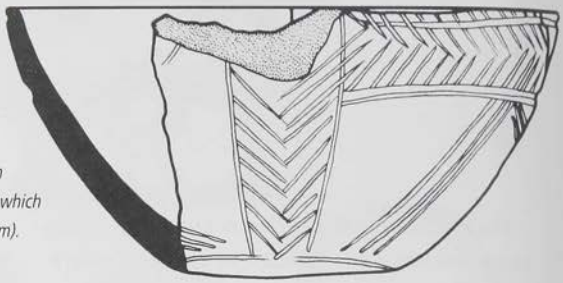


A fragment of a late third millennium soft-stone bowl. This may not be the most interesting-looking piece in this book, but it illustrates well how important accurate drawings are. The drawing clearly shows that, on both of the broken sides of the sherd, there are remnants of two dotted-circles. This motif, when used alone, indicates a date in the last three centuries of the third millennium BC (4.1 x 2.1 x .6cm).

These references have been known for many years and were we dependent on them solely we could not say definitively that ancient Magan was located in the Oman peninsula. After all, there are other places to the east of Mesopotamia where copper, timber and other goods mentioned in association with Magan could have been procured. In fact, however, we have later evidence which clinches the identification. In about 640 BC, as an inscription from Nineveh in northern Iraq tells us, a king called Pade from the land of Qade sent tribute to the Assyrian monarch Assurbanipal. Pade's capital was at a



A complete example of a late third millennium, squat beaker with double dotted-circle decoration in vertical rows spaced evenly around the body (height 8.4cm, base diameter c. 8.7cm, rim diameter 8.6cm).

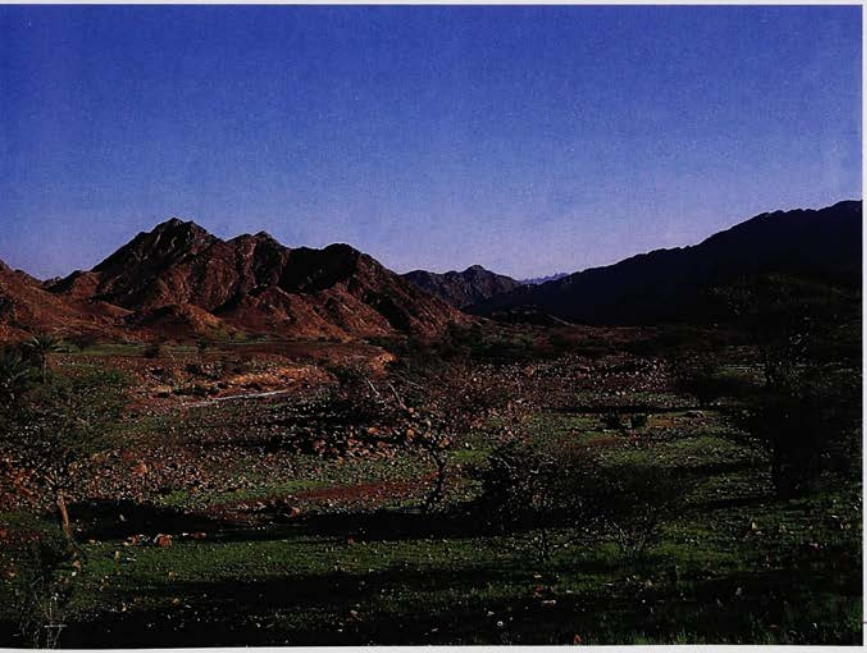


A typical Iron Age soft-stone bowl with incised herringbone decoration. The broken area marked by stippling in the centre of the drawing indicates that the vessel probably had a small, open pouring spout running off the lip which has broken off (10.5 x 8.3 x 1.3cm).

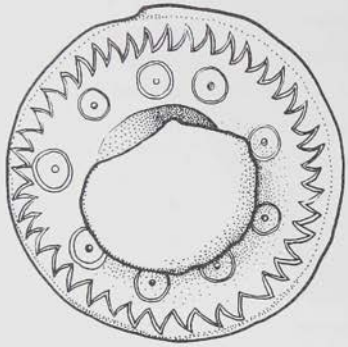
place called Iz-ki-e. Qade is also known from several royal Achaemenid inscriptions found at Susa and Naqsh-i Rustam in Iran which were commissioned by Darius the Great. Fortunately, these inscriptions are generally trilingual, written in Old Persian, Akkadian and Elamite (see Elam box p 116). In those places where Qade appears as the placename in the Akkadian version, Maka is given as the Old Persian equivalent and Makkash as the Elamite. These texts leave us in no doubt that Qade = Maka/Makkash, the latter equivalent to Sumerian Magan and Akkadian Makkan. Pade's capital, Iz-ki-e, moreover, is easily identified with the central Omani town of Izki, long claimed to be the 'oldest' town in Oman (Potts 1985). Since the Sultanate of Oman and the United Arab Emirates share one and the same landmass as well as the same archaeological cultures, there is no doubt that the names Magan, Makkan, Maka and Makkash applied equally to the entire region.

My wife holds up fragments of slag still showing the curvature of the oven from which they came at a site in the Wadi Safafir, southern Ras al-Khaimah.

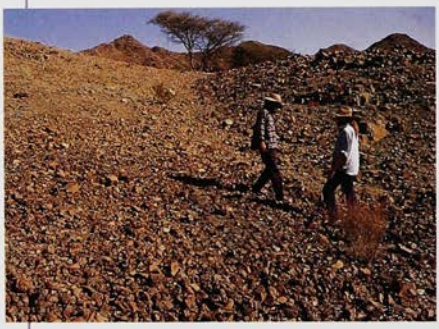
In ancient texts Magan is first and foremost associated with copper. Geologically, copper occurs throughout the Hajar mountains of northern Oman and the UAE in a formation known as the 'Samail ophiolitic nappe'. Hundreds of sites of ancient copper mining and copper smelting (refining), many with tons of slag still visible on the surface, have been documented throughout Oman, Fujairah and Ras al-Khaimah. Magan's copper is a prime example of an important resource in great demand in the workshops of the temples, palaces and metalworking establishments of southern Mesopotamia's large cities which, by hook or by crook, had to be imported from outside the region.



Archaeologists and metallurgists have had the 'copper mountain of Magan' in their sights since early this century. Archaeometallurgical investigations in Oman and in the mountains of Fujairah and Ras al-Khaimah have identified hundreds of pre-Islamic and early Islamic sites with, in some cases, tons of slag on the surface. This view of one such site in the Wadi Ashwani, Ras al-Khaimah, was visited by my team in 1996 and 1997 during a metallurgical survey of Fujairah. (photo: Michele Ziolkowski)



Soft-stone lids abound but it is often impossible to match them up with a particular bowl. This one dates to the middle-to-late second millennium BC and shows the dotted circle typical of the earlier styles of soft-stone decoration and the zig-zag typical of the later, Iron Age style. In the black section drawing the artist has shown the full diameter of the top of the lid because this could be measured from what remained, even though, as the drawing shows, part of the lid handle was broken in antiquity (6.5 x 6.3 x 3cm).



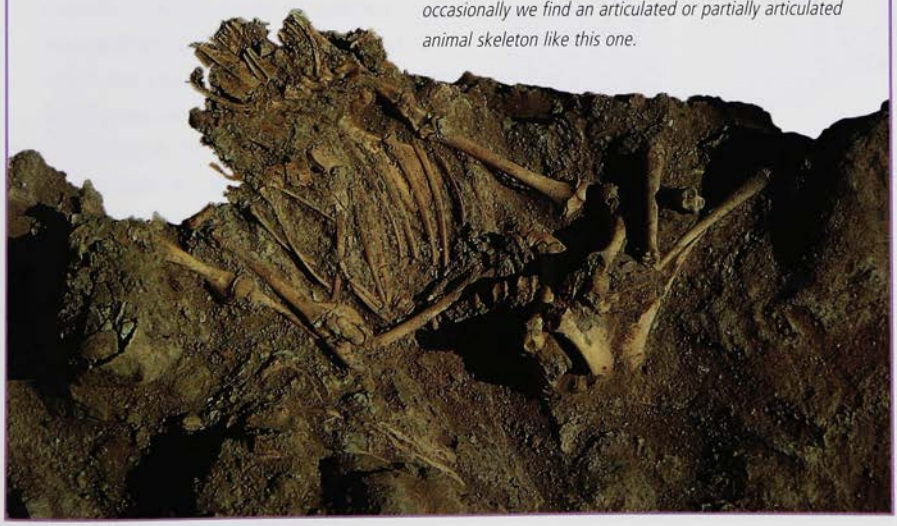
Cameron Petrie, left, and Lloyd Weeks, right, two post-graduates at the University of Sydney, walk over a large copper smelting site near Awhala in southern Fujairah.

To really understand Magan's history and role in the ancient Near East we must have an appreciation of the entire mosaic of cultures of which it was a part. I am not a great believer in the currently popular centre-periphery approach to history or archaeology in which large centres are thought to have exerted a dominant force over their cowering neighbours in the periphery. Why would Sargon have boasted about the arrival of ships from Magan? Why indeed would Manishtusu and Naram-Sin have campaigned against Magan? Why would the Nanna temple, Lu-Enlilla, or Gudea have expended so much effort vis-à-vis Magan, if Magan was a mere backwater in the periphery of the great centres of Mesopotamia, as eastern Arabia has so often been portrayed?

Faunal remains

In describing their excavations at Ali Kosh and Tepe Sabz in Iran, the American archaeologists Frank Hole, Kent Flannery and James Neely once wrote, 'We confess a little amusement at the thought that, while most Near Eastern archaeologists have dug for buildings and incidentally recovered a few seeds in the process, we dug for seeds and incidentally recovered a few fragments of buildings in the process' (Hole, Flannery and Neely 1969: 4). Given the fact that Hole and his colleagues were investigating the processes whereby wild plants and animals first became domesticated by human communities, their focus on biological, rather than cultural remains, is certainly understandable.

In the case of a site like Tell Abraq we are obviously not investigating the earliest anything, since a site established in the late third millennium BC was inhabited long after most of the plants and animals important in the ancient Near East (with the exception of the camel) were first domesticated. So how important are animal and plant remains in an excavation like ours? In fact, far too many archaeologists tend to ignore



Faunal remains often occur as loose, individual bones but occasionally we find an articulated or partially articulated animal skeleton like this one.

These burnt fragments of turtle carapace (shell) were found close to the base of the third millennium fortification. In antiquity the green sea turtle (Chelonia mydas) *contributed significantly to the diet of many coastal populations in southeastern Arabia.*

faunal (animal) and floral (plant) remains from archaeological sites of the historic period, feeling that information on the economy of those periods can be derived from written sources. Nothing could be further from the truth! In most parts of the world, writing was not used in antiquity to record what people ate. True, there may be texts which record the incomings and outgoings of animals or the arrival of fruits and vegetables or barley and wheat at Mesopotamian temples. But this does not tell us what people actually ate at any given point in time, and it certainly does not help us if we are working in eastern Arabia. This is where archaeology comes to the rescue, for we are in the fortunate position, on many sites, of finding animal bones which, if saved, curated and studied, have the potential to add immeasurably to our understanding of ancient diet.

Although hunted out of existence in the 1930's, the ostrich once roamed freely throughout Arabia. Ostrich eggshell containers were probably deposited in the tomb at Tell Abraq. These fragments have a carefully cut hole, the rim of which has been polished, and probably come from containers meant to hold liquids.

At Tell Abraq we tried to strike a balance between employing an extremely slow, time-consuming style of excavation in which all deposits would be sieved in order to recover animal bones, and a faster style in which we and our workmen made every attempt to pick up and bag every bone which we encountered during our digging, without sieving, while still allowing us to achieve relatively large exposures in our excavations. Had we sieved every bucket of earth the result would have been a far smaller window on the actual insides of our site than

we managed to achieve. With well over 40,000 identifiable animal bones (by 1993 the number of identified fragments [NIF] stood at 41,546), not counting fish remains, and the largest collection of faunal remains yet recovered on any site in the Arabian peninsula, I think we have struck the needed balance between large scale excavation and fine-grained recovery.

From the start of the project in 1989 all of the animal bones have been studied by Hans-Peter and Margarethe Uerpmann, at the University of Tübingen in Germany, and their students, Elisabeth Stephan and Hitomi Hongo (Stephan 1995). This has given us a very good idea of which animals were raised and eaten in every period of the site's occupation. We can assess the relative importance of domestic animals, like sheep and goat, vs. wild, hunted animals and birds, such as gazelle, oryx, cormorant, turtle, dugong and dolphin. The faunal experts can chart the changing percentages of each identified species through time; their relative contribution to the diet of the site's ancient inhabitants by weight of meat or caloric value; patterns of butchering (e.g. selective butchering of males vs. milk-yielding females); the differential importance of marine vs. terrestrial fauna, and so on. Finally, the economy of a site like Tell Abraq can be compared with what is known at contemporary sites elsewhere in the region or indeed elsewhere in the Near East, and at both earlier and later sites to see what patterns may emerge through time in dietary habits. Faunal remains provide archaeologists with a wealth of data available from no other source. They are unlikely to be displayed in a museum case, but animal bones are, in many ways, far more significant than the odd bit of gold or complete pot which may ultimately find itself on public view.

Is it a bird, a plane? Judging by the bounding position, the rear and the legs, the painter of this second millennium bird may have had an ostrich in mind, but his execution of the head and neck suggest that camels were not far from his thoughts as well! Thus far our faunal analysts report no cases of hybrid camritches or ostrels.

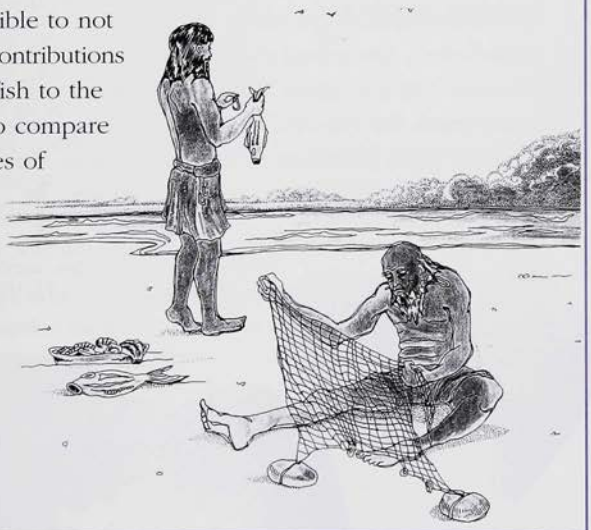
Fish remains

EVERYTHING SAID ABOVE about terrestrial faunal remains applies as well to fish remains. While it is presently located several kilometres inland, Tell Abraq was in fact a coastal site when it was inhabited. The *sabkha* (salt flat) which extends over a considerable area of Umm al-Qaiwain represents an ancient inlet which, in a time of marginally higher sea level, would have held water (Dalongeville 1990). Yet even if Tell Abraq was not immediately on the coast, it is clear from the remains of fish excavated that the diet of the site's inhabitants included fish in varying proportions during all periods. For a number of years Margarethe Uerpmann has been working on the fish remains, paying particular attention to a 'fish bone layer' over 30 cm thick excavated in 1992. To date, she has identified some 13,627 bones from this layer, representing the remains of no less than 28 different families of fish. At least 19 of these have been identified to species level.

This articulated fish skeleton was found within the thick fishbone layer excavated by the Uerpmanns and their team in 1992.

We have a handful of both copper and bronze fishhooks from the settlement deposits at Tell Abraq, all of which are large in comparison to most modern ones.

A detailed report on the fish remains from Tell Abraq is not yet available, but we can already see from Uerpmann's work that the menu at the site was sizeable. Jacks and pompanos (Carangidae), snappers (Lutjanidae), grunts (Haemulidae), emperors (Lethrinidae), porgies (Sparidae), spadefish (Ephippidae), mullets (Mugilidae), barracuda (Sphyraenidae), rabbitfish (Siganidae), tuna (Scombridae), shark (Carcharhinidae, Sphyrnidae), sawfish (Pristidae), stingray (Dasyatididae) and sea catfish (Ariidae) were all available. Once the study of the fish remains is complete it will be possible to not only chart the different contributions of the various types of fish to the diet through time, but to compare the changing percentages of fish from the inner, lagoonal environment with those from the immediate, offshore environs or from the deeper waters further out in the Gulf.



Shellfish

Shell beads were not very common at Tell Abraq. This large, mother-of-pearl spacer bead from the tomb is unique at the site.

IF YOU GO INTO a stylish restaurant in Sydney or San Francisco, oysters are bound to be on the menu but they are not cheap! In Belgium or France a less wealthy shellfish connoisseur may order a bowl of moules, since mussels are fairly inexpensive, but if you visit Cape Cod or Nantucket, watch out, because softshell clams and Littlenecks can put a big dent in your wallet.

The ancient inhabitants of Tell Abraq left us ample evidence of a penchant for munching molluscs and it is now clear from work being done all over the world that the contribution of shellfish to the diet was of major importance in most pre-modern coastal communities. Several years ago I compiled a list of all marine molluscs found on archaeological sites in the UAE which ran to two pages, single-spaced (Potts 1997c: Table 6). A study of the molluscan remains from the first season alone identified 18 different gastropods and 20 different bivalves.

As far as diet goes, however, five species were of particular importance: *Terebralia palustris* (variously known as mudsnails, mudcreepers or mudwhelks), *Saccostrea cucullata* (oysters), *Callista erycina* and *Marcia hiantina* (Venus clams). The high frequency of *Terebralia*, in particular, corroborates the charcoal evidence of more widespread mangroves in relatively close proximity to Tell Abraq since *Terebralia* are known to inhabit mangrove swamps in large numbers.

While shellfish most definitely contributed greatly to the ancient diet, shells themselves were used for a variety of purposes. The fig shell (Ficus subintermedia) *was traditionally used in this part of Arabia by mothers to feed liquids to babies. Considering the large number of children represented in the tomb at Tell Abraq, it is perhaps not surprising that we should have recovered no fewer than 81 such 'feeding shells' at the site, most of them in the tomb.*

Seed impressions and charcoal

WITH SUCH AN ABUNDANCE of fish and terrestrial faunal remains I always held out high hopes for the recovery of plant residues at Tell Abraq as well. Quite apart from the fact that we never saw any visible remains, such as seeds, in the soil deposits at Tell Abraq, an attempt to find seeds by more systematic means in 1994 was unsuccessful. George Willcox, a palaeobotanist with the French National Scientific Research Centre (CNRS) and Margareta (Eta) Tengberg,

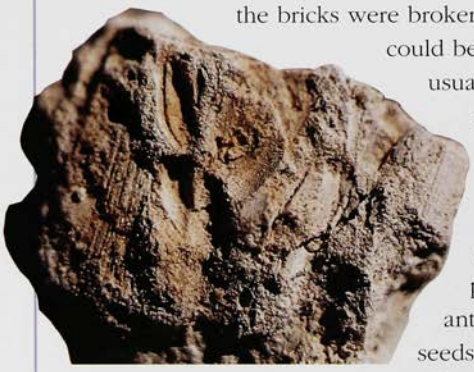
The large, rectangular bricks used in the mudbrick platform were bonded with thick layers of mortar. These, too, were chaff-tempered and an important source of data on the use of wheat and barley at Tell Abraq.

Mudbrick fragments like this one show clear finger impressions. These were used by brickmakers in exactly the same way as holes in modern bricks, to better grip the mortar between the bricks and therefore achieve a tighter bond. Bricks such as this one held the clue to finally uncovering Tell Abraq's 'hidden' cereal economy.

then a student in Paris, came to Tell Abraq and built a flotation machine. Basically, this consisted of a large drum with a series of mesh sieves on top into which bags of excavated soil could be poured. These were flushed through with running water and, with the drum full of water which was constantly being drained off and re-filled, the deposits were 'froth floated', as the saying goes. The results were less than spectacular. No seeds whatsoever emerged from a variety of deposits representing different areas of the site and different periods of occupation.

The impression of a wheat (Triticum) *lemma, one of the outer layers of the* floret *on a spikelet. The* spikelet *is part of the* ear *or flower of wheat or barley.*

We did, however, have plenty of mudbrick at the site and when flotation proved ineffectual George and Eta turned to bashing bricks. Presto! When the bricks were broken, entire seeds or their impressions could be clearly seen. Mudbricks, after all, usually contain chopped up plant remains, usually chaff from cultivated cereals, which was added to the mud in order to give it more strength, much like temper was added to clay when pottery was manufactured in antiquity. These impressions and seeds (Willcox and Tengberg 1995) confirmed what the absence of seeds in the excavation had otherwise obscured, namely that from the beginning of the site's occupation, the inhabitants of Tell Abraq had access to domesticated barley and wheat. Given the fact that chaff export is practically never attested in antiquity, George was perfectly confident that the wheat and barley must have been grown



The impression of a six-row hulled barley (Hordeum vulgare) rachis, *the central axis of the ear. This relatively heavy, inedible part of the plant forms part of the unwanted chaff which must be sieved off after winnowing.*

ABOVE AND RIGHT: *An Iron Age, conoid-shaped stamp seal of dark soft-stone. The sealing face, i.e. the underside, shows what may be a stylized cluster of dates. The seal is pierced near the top, probably so that it could be worn on a necklace.*

BELOW: *This bronze dagger was analysed by Lloyd Weeks and found to contain 12 per cent tin. Just as interesting, however, is the charred wood at the base of the tang. Eta Tengberg has identified this as one of five fragments of* Dalbergia sissoo, *commonly known as Pakistani rosewood, from Tell Abraq. Sissoo was rare in the ancient Near East. Assyrian kings (Assurnasirpal II, Tiglath-pileser III, Sargon, Assurbanipal and Esarhaddon) had doors and furniture made of sissoo and the Achaemenid Persian emperor Darius the Great used it in his palace at Susa. Interestingly, the name of this wood in Mesopotamian cuneiform sources was 'mes-wood of Magan'*

More than 22 socketed spearheads were found in the tomb at Tell Abraq. Occasionally small fragments of wood remained near the top of the socket. But what actually happened to the rest of the wooden spear shafts?

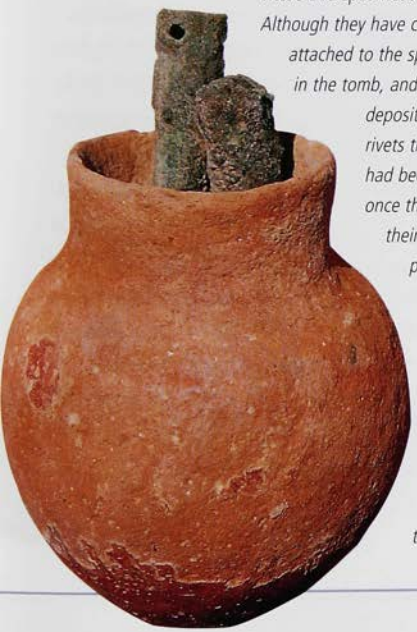
locally, although whether that was done in nearby date-palm gardens, or kilometres away on the gravel plains of the interior, we cannot say.

One thing is certain, however. The recovery of thousands of burnt date stones in all levels of the site, as well as date-palm wood charcoal, confirms that dates were available at Tell Abraq (and the incidence of caries on the teeth recovered in our tomb corroborates the presence of sugar in the ancient diet as well). If date gardens existed in the neighbourhood, then wheat and barley could well have been grown at Tell Abraq in small plots in the shade created by the palm fronds.

However, date-palms (*Phoenix dactylifera*) were not the only trees growing in the area

4000 years ago. Charcoal identifiable as coming from Christ's thorn (*Ziziphus spina christi*) and tamarisk (*Tamarix* sp.), two trees still found in the wadi and sand dune habitats of the region, was identified at Tell Abraq. In addition, we have charcoal belonging to two different species of mangrove, *Avicennia marina* and one of the Rhizophorae. Today the coast of the UAE from Abu Dhabi in the south to Ras al-Khaimah in the north has pockets of mangrove and in the past it was probably even more extensive. *Rhizophora*, attested also at Saar on Bahrain c. 1900 BC, is however today extinct in the Gulf. In the past, though, it most probably grew in the Gulf as well (Tengberg 1998).

Finally, Tell Abraq has yielded both loose charcoal fragments and wood adhering to the tangs of daggers in the third millennium tomb at the site which are identifiable as Pakistani rosewood (*Dalbergia sissoo*) (Tengberg and Potts 1999). This wood, well known in Baluchistan and Iran, must have been imported to Tell Abraq. Today it grows on Jabal Akhdar in Oman as well as in Iran, Pakistan and India.



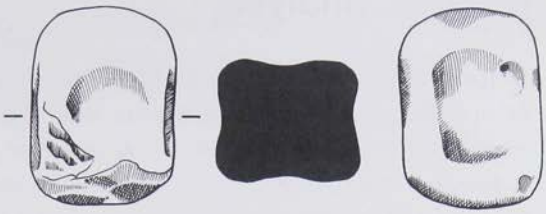
These two spearheads found stuck straight into this small pot give us a clue. Although they have clear rivet holes – presumably the wooden spearshafts were attached to the spearheads with bronze rivets – we never found a single rivet in the tomb, and that in spite of the fact that we excavated the entire deposit with dental probes. My feeling is that, if there had been rivets there, we would have found them. Moreover, if the spears had been buried with their wooden shafts, we would expect that, once the wood had decomposed, the rivets would remain, either in their original holes, or close by the spearhead if they fell out of place. The position of these two spearheads in a pot like this, coupled with the absence of rivets in the tomb, suggests to me that the wooden shafts and the rivets of the spears were removed before being deposited in the tomb. In a region where copper was abundant, and trees that could supply straight spearshafts relatively rare, I assume that the wooden spearshafts were deemed too valuable to take out of circulation and place in a tomb. My guess is that these were recycled and only the bronze spearheads put in the tomb.

Groundstone and starch

ARCHAEOLOGISTS WHO ARE NOT particularly interested in the origins of agriculture or in problems of cereal domestication often overlook some of the most important evidence of subsistence activities in the past, namely groundstone. Tell Abraq is particularly rich in groundstone, whether large grinding platforms, often curved from grinding action over time; heavy mortars; or hammer and pestle stones used in conjunction with another stone in grinding or crushing. From our first season in 1989 we began recovering groundstone and, as noted above, by 1994 we knew that wheat and barley had been eaten by the ancient inhabitants of Tell Abraq. It stood to reason that the dozens of grinding stones and hammers or pestles recovered ought to have been used to prepare flour from wheat and barley, although other activities, such as softening meat, treating hides, or even cracking open shellfish, could not be entirely ruled out. The problem was to prove that cereal grinding occurred, not to simply assume that such had been the case.

A first attempt at setting the analytical process in motion was made in the early 1990's when I visited Dr Patty Anderson, an American scholar working with the CNRS in France, who is an expert in this field. But for various reasons, partly technical and partly to do with her time, this attempt came to naught. I was particularly happy, therefore, when it transpired that one of my own Sydney students, Katia Davis, became interested in

Large, curved grinding platforms like these show signs of repeated forward and backward motion. The presence of starch granules on them suggests that they were indeed used to make flour.



This groundstone pounder has visible depressions on all four sides, a clear sign of percussion. It may have been used as a hammerstone along with a second stone which functioned as a chisel or pestle.

looking at groundstone. But I was not prepared for the fact that, already within the scope of a BA honours thesis on material from the nearby Iron Age site of Muweilah, Katia was able to show the presence of starch granules on some 60 per cent of the groundstone included in her study (out of 24 pieces). Since that time she has widened her study for a PhD and is examining the groundstone from Tell Abraq and many other sites in the Emirates as well.

The technique used involves making extractions from the surface of a piece of groundstone using ultra pure water and a solvent; mounting a sample from the extraction on a slide; examining it at 500x and 1000x magnification under a transmitted light microscope with polarizing filters; and photographing, measuring and describing the visible starch granules. Along with specialists in geology and the study of archaeological residues, people in crop science have been critically important to the success of the project because of the fact that they maintain reference collections of starch from a wide variety of cereal species with which our ancient granules can be compared (starch granules of different cereals can be distinguished on the basis of size and shape). Since 1998, moreover, Katia and her collaborators have been trying to extract DNA from the ancient starch present on our grinding stones. If they succeed, their work will revolutionize current work on archaeological plant residues worldwide.

These stones have circular depressions made from repeated percussion. They must have been used together with a hammerstone of some sort. The question is, what for?

Ceramic analysis

Archaeologists working in the Emirates on sites of the third millennium BC and later periods normally recover large quantities of pottery. Local museums may be interested in having complete vessels to display, but archaeologists are usually just as interested in the broken bits of pottery as in the whole pots. After all, when we find a piece of Harappan pottery at Tell Abraq, no matter how small, it is as good as having a complete one. It certainly means there was once a whole pot of that type at the site even if a sherd is not as nice to look at as a complete vessel.

But pottery serves many purposes beyond scratching the aesthetic itch of visitors to museums. The trick is mobilizing all the analytical forces available in order to extract a maximum of information from a representative sample of the broken sherds we excavate. One common way of doing this, beyond simple visual description and comparison with material from other sites, is to aim for a chemical characterization of the actual ceramic fabric, a quantitative and

Sherds were found by the thousands in the settlement at Tell Abraq, whereas over 65 complete vessels were found in the tomb. On the basis of their shapes and decoration we can often match them with material from other sites which have already been published, but in order to do that we need high quality, scale drawings. My wife, Hildy, has been the artist of the Tell Abraq and al-Dür expeditions for me and previously worked in one of the Harvard museums. Her drawings are done at a scale of 1:1, i.e. lifesize. They are first done in pencil and then inked. Both pencil and ink drawings are done on plastic drafting film because it does not shrink and wear as easily as paper. Archaeological drafting is an exacting business, not good for the back but essential for any project.

A very hard-fired, fine, orange sherd with black-painted, pendant triangles containing vertical bands. This piece was found lying flat on the ancient ground surface outside of the tomb. It finds a close parallel in a vessel from one of the late third millennium tombs at Dhahran in Saudi Arabia.

qualitative description of the clay used to make a pot. This can then be compared to the ceramics from other sites to see if they come from the same workshop, or if they are manufactured of clay from the same source.

There are numerous ways of chemically characterizing archaeological objects. When it comes to pottery, some of the most commonly used laboratory techniques are INAA (instrumental neutron activation analysis), XRF (x-ray fluorescence analysis), and PIXE/PIGME (proton-induced x-ray and gamma-ray emission analysis). At the University of Sydney we have undertaken an extensive program of PIXE/PIGME analysis in collaboration with scientists at the Australian Nuclear Science & Technology Organisation (ANSTO), Lucas Heights, NSW, under grants provided by the Australian Institute of Nuclear Science & Engineering (AINSE). This involves irradiating a prepared sample with a 2.5 million electron volt proton beam for several minutes and using detectors to record the x-rays and gamma-rays which arise as a result of proton excitation of sample atoms. The data is then

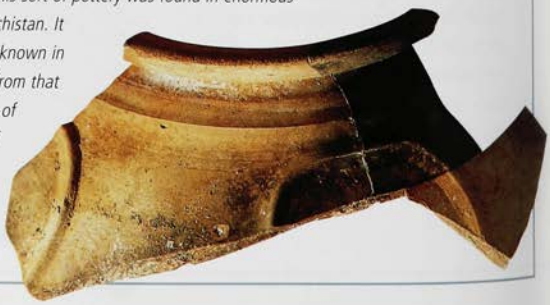
Numerous sherds of this large, black-on-orange jar were recovered in excavation and subsequently glued back together by Wendy Reade, our conservator. Based on the fineness of the ceramic paste and the decoration I suspect that it is an import from southeastern Iran but we will not know for sure until a chemical characterization of the paste is done which can be compared with material from sites on the other side of the Straits of Hormuz.

In spite of the large numbers of soft-stone vessels found on sites of third through first millennium BC dates in the Oman peninsula, we have evidence of a curious phenomenon: the manufacture of ceramic imitations of soft-stone containers. This tiny sherd has the double dotted-circle decoration so characteristic of third and early second millennium soft-stone. It was easy enough to make, using a tube drill with a mounted bronze or flint point in the centre and a bow to create the drilling action.

analysed on the ANSTO Fujitsu VP2200 computer and further subjected to a principal components analysis (PCA), a statistical method which allows one to detect structural relationships in the very complex data set which results from this sort of procedure.

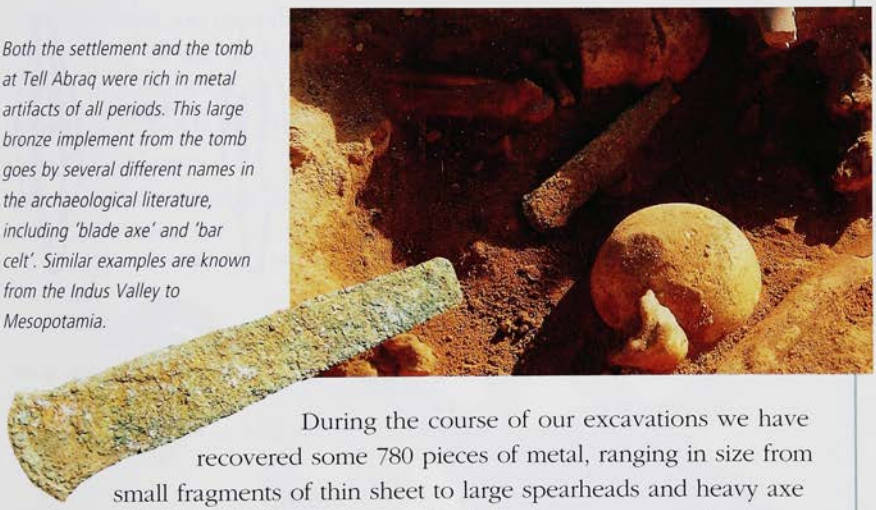
In working on the material from Tell Abraq Dr Peter Grave, a ceramic specialist at the University of New England in Armidale, NSW, has analysed ceramics from all periods (e.g. Grave *et al.* 1996, Magee *et al.* 1998) and, working together with various members of the team, has begun to produce an important series of publications in which it has been possible to discriminate locally made wares from imported ones, to see differences in ceramic manufacture between different periods at the site (in other words, through time), and to chart Tell Abraq's relationships with the outside world in ways which a subjective, intuitive, merely visual study of our pottery simply cannot do.

Large storage jars with raised ridges, often ending in snakes' heads, have long been known from sites in the Gulf, including Qalat al-Bahrain, Umm al-Nâr and Tell Abraq. I was already familiar with this sort of pottery from my days of excavating at Tepe Yahya in Iran but until recently had no idea where it originated. The paste is unlike that of the vast majority of pottery produced in ancient Magan and therefore I always suspected that it was foreign. Recently I discovered this sort of pottery was found in enormous quantities at Anjira, in Pakistani Baluchistan. It seems likely, then, that the examples known in Iran and the Gulf region are imports from that region. As with the soft-stone vessels of Magan, I suspect that the contents of these vessels, whatever it may have been, was the important thing, not the vessels themselves.



Metallurgical analysis

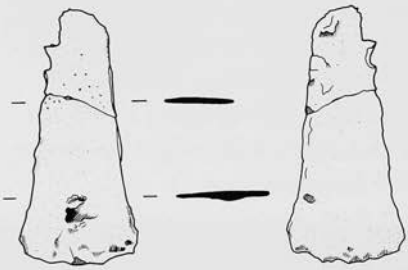
READERS OF THIS AND OTHER BOOKS on the archaeology of the Near East would certainly be familiar with the term 'Bronze Age'. In fact, when in 1836 the Danish antiquarian C. J. Thomsen first arranged the prehistoric objects in the National Museum of Northern Antiquities in Copenhagen under the headings 'Stone', 'Bronze' and 'Iron' Age, he would never have dreamed that so much data would one day become available from southeastern Arabia. Although these terms can connote very different things in different parts of the world, the fact remains that of all the hallmarks of the Bronze Age the use of metal is one of the most important.



Both the settlement and the tomb at Tell Abraq were rich in metal artifacts of all periods. This large bronze implement from the tomb goes by several different names in the archaeological literature, including 'blade axe' and 'bar celt'. Similar examples are known from the Indus Valley to Mesopotamia.

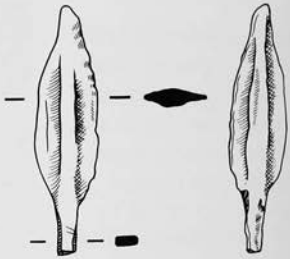
During the course of our excavations we have recovered some 780 pieces of metal, ranging in size from small fragments of thin sheet to large spearheads and heavy axe blades. While some of these were made of nearly pure copper (or copper with 1-2 per cent arsenic, sulphur, nickel, lead, zinc or iron in varying proportions), by far the majority were made of bronze, an alloy of copper and tin. We are able to say this with confidence since the composition of a large selection of our metal artifacts was determined by EDX (energy-dispersive X-ray analysis) on a Jeol JXA 733 Superprobe at the University of Western Sydney, by Dr Richard Thomas and Lloyd Weeks, a Sydney

Our early second millennium BC copper ingot. Damage makes it difficult to see its original shape which was a square-based pyramid with a flattened top. The only other pyramidal ingots which I know of in the ancient Near East were found in eastern Saudi Arabia. (photo: Georgia Britton)

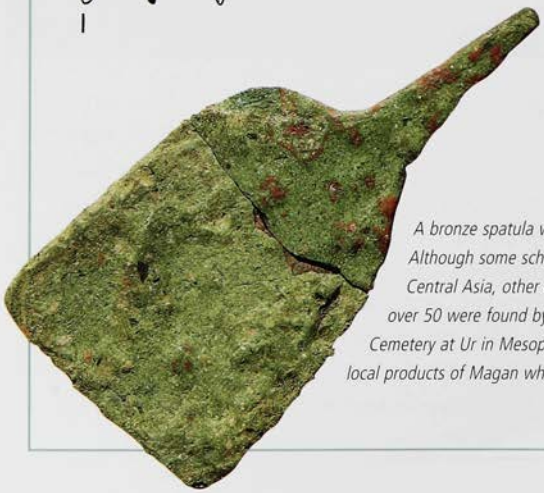


LEFT: *An unusually thin, copper-bronze (I use this term for metals which have not been analysed) axe-blade from one of the al-Dûr-period graves at Tell Abraq (9 x 2.8 x 4cm).*

LEFT: *A particularly small copper-bronze arrowhead of somewhat amorphous shape (3.3cm long, .3cm maximum thickness).*



ABOVE: *A copper-bronze arrowhead with square tang and raised, flattened midrib (5.6cm long, .4cm maximum thickness).*



A bronze spatula with a distinctively asymmetrical shape. Although some scholars suggest that these originate from Central Asia, other examples are known in the Emirates and over 50 were found by Sir Leonard Woolley in the Royal Cemetery at Ur in Mesopotamia. I am inclined to consider them local products of Magan which were exported.

PhD candidate. In comparison with sites in the area or in neighbouring regions, Tell Abraq shows an extremely high incidence of tin usage.

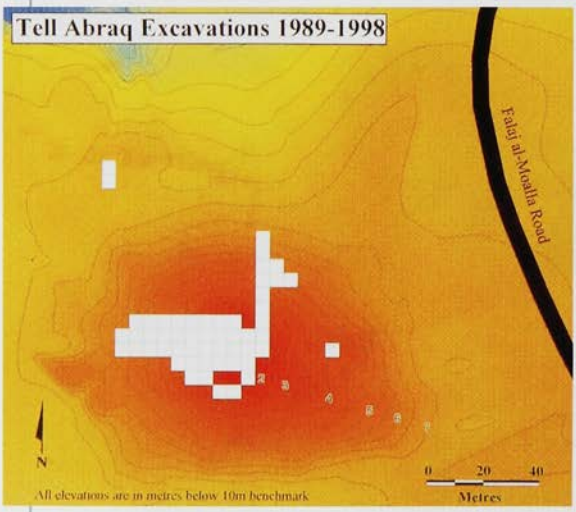
In addition to finished objects in bronze and copper, moreover, Tell Abraq provided enough pieces of slag and tiny droplets of once molten copper to leave us in no doubt that both secondary refining and casting took place at the site in all periods. Of course, Tell Abraq is not located in an area where copper ore itself could have been mined. That occurs further inland, in the Hajar mountains (specifically in the ophiolite). But the presence of a nearly complete copper ingot from an early second millennium BC level strongly suggests that copper was imported to the site in ingot form where it was refined again and cast into a wide array of objects.

The tin used, on the other hand, is not local to the Arabian peninsula. For a variety of reasons the tin sources located by Soviet archaeologists in Afghanistan stand out as the most likely source of tin used in Magan. Important research on this problem, using the results of lead-isotope analysis (LIA) carried out for us by Prof. Ken Collerson at the Univ. of Queensland (Brisbane, Australia), is being conducted by Lloyd Weeks as part of his PhD thesis (Pedersen and Buchwald 1991, Weeks 1997, 1999).

Bronze rings, a single gold ring, and a unique tin ring, were recovered in the tomb at Tell Abraq, sometimes on fingers, sometimes on toes. Often two rings were worn together on a toe, in much the same way as Indian women continue to do so to this day. (photo: Georgia Britton)

Documentation and registration

At Tell Abraq we always worked from 7 a.m to 2 p.m with a half hour for lunch. Much of that time, however, the excavator of a trench was not digging but writing. In contrast to many excavations in the Near East, we have tried to document the precise findspot of every object recovered (though not every animal bone or sherd). This means that every time a broken grinding stone or a small fragment of copper or a bead is found, the excavator must determine the coordinates of the object. All of our trenches were set up within a north-south, east-west, X–Y grid. The entire site sits within the confines of this theoretical grid so that any point on the mound can be located with reference to its location north and east of the zero point. In addition, each object's elevation below an artificial datum can also be determined with a level. Every object, therefore, when discovered, must have its coordinates determined (easting, northing and elevation). These, in addition to other relevant information such as the date, type of material,



A contour plan of Tell Abraq made using an EDM (electronic distance metre) in 1997/8. The locations of our trenches are indicated, as are the edge of the sabkha *to the north and the Falaj al-Mu'alla road to the east. Even though it is not always possible to determine one's absolute elevation above sea-level, a topographic plan is important because of the need to determine relative elevations. At Tell Abraq we established a datum point on the top of the mound, called it 0.00, and calculated all elevations from that point so that a typical elevation appears as '-7.75', i.e. 7.75m below datum.*

and excavator's name, are recorded on a specially printed tag and the object is slipped, with the tag, into a plastic bag (preferably zip-lock).

Back at the house, all of these 'smallfinds' are logged into a database on a laptop computer. We have used FileMaker Pro, a simple and flexible database program which allows us to have an unlimited number of fields for the information we require. Every object is given a registration number and fields exist for the coordinates, date of excavation, description, material,

ABOVE: *Christian Velde is shown excavating in an area of post-holes. In exposing and cleaning a level anywhere on the site ceramics, animal bones, shell and small objects appear constantly and it is the excavator's job to separately bag each type of material, write out tags so that the bags are properly labelled, and keep notes on the entire deposit.*

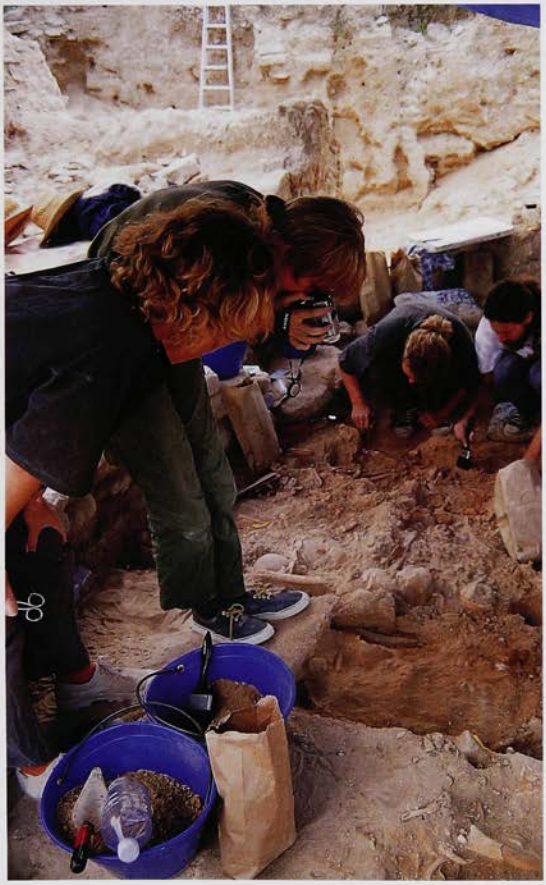
LEFT: *Stephanie Licciardo, our architect in 1992 and 1993, is shown here using a planning frame. This consists of a simple aluminium frame, 1m on a side, strung up with a grid of 20cm squares. Since our plans are always drawn at a scale of 1:20, the planning frame makes it easy to plot features on paper for the 1m square in front of the planner corresponds to a 5cm square on the drafting paper used.*

Much excavation is not actually digging, but brushing. We brush all the time in order to see emerging features. This can be very difficult on sites where soil colour differences are minimal, or where decomposed mudbrick looks scarcely any different from the soil in which it lies. Brushing can help highlight the differences between lumpy, chaff-tempered brick and the surrounding matrix of soil.

type of object, miscellaneous comments, etc. We can then sort the database in any number of ways. We can call up all objects from a particular locus; all objects of a particular material; all of the beads; everything found in 1990, etc.

In addition, plans are drawn at a scale of 1:20 of every architectural feature and 'sections' are drawn of every single wall of every trench. This is the most important record of the different buildings and soil formations encountered in the excavation and, along with photographs of all architectural features and selected sections, constitutes all we have to work with once we have left the site. Moreover, it is the record which will eventually be published for others interested in Tell Abraq to use whenever they wish to investigate the sequence of the mound.

Using a GIS (geographical information system) program called MapInfo we can plot the objects on a digitized contour plan of the mound and study, for example, the distribution of groundstone; the locations of all beads; the relative locations of metal artifacts as opposed to pieces of casting spillage, and so forth. The computer is every bit as essential in an excavation as the shovel. Documenting the finds and entering the data into the computer is as big a part of the daily work routine as excavation.



Excavation in the tomb in 1998. We excavated the tomb deposit in 50cm squares, cleaning the area, exposing the bone and artifacts, drawing what we could see, photographing and then removing each object (bagging and tagging it of course). Zip-lock plastic bags were used to hold loose teeth but paper bags were used to hold human bone since they do not seal in moisture like plastic ones. In addition to photographing our squares using 35mm cameras, we also began to video the deposits. This practice has several virtues. One can narrate and comment on what is being photographed, and one can also create stills from the videotape. Here my daughter Rowena, then 15, is shown videoing a square she had been helping to excavate.

The lateen sail

The pendant with the Magan seacraft. The body of the boat is crescent-shaped and punctuated by vertical lines. The lateen sail is shown as an isosceles triangle above it.

WITH ALL THE TO-ING and fro-ing which must have gone on in the Gulf, all of the maritime contact with Mesopotamia, Iran, Bahrain and the Indus Valley, the tuna fishing and the copper transportation, it is simply inconceivable that the inhabitants of Tell Abraq and other sites along the coast were not competent sailors. And yet while we make much of the artifacts which reveal the region's far-flung contacts, far less has been written of the actual evidence of sailing. Unfortunately, in contrast to the Mediterranean, the Gulf itself has yielded no prehistoric anchors. And yet at Tell Abraq we have recovered a precious document which throws more light on early sailing than anything else discovered in the Emirates.

A small, soft-stone pendant from an Iron Age context depicts what appears to be a sewn plank boat with a distinctly triangular sail (Potts 1995, 1998). It is tempting to suggest, although impossible to prove, that this is an early depiction of the famous lateen sail. Earlier generations of maritime historians have assumed that the Arabs acquired the technology of the lateen sail from the Mediterranean, but the pendant from Tell Abraq, which can be roughly dated to c. 1000–500 BC, is decidedly earlier than any contact between Arabs and the maritime communities of Egypt, the Levant, or Asia Minor.

Mesopotamian scribes were quite discriminating in referring to the watercraft of other nations and depictions of ships in the Harappan world, on Bahrain, and in the Oman peninsula suggest that there were visible differences in boatbuilding across Western and South Asia. When Sargon of Agade boasted c. 2300 BC that 'ships from Dilmun, Magan and Meluhha docked at the quay of Agade' he may well have been able to tell them apart just by their appearance. The pendant from Tell Abraq gives us for the first time an idea of what one type of Magan seacraft may have looked like.

Our first glimpse of the tomb at Tell Abraq came in 1989 when the north face of one of our squares in the original step-trench exposed just these few stones. This was enough to know that, in the squares directly north of what we see in this photograph, we would find the rest of the tomb.

The tomb at Tell Abraq

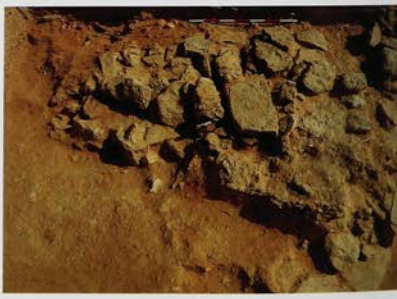
When I first began working at Tell Abraq in 1989 I was clear in my own mind about the purpose of the excavation. We were going to excavate a stratified mound with a long sequence which would provide us with a good look at the development of the region through time. I had no interest in excavating yet another tomb, which may anyway have been looted in antiquity, for the sake of a few more objects. After all, the storerooms of the museums in Ras al-Khaimah, Fujairah and Al Ain were full of objects, most of them unpublished. What we needed was a deeply stratified site which would provide an anchor for the local sequence.

Christian Velde beginning to strip the area above the tomb in 1992. Note that he is not excavating horizontally. If he did he would have cut through many different layers at once! Because they overlay the tomb beneath, the strata of the mound at this point sloped sharply down towards the west. Christian peeled back those strata, one by one, following their actual incline.

By the end of the 1992 season we had cleaned up just a small section of the stones originally seen in 1989 and could begin to get an impression of the curvature of the tomb's outer wall.

When, in that first season of excavation, we found that our east-west step trench had just barely exposed the exterior of an Umm al-Nâr-type tomb of the late third millennium, I was adamant about not excavating it. I modelled my restraint on the great Sir Leonard Woolley, excavator *sans pareil* who, in his first season at the mighty Mesopotamian metropolis of Ur, discovered what became known as the Royal Cemetery but waited five years to excavate it while his workmen became used to the business of digging.

However, three years into the project I decided we would excavate our tomb for two reasons. Firstly, it lay deeply buried beneath over two metres of stratified deposit. In fact, it had been buried from view, covered over by the growing settlement, by about 1900 or 1800 BC. That meant, I hoped, that the tomb might in fact be unrobbed, a rarity in this part of the world, and thereby contain some useful data rather than mere bits and pieces of things the tomb robbers left behind. The second reason for excavating the tomb was the fact that, having



The 1993 season commenced with the removal of everything that remained above the tomb. Here we see the western half of the tomb after it had been completely cleaned, but prior to actually digging into the tomb deposit itself.

ABOVE: *There are two sides to every story, and there are two halves to our tomb. Soren Blau, left, brushes some of the upper stones in the eastern side of the tomb's outer wall. In front of her is a jumble of large, flat slabs which originally formed part of the roofing of the tomb. The rest of the team stands in the western half of the tomb, planning, excavating, and discussing what is happening. The raised 'wall' of earth covered by wooden boards which appears to run through the middle of the tomb is called a 'balk' (or baulk). This is simply a 50cm wide strip of earth left standing between two different trenches. It provides a 'section' through a deposit. We carefully study and draw the outline of the different soil deposits shown on the face of a balk. Once all the earth in a square has been removed, drawings and photographs of these sections are the only records of the actual succession of strata left to us. They can be extremely important in trying to solve problems in the occupational history of a site.*

BELOW: *Emeritus Professor Richard V. S. Wright, of Sydney University, is not only a wizard at multivariate statistics but has excavated widely throughout the world and developed computer programmes to analyse cranial variation in human populations.*

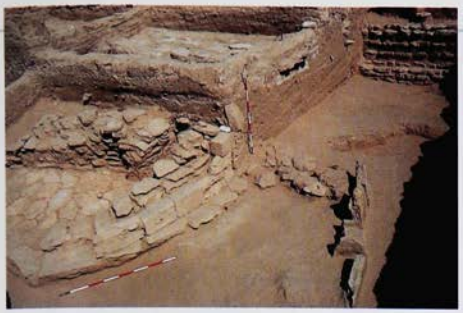
Professors Alan Goodman and Deb Martin from Hampshire College (Amherst, Ma., USA) excavating at Tell Abraq in 1993.

excavated in the mammoth fortification just 10m away, I hoped that we would find, buried in the tomb, the very people who had lived and worked in and around the late third millennium fortification. This gave the tomb potentially greater significance since it is rare to find a tomb in such close proximity to a settlement, indeed well within a settlement.

In 1992, therefore, one of our team, Christian Velde, veteran of the German expedition at Shimal in Ras al-Khaimah, began stripping the 2m of overburden back from the area above the tomb, leaving just enough to cover it from view until we returned to the site for more work. The following season we began excavating the tomb itself with a sub-team which included three biological anthropologists or bioarchaeologists, depending on what you prefer to call them, Professors Alan Goodman and Debra Martin from Hampshire College (Amherst, Ma., USA) and Emeritus Professor Richard Wright, from the University of Sydney.

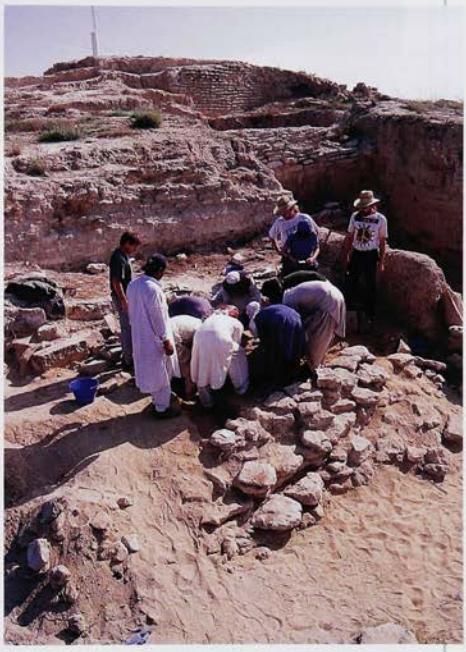
Excavation above and around the tomb showed it to be a typically circular structure built for the most part of locally available beach rock (Arabic *farush*) with an external facing of finely masoned limestone ashlar blocks. The tomb has a diameter of 6m with a single,

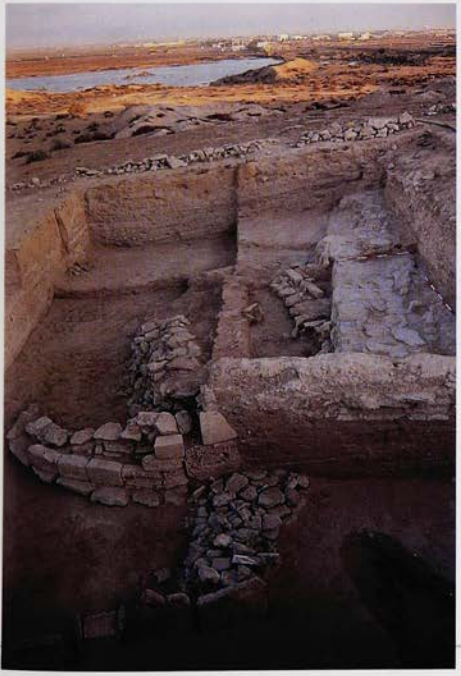
The tomb as it looked from the north at the end of the 1993 season. Only the western half had been excavated at that point.



ABOVE LEFT: *The tomb was located only 10m to the west of the fortification tower. Both were built on the same, original groundline. This is how we left the site at the end of 1993.*

ABOVE RIGHT: *When we finally returned to the site in December, 1997 a couple of wet winters had given it a vegetation cover I had never imagined possible in such an arid region.*





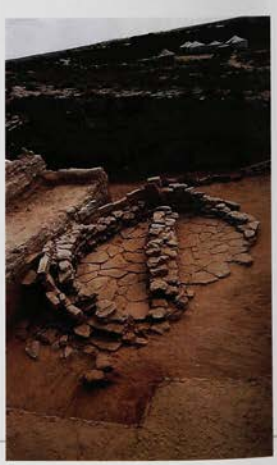
ABOVE: *Starting up again in 1997 was difficult, not least because it took about five strong Pathans to help shift one of the enormous roofing slabs which overlay the central part of the eastern half of the tomb.*

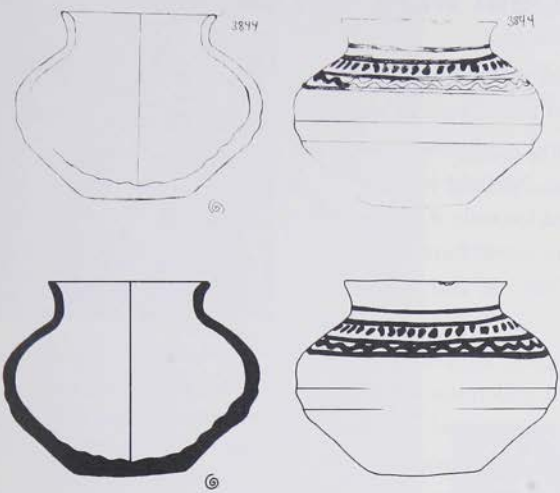
LEFT: *Viewed from the south, looking north, the tomb awaits completion after our first assault on it in 1993.*

LEFT: *Viewed from the south, the tomb completely excavated.*

BELOW: *From the north it is easy to see that the northwest part of the structure had been removed in antiquity. Apart from that, the interior contents of the tomb deposit showed no sign of robbing.*

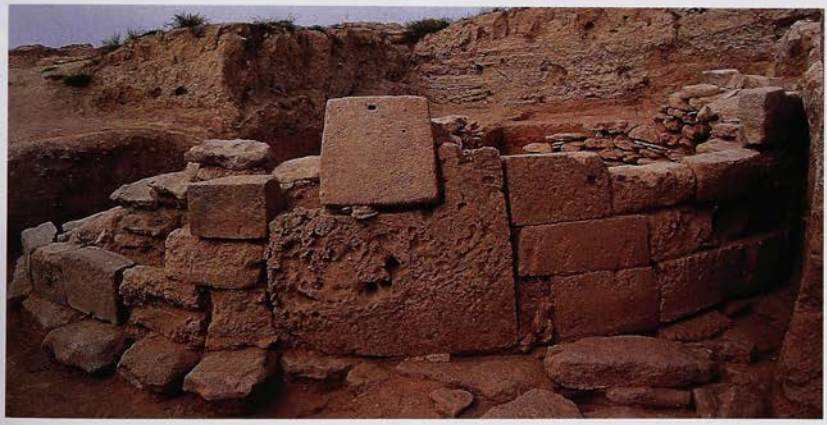
internal dividing wall. The two chambers are joined by a passageway to the south of the interior wall. The entire tomb is constructed upon a flat, beach rock pavement, on the south side of which is a small retaining wall with what appears to be an entrance step. The interior of the tomb contained a deposit c. 1.40m thick of bone, soil and artifacts. While the northwestern corner of the tomb had been disturbed in antiquity, the interior of what remained showed no signs of any looting. Given that we excavated very slowly so as to recover as much unbroken bone as possible, it took an entire season to excavate each half of the tomb. Unfortunately, after a stellar season in 1993 events beyond our control led to a postponement of the excavation. We returned in December, 1997, excavating until midway through February, 1998, and finishing the east side of the tomb. Dozens of complete pots, metal weapons and stone vessels; hundreds of beads; a dozen ivory combs; several gold pendants; and an ivory stamp seal bear witness to the site's far-flung contacts with Mesopotamia, Iran, Bahrain, Bactria (northern Afghanistan and southern Uzbekistan), Baluchistan and the Indus Valley. Just as exciting is the biological information we now have on the inhabitants of Tell Abraq around 2000 BC.





The pencil drawing of this squat, black-on-red jar from the tomb at Tell Abraq as it looked during the field season.

The inked version of the original pencil drawing was done on a second piece of drafting film. The small spiral near the base is our way of indicating that the base was 'string-cut'. We use this symbol because using a string to remove the vessel from the potter's wheel leaves a typical swirling pattern (height 6.9cm, base diameter c. 3.9cm, rim diameter 5.7cm).



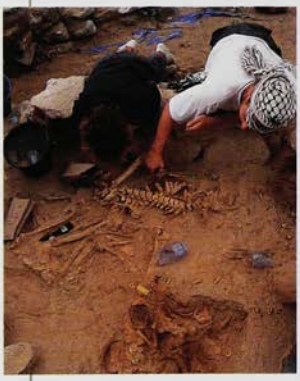
A close-up of the south face of the tomb. The nicely masoned, trapezoidal stone in the centre of the picture looks suspiciously like it marks an entrance to the tomb. Furthermore, it is situated right in front of the passageway linking the eastern and western chambers of the tomb. Assuming the walls of the tomb stood roughly 2m in height, and the whole was roofed over with stone slabs of the sort encountered in our excavations, the trapezoidal 'porthole' sealed by this stone may have been the point through which bodies were brought into the tomb.

Remains of Ancient Man

No matter how we tried, it was invariably difficult to get comfortable excavating the 50cm squares in the tomb. Here Alan Goodman tries the 'sit on the internal wall and open your legs' approach.

THE TOMB AT TELL ABRAQ has yielded the remains of probably more than 300 individuals of ancient date ranging from foetal and newborn infants to adults over 50 years of age. Nothing suggests that the tomb was reserved for only a sub-set of the site's population, the rich and famous, the young and good-looking, the old and weary, or only the blondes. Thus, we are pretty confident that we have here a very good sample of the population of the late third millennium BC at our site. When people died in the second and first millennia BC they were probably buried as well, but we have yet to locate their tombs.

Alan Goodman and Deb Martin, as well as a number of their students in America, and Soren Blau, in Canberra, have all been working on Tell Abraq's ancient skeletal remains. For the most part, preservation is excellent. This is, by any measure of significance, an important collection.



Others preferred the 'lie on your belly on the internal dividing wall and kill your back and stomach' approach.

By now the material from the west side of the tomb has been thoroughly analysed, while that from the east side is still under study. There is already much that can be said about our population, roughly half of whom were children. Arthritis was common, muscular stress and strain must have been significant. Infections caused by schistosomiasis, staphylococcus and streptococcus were common, as was anaemia, and probably malaria. Tooth decay (caries), abscessing, dental wear and tooth loss all show up frequently. The population appears to have been genetically

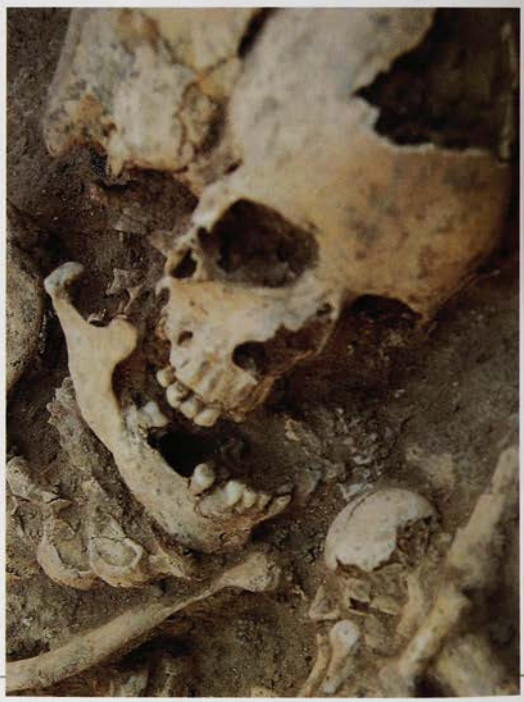
One of the great difficulties in excavating and analysing ancient collective burials, like the tomb at Tell Abraq, is the fact that most of the remains found in them are disarticulated. This is mainly because, as new bodies were put into the tomb, skeletons which had been there for some time and had long since become defleshed, were simply pushed aside to make new room. For this reason, it is generally true that the latest Bronze Age burials in the tomb showed the most articulation. Here is an example of one, relatively well-articulated individual, who was placed not too far north of the presumed entrance of the tomb.

This unusual case might show a secondary burial from ancient Tell Abraq. The individual's limbs appear to have been bundled up after the skeleton had become defleshed.

More often than not the bone deposit in the tomb looked like this, a disarticulated jumble of skeletal elements all mixed together.

ABOVE LEFT AND RIGHT: *One unusual case at Bronze Age Tell Abraq was that of the female with a possible case of polio. She herself was fully articulated, but there was disarticulated bone both above and below her.*

RIGHT: *The possible victim of polio had lost some teeth prior to death as well.*



LEFT: *Ante-mortem tooth loss (i.e. loss of teeth prior to death) was common. When that happens it takes a surprisingly short time for bone resorption in the upper and lower jaw to fill in the tooth sockets. This individual's mandible (lower jaw) is completely smooth where once teeth had been.*

BELOW: *Even in the bone deposit just above the paved floor of the Tell Abraq tomb we occasionally came upon small pockets of articulation, like this segment of a vertebral column.*

ABOVE: *Dental attrition at Tell Abraq was also significant, caused no doubt by grit in the diet, whether from eating shellfish or bread made with coarsely-ground flour.*

RIGHT: *Richard Wright holds a mandible fragment (lower jaw) showing clear resorption in the molar region.*

ABOVE: *A lone, articulated foot on the floor of the tomb with two bronze toe rings still in place.*

RIGHT: *No 'rings on their fingers and bells on their toes' at Tell Abraq. We found rings, often more than one, on both fingers* and *toes.*

homogeneous and yet some individuals were hyper-robust while others were gracile. One completely articulated skeleton found near the presumed entrance to the tomb was that of a female, aged 18–20, whose bones show all the signs of a severe neurological disorder, quite possibly polio. If this diagnosis is correct – and it is strongly suggested by a variety of indices (upward curvature of the sacrum, arthritic changes in the right knee and ankle, abnormal curvature of the left foot) – then this young Tell Abraqian represents one of the earliest cases of polio detected anywhere in the world. Deb Martin has written in greater detail about this elsewhere (Martin 1999) and it is clear that, when the complete skeletal collection has been studied, we will know a good deal more about health, disease and nutrition in Bronze Age Arabia than we do at present.

One of the rare signs of trauma at Tell Abraq for which we are lucky to have the proverbial 'smoking gun'. This longbone fragment, stained green from contact with bronze, still had embedded in it the tip of a bronze dagger or short sword.

Work and play

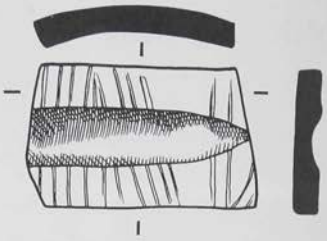
What will you give me for one fine set of knucklebones? These four which came out of the fishbone layer were all extremely smooth, as though they had been handled repeatedly.

We know from a number of works of classical literature, such as the *Onomasticon* by the scholar and rhetorician Pollux (second century AD), that both young and old in the Greco-Roman world enjoyed a good throw of the knucklebones (*astragaloi*) now and then. With the exception of some memorable discoveries, such as Sir Leonard Woolley's recovery of a gaming board in the Royal Cemetery at Ur, or Maurizio Tosi's discovery of a similar object at Shahr-i Sokhta in eastern Iran, we have little idea what games were played in the late third millennium Happily, the very same level at Tell Abraq which was so rich in fishbones (described above) yielded a beautifully polished set of four knucklebones. A variety of different games using knucklebones are still played today throughout the Near East (Boehmer and Wrede 1985).

Another toy found at Tell Abraq is a ceramic disk with two holes in it. This type of toy is well-known in the Bronze Age Levant, in the Indus Valley, in Ptolemaic Egypt, amongst various Native American tribes and in colonial America. The Japanese, Koreans, Chinese, Eskimoes, Brazilian tribes and undoubtedly other groups have also used them. A long loop of string, passed through the two holes of the toy, is wound back upon itself and then pulled, creating a humming sound. For this reason, this type of toy was called a 'buzz' at the beginning of the twentieth century in America (Van Beek 1989).

The Tell Abraq 'buzz', a simple toy known all over the world from prehistoric to modern times.

Well, we should never begrudge the ancient inhabitants of Tell Abraq their fun. After all, they deserved it! Soren Blau's study of the *talus* (ankle) and *calcaneus* (heel) bones from the west half of



This curved piece of soft-stone (see the curved section drawn in black above the frontal drawing of the object) is probably a fragment of a stone vessel which was re-carved (see the gouged out area in the middle and incised lines). It may simply have been a stonecarver's 'doodling' or a failed attempt to turn a broken sherd into a pendant (4.2 x 2.7 x .5cm).

the tomb revealed alterations resulting from 'habitually high joint reaction forces' (Blau 1996). These could have been caused by squatting or vigorous walking, while changes to the metatarsals (also in the foot) suggest repetitive kneeling. Precisely what activities may have brought about these changes is difficult to say. When kneeling to grind grains, did the grinder rest with his bottom perched on his heels and his metatarsals bent back? Did fishermen repair their nets in a squatting position? Or did people while away the hours running from place to place for a good game of knucklebones? Activities of all sorts (and not merely hard work) could account for the modifications seen on the Tell Abraq bones. Hopefully the ancient Tell Abraqians realised that all work and no play made Magan a dull place in which to live.

The ancient inhabitants of Tell Abraq were no strangers to sore joints, arthritis and a range of back problems.

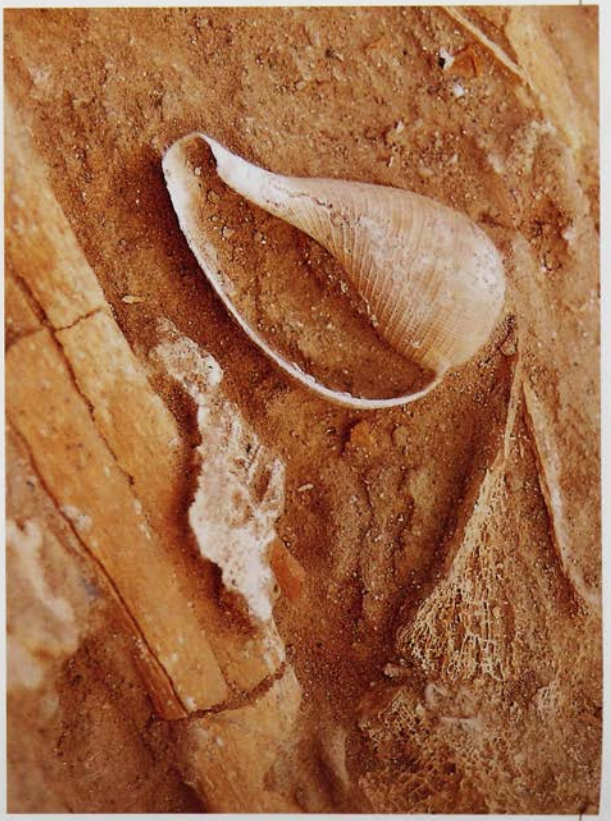
Textile remains

Whenever I am asked what people in the past looked like and how they dressed I tend to resist making any categorical assertions. The coast of the UAE was and is warm by any meteorological standard. Clothes would not have been particularly important, except perhaps in the middle of a wet winter. In the late sixth century BC the sculptors of the Persian emperor Darius I depicted inhabitants of Magan, known as Machiya in Old Persian, amongst the subject peoples who held up the Great King's throne. Significantly, they are shown wearing a short kilt, something like a lungee, with nothing on their upper body apart from a sword slung over one shoulder.

At Tell Abraq we have no visual representations of what people actually looked like but the tomb has provided us with over half a dozen textile fragments so that we know that cloth was certainly used. Given its humidity, the Emirates

A textile fragment, visible as a brown patch, on one of the socketed spearheads from the tomb at Tell Abraq.

A close-up of a dagger blade from the tomb with a fragment of linen adhering to it.



OPPOSITE TOP: *A shadowy, yet still identifiable textile impression in a calcareous substance adhering to a long bone.*

OPPOSITE BELOW: *An SEM (scanning electron microscope) photograph of linen fibres (on the dagger, p 97) photographed at 1200x magnification. (photo: Wendy Reade)*

BELOW: *This dagger blade has textile impressions in the corrosion on the surface of the metal*

is not the sort of place where you would expect textile fragments to preserve well on archaeological sites, and indeed such is the case. In the tomb, however, we found small patches of textile adhering to metal, whether bronze spearheads, dagger blades or vessel fragments, as well as textile impressions in the corrosion on such objects. Why should this be so? As it happens, the bacteria which would otherwise destroy textiles in an archaeological deposit are killed off by the so-called 'biocidal' effects of contact with the corrosion products on metal. Thus, corrosion can be the proverbial cloud with the silver lining. As much as we may despair over the corrosion of ancient metal artifacts, that very process has at least preserved for us the only textiles known from the late third millennium in the Arabian peninsula.

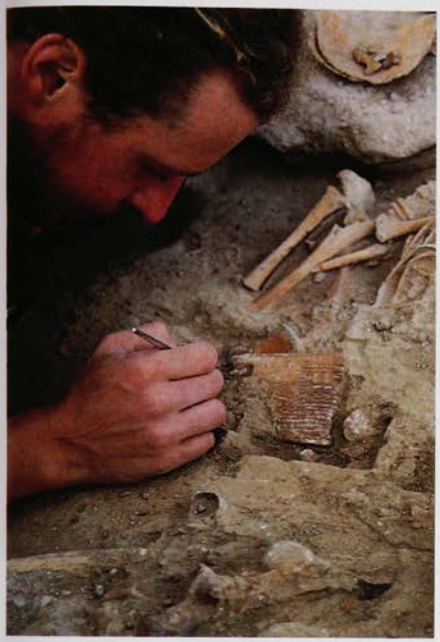
Thus far our conservator Wendy Reade has analysed only one textile sample from the tomb but the results were intriguing. Using a scanning electron microscope to photograph the tiny fibres in her sample, Wendy has shown that they came from linen (Reade and Potts 1994). This is particularly interesting because, in Mesopotamia at the very same time, linen was reserved for high-ranking officials, kings, priests and the garments of the gods (statues of deities were routinely draped with jewellery and clothing). Of course we do not know whether the linen from the tomb was originally part of a piece of clothing or whether it might have come from a shroud wrapping which enveloped a corpse.

One of the combs as it appeared in the ground and after conservation.

Ivory

WELL, WHEN YOU ARE WEARING A KILT or skirt made of linen, and have your eyes made up with green eyeshade (see below), the obvious thought must be, what in the world do you do with your hair? The answer, if you lived at Tell Abraq four thousand years ago: put it up with an ivory comb.

Tell Abraq has probably yielded more ivory combs than any other site in the Near East. These were tall, with a flat, upper area decorated with simple dotted-circles or, more intriguingly, with a long-stemmed tulip. The source of our ivory must have originally been the Indian elephant but the floral pattern on the decorated combs points further north, to ancient Bactria (northern Afghanistan/southern Uzbekistan), as their source since this is a very distinctive design which is unknown anywhere else in the ancient world (Potts 1993d). We have found combs literally adhering to the back of crania, or situated just a few centimetres away, as though stuck into hair which has long since decomposed. In one case we even found a long ivory hair pin used in conjunction with a comb, much as Japanese women use combs and ornamental hairpins (kanzashi) in their hair.



ABOVE, LEFT AND RIGHT: *Sydney post-graduate Cameron Petrie working on the excavation of an ivory comb. Fine tools, such as dental probes and toothpicks, are needed in excavating something so fragile.*

LEFT: *The degree of warping and misshapenness of the ivory combs was often extreme, but careful conservation worked wonders with even the most hopeless looking examples.*

This fragment of a very small comb was unique in having a mat-weave design incised on one side.

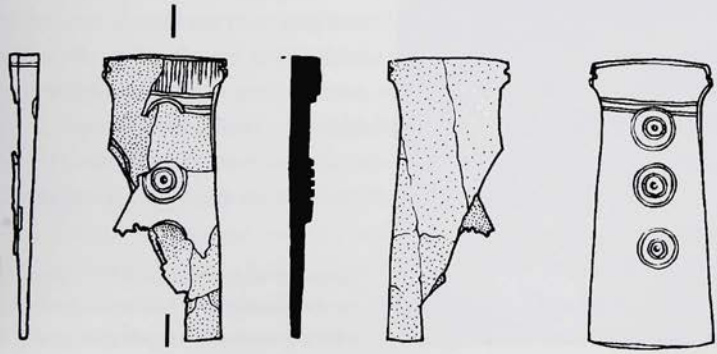
*This ivory hairpin reminded me of the ornamental hairpins (*kanzashi*) worn by Japanese women in conjunction with combs. It was found not far from a cranium and associated comb. These had obviously been worn in tandem.*

BELOW: *Combs were sometimes found several centimetres away from a cranium.*

RIGHT: *In some cases, combs were found directly adhering to crania.*

The combs, although generally alike, showed subtle differences in size and decoration. Size differences might relate to whether one or more were worn in the hair at any one time, or whether children and adults used combs of differing size.

BELOW: *Fragment of the handle of an ivory hair pin comparable to the complete one found in the late third millennium BC tomb at Tell Abraq in 1998 (4.2 x 1.8 x .4cm).*



Conservation

IF WE HAVE SOME INTERESTING THINGS to say about textile remains, metals, ceramics, ivory and other fragile sorts of material, it is only because, during each and every season at Tell Abraq, we have had a conservator with us. Many archaeologists excavate without conservators on their team and if they find something terribly fragile it usually bites the dust or sits, unconserved and unrestored, in a box in the basement of a museum. This is poor archaeological practice to say the least.

When an ivory comb appears in the ground and just looking at it or blowing on it seems to dislodge precious fragments, then it is clear that a trained conservator is needed straight away. When a minute fragment of textile, observable only under a microscope, is found on the surface of a dagger blade, then the importance of a conservator to a project becomes abundantly clear.

Conservation is an amazing art. It combines a knowledge of chemistry with an intuitive love of material culture. It requires the skills of a problem-solver and puzzle-fiend as well as a grasp of both high-tech and low-tech options. A conservator in the field may have to do without certain chemicals or equipment routinely available in a well-equipped museum laboratory. There is no point in complaining

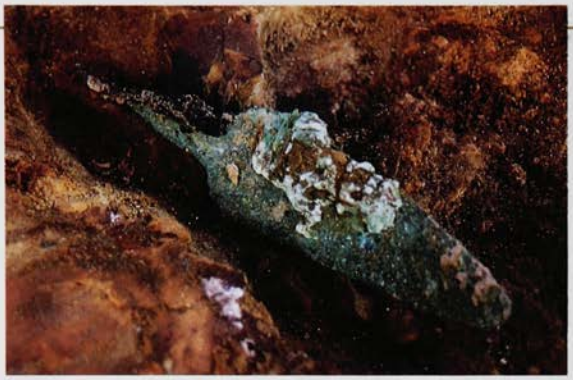
Conservator Wendy Reade undertaking excavation and consolidation in the field. Here she is shown working on the comb discovered in the tomb in 1993.

The ivory hairpin handle fragment after conservation.

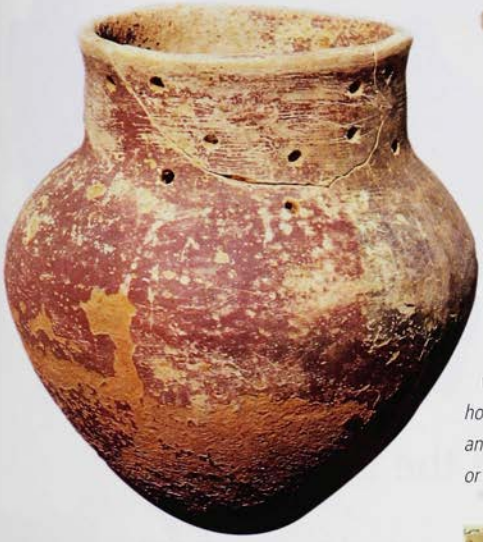
LEFT: *Excavated in 1993, this isolated ivory fragment probably came from the handle of a hairpin like the one discovered in 1998. It was breaking apart badly when discovered.*

about the absence of a scanning electron microscope if all you have available is something on loan from the biology laboratory at the local high school. Conservators have to be flexible. A conservator who can work as happily on wood and ceramics as on textiles and metals is a rare find.

Wendy Reade, our conservator since 1992, has saved more objects from near certain destruction than I can even count. The additions to knowledge made possible by having a first-class conservator in our team can scarcely be listed. When we remove fragile artifacts from the ground it is our responsibility as archaeologists to treat them with the utmost care, to preserve them for future generations, and to extract the maximum amount of information possible from their lifeless forms. In my opinion, if fragile material is coming out of a site and no conservator is at hand, it would be far better to leave it in the ground. When I walk through a museum and see uncleaned bronzes on display, pottery which has been stuck together using an insoluble glue, or dirt still adhering to stone vessels, it makes me long for the curator's neck. There is simply no point digging the stuff up if you are not going to conserve and curate it properly!



In addition to having a considerable bit of burnt wood still adhering to its tang, this bronze dagger from the tomb was suffering badly from 'bronze disease' when it was discovered. This appears like a green, powdery fungus on the surface of the metal.

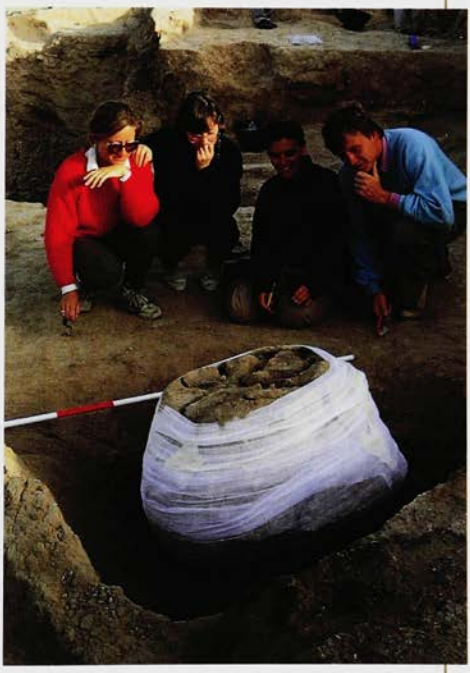


RIGHT: *Every now and then we find sherds like this one with drill holes. These are signs of ancient conservation, for when a ceramic or stone vessel broke in antiquity holes would be drilled on either side of the break and the two pieces were lashed together with cord or a leather thong.*

ABOVE: *This complete vessel from the tomb originated on Bahrain where numerous comparable examples have been found. This piece was obviously valued in antiquity as the carefully drilled repair holes attest.*

RIGHT: *A large storage jar which had been used as an oven, much like a tannour is used nowadays for baking bread, was found in a second millennium BC context in 1992. Wendy Reade consolidated it and wrapped it with gauze but lifting it was no mean feat!*

OPPOSITE: *Part of a large, black-on-orange storage jar of local manufacture found in the burnt room or oven within the fortification tower in 1989. In 1992 Wendy Reade put together a large portion of the vessel, adding plaster in some places to provide support for segments which would otherwise have come apart.*

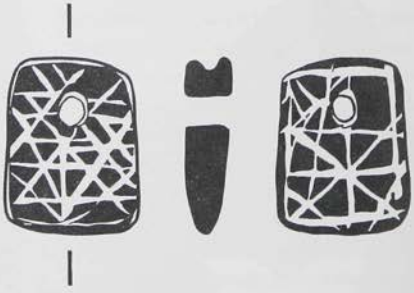


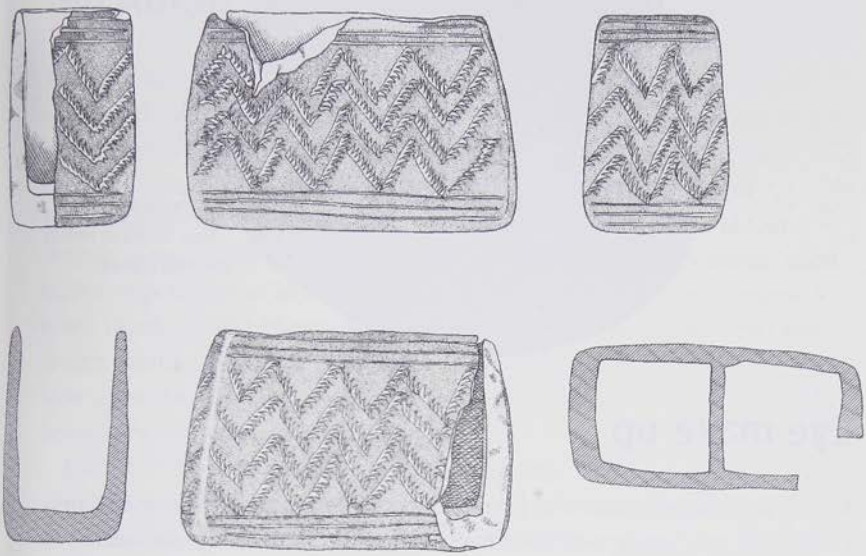
Where is the iron in the Iron Age?

WE HAVE DISCUSSED THE BRONZE which accounted for a Bronze Age in Arabia. What about the iron in the Iron Age? This is somewhat embarrassing. As a professional archaeologist I do not know how many times I have had to explain in lectures that, although we talk about an Iron Age in southeastern Arabia, the fact is that we really do not have any iron! Well, at least not much of it. There is simply so much copper in the Hajar mountains that iron production must have seemed unnecessary in Magan. True, by the early first millennium BC the Assyrians were beginning to revolutionize

ABOVE: *Iron arrowheads, like these first century AD examples from al-Dûr, are completely absent during the Iron Age at Tell Abraq.*

RIGHT: *An Iron Age soft-stone pendant with geometric decoration (2.5 x 1.8 x .6cm).*

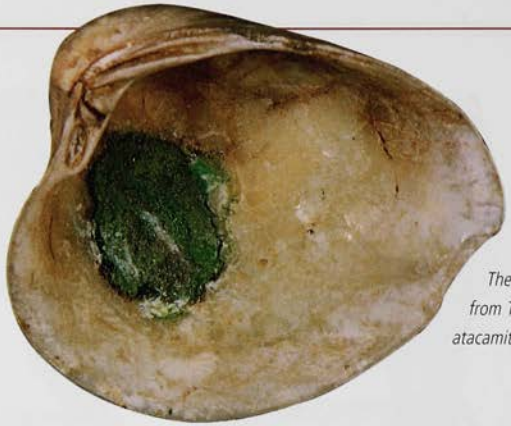




A so-called 'compartmented' soft-stone vessel dating to the Iron Age. The vessel is a stone container with two chambers. Decoration takes the form of a feather-like zig-zag pattern in nested bands around the body of the vessel. A number of nearly identical pieces are known now from other sites in the Emirates and Oman, and one piece, certainly an import from Magan, was found in a tomb at al-Hajjar, on Bahrain (12.1 x 7.9 x 5.8cm).

the business of warfare and weaponry causing a major shift from bronze to iron. But even though there is some iron in the hills south of Milaiha, in the interior of the Emirates, there is no evidence that these sources were used until after the Iron Age. Some scholars think it may have been the Macedonian conquest of the Near East by Alexander the Great which finally convinced the local inhabitants of eastern Arabia to give up their bronze and embrace the more robust metal iron.

Of course, the odd piece of iron is known to have been imported during the Iron Age. A dagger from Muwailah, near Sharjah Airport, was excavated several years ago by the Univ. of Sydney team under the direction of Peter Magee (Magee 1998b). So far, that is about it as far as iron in the Iron Age of the Emirates goes.



The cosmetic shell from Tell Abraq with its atacamite pigment.

Eye make-up

IF YOU WERE GETTING READY to go to out for a tryst with your sweetheart c. 2000 BC you might well have been tempted to add a little colour to the area around your eyes. A bit of kohl on the eyelashes could be complemented by a nice green eye-shadow, carefully kept in a clam shell container. In 1992 we discovered half of a *Marcia hiantina* shell in an early Iron Age context which contained a green substance (Thomas and Potts 1996). Richard Thomas, a metallurgist at the University of Western Sydney, analysed this mystery matter using the x-ray powder diffraction technique and found it to be atacamite ($Cu_2Cl(OH)_3$), a mineral which, in antiquity, was widely used for eye-makeup when crushed. Significantly, in all of the Mesopotamian, Greco-Roman and medieval Arabic medical literature, atacamite is never known to have been used for medicinal purposes. Thus, it appears that sheer vanity explains its presence at Tell Abraq.

Excavations in the cemetery at Kish, an important third millennium site in Mesopotamia, revealed that similar shells containing kohl and green pigment occurred in the graves of both men and women. It is nice to think of the Iron Age population of Tell Abraq keeping up with the latest fashion trends!

Tell Abraq in the first century AD

What became of Tell Abraq when the water ran out or the population drifted off at the end of the Iron Age? We have no information about the period between c. 300 BC and the time of Christ in this part of the Emirates, but during the first century AD an important settlement flourished about seven kms up the highway at a place called al-Dûr. Roman glass, Indian coins and Parthian pottery, among other things, attest to the importance of al-Dûr which may be the site of ancient Omana, a town mentioned in Pliny's *Natural History*. By this time Tell Abraq was largely uninhabited, but the likelihood is strong that a few families may have lived there, or at least used the site as a burial ground.

Dug into the surface of the mound at various points is a handful of graves containing pottery, glass and jewellery identical to that known from al-Dûr. To the north of the mound, moreover, in the sandy area between the third millennium tomb and the edge of the *sabkha*, Soren Blau

BELOW LEFT: *Telltale signs of a grave near the surface of Tell Abraq. This concentration of stones marked a grave of the first century AD.*

BELOW RIGHT: *A more obvious grave dug through the upper courses of the mudbrick platform.*

North of the east-west step trench we spotted a single stone which, more likely than not, came originally from our third millennium BC tomb. Soren Blau excavated here in 1993 in order to find out whether yet another tomb lay hidden from view.

excavated the burial of a woman wearing elaborate gold earrings and a silver bracelet. It would be tempting to say that the ancient mound of Tell Abraq served merely as a burial place in this period were it not for the fact that our excavations also recovered small quantities of the heavy black storage jar sherds so typical of the settlement at al-Dûr. This is not the sort of thing commonly found in graves and suggests that there might have been a few people who continued to call Tell Abraq 'home' in the first century AD.

BELOW FAR LEFT: *To our surprise a female buried in the sand with a small grey pot and an upturned bronze bowl appeared in this area.*

BELOW CENTRE: *A silver bracelet on one wrist, a copper or bronze ring on one finger, and a shell ring on another, constituted the more mundane jewellery in her collection.*

BELOW: AND LEFT: *On her ears, still sitting where they had fallen after her flesh had decomposed, was an identical pair of elaborate earrings with fine granulation.*

An area on the southern slope of the main mound, to the south of the mudbrick platform, was opened in 1993.

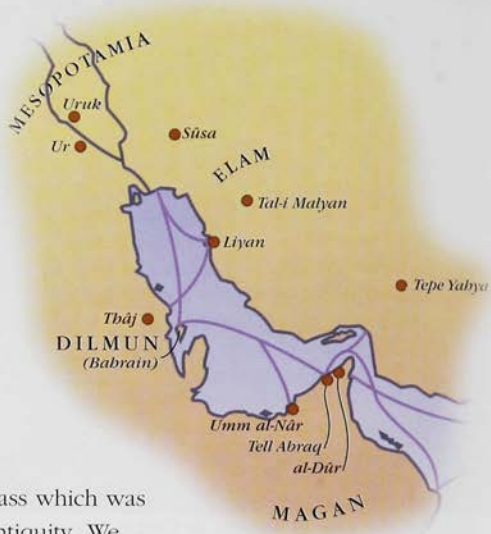
The Sasanians

FOLLOWING THE BREAK-UP of Alexander the Great's short-lived empire, his successors held power briefly only to be supplanted, in the east, by the Parthians who hailed originally from the area around Nisa in what is today Turkmenistan. Regarded as foreign interlopers by the inhabitants of Iran proper, the Parthians were ousted by Ardashir Papakan, self-proclaimed 'king' of Istakhr in southern Iran, who, early in the third century AD, overthrew Artabanus V, last of the Parthian emperors. With the help of his son and co-regent Shapur I, Ardashir soon made short work of any and all opponents and set a good example for his son. Between 244 and 260 Shapur defeated no less than three Roman emperors (Gordian, Philip the Arab and Valerian). In the early fourth century his namesake, Shapur II, waged a bloody campaign against the Arabian side of the Gulf. By then, if not already in the lifetime of Ardashir, Magan or Mazun as it

This silver drachm of Shapur II (309-379 AD) weighs 3.8g and is 22.5mm in diameter. The obverse shows the bust of the king, facing right, wearing a tripartite mural crown surmounted by a globe. The somewhat clearer reverse shows a Zoroastrian fire altar flanked by two attendants, each of whom holds a staff. (photos: Georgia Britton)

came to be called, was under Sasanian control, at least nominally. Even if Sasanian garrisons, like the one at Rustaq in Oman, were thin on the ground, the region remained in Sasanian hands until the Islamic conquest.

Apart from the literary testimony of a Sasanian presence in the Arabian peninsula we have precious little archaeological evidence which documents it. For this reason a drachm of Shapur II discovered in 1993 just under the surface of Tell Abraq in a trench opened to the south of the large platform is particularly important (Cribb and Potts 1995). Shapur II is known to have campaigned widely and to have minted vast amounts of coinage, so necessary for the payment his troops. It is not surprising, therefore, that of all the types of Sasanian coinage known, his coins are among the best represented in eastern Saudi Arabia, the Emirates and Oman.



Elam

IRAN OCCUPIES AN ENORMOUS landmass which was anything but homogeneous in antiquity. We know that in the later periods of pre-Islamic history it was composed of a variety of very different provinces and this diversity seems to have characterized the early periods in its history as well. Of all the constituents of ancient Iran mentioned in Mesopotamian sources, none is better attested than Elam. Originally centred in the highlands of what is today Fars province, in the area of modern Shiraz, Elam periodically incorporated neighbouring regions as well, most notably the lowlands of Khuzistan in southwestern Iran where great sites like Susa, Choga Zanbil and Haft Tepe played important roles.

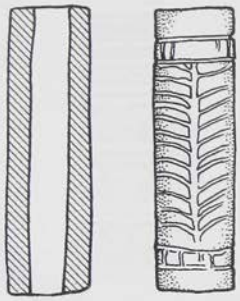
More often than not, Elam was an adversary of whatever power was based in southern Mesopotamia. How then did it relate

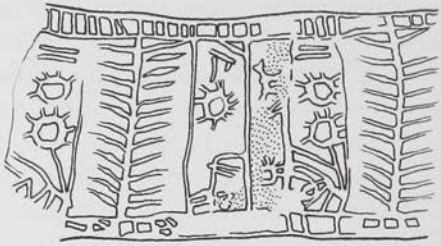
to the countries of the Gulf? We know from texts found at Susa that commerce was carried on with Dilmun (Bahrain) in the early second millennium BC (Potts 1999). Earlier still we have soft-stone (soapstone) bowls of Omani manufacture from Susa and around 2000 BC painted pottery like that known at Tal-i Malyan in Fars was deposited in the tomb at Tell Abraq. Later still, during the so-called Middle Elamite period (c. 1500–1100 BC), Elamite ceramics and a cylinder seal reached our site. The Elamite artifacts from Tell Abraq may well have come through Liyan, an Elamite port on the Persian side of the Gulf located a few kilometres south of the village of Sabzabad near modern Bushire (Potts, in press).

One of two Kaftari vessels from the late third millennium tomb at Tell Abraq. The decoration is painted in brown over a chaff-tempered, buff ware (height 20.2cm, base diameter 4.4cm, rim diameter 6.4cm).

The Elamites spoke a language completely unrelated to either Sumerian, the Semitic or the Indo-European languages. Some scholars believe that, in the remote past, Elamite may have shared a common parent with the later Dravidian languages, today preserved for the most part in South India (e.g. Tamil, Malayalam, Kannada, Telugu) although found in Baluchistan and Afghanistan (Brahui) as well.

These painted jars are typical examples of what is called 'Kaftari painted buffware', a kind of pottery which is characteristic of the late third and early second millennium BC in Fars province, Iran. This region formed the core of the area known as Anshan, an important constituent of ancient Elam. Kaftari pottery has also been found at coastal Elamite sites such as Liyan, near Bushire.





ABOVE: *A Middle Elamite cylinder seal made of greenish frit or faience found at Tell Abraq in 1989. Many comparable pieces are known from both Susa and Choga Zanbil in Khuzistan, southwestern Iran (4.2cm long, 1.7cm diameter).*

BELOW: *The impression in rather lurid yellow modelling clay of the cylinder seal discovered in 1989. The design is comparable to a large series of seals from the Middle Elamite period (c. 1500–1100 BC) at Susa in southwestern Iran.*

Dilmun

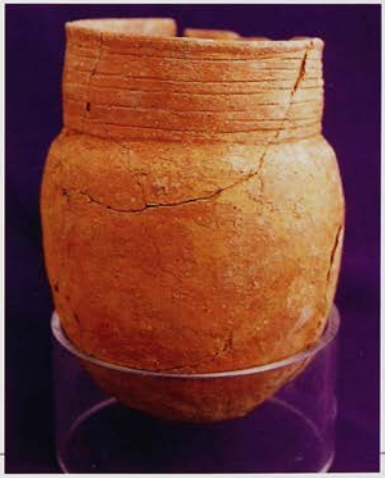
When we look at the material culture of the Gulf in antiquity – whether it be ceramics, stone vessels, stamp and cylinder seals, or architecture – we can detect a very clear 'fault line' dividing the area into two discrete zones. Magan, the area of greatest concern here, was equivalent to that portion of southeastern Arabia composed of the UAE and Oman. Somewhere in western Abu Dhabi, however, certainly south of the Qatar peninsula, we cross over into a different cultural zone known in antiquity as 'Dilmun'. As long ago as 1880 Dilmun was identified with the Bahrain islands, largely on the basis of the cognate name Tylos by which the largest of the Bahrain islands was known in Greek sources from the period of Alexander the Great and his successors. For the earliest portion of Dilmun's history, however, the name probably applied to the northeast Arabian mainland since there we have abundant evidence of occupation in the late fourth and early third millennium BC, the time when the first Mesopotamian texts first refer to Dilmun, when virtually nothing is known of comparable date on Bahrain itself.

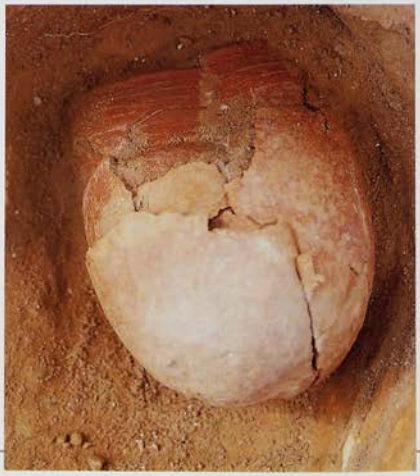
The two Gulf neighbours, Magan and Dilmun, certainly enjoyed close ties. We find imported pottery and stone vessels, typical of third and

Sherds of Dilmun red-ridged ware, like this one, began appearing in our excavations during the very first season.

second millennium BC Oman (by which I mean the Sultanate and the UAE) on Bahrain, just as we have several stamp seals and a large quantity of typical Dilmunite pottery, so-called 'Barbar red-ridged ware', at Tell Abraq and, to a lesser extent, at sites like Kalba in eastern Sharjah and Shimal in Ras al-Khaimah. This evidence of close ties is all the more intriguing in that it substantiates what the Mesopotamian texts only hint at. Reading between the lines of documents recording the activities of the *alik Tilmun* or 'Dilmun traders' at Ur in southern Mesopotamia, it seems clear that the copper imported by them around 1800 BC and said to be 'Dilmun copper' must have originally come from Magan. Well over 600 sherds of Dilmunite pottery (Grave *et al.* 1996), as well as a typical Dilmunite stamp

Looking like a crushed egg in the ground, this sac-shaped jar with crudely scored neck came up looking remarkably well after conservation. Although not much to look at, it is an example of a highly distinctive type found by the thousands on Bahrain island, largely in burials.





seal of 'Persian Gulf-type', were recovered at Tell Abraq. Such archaeological evidence of links between Dilmun and Magan is abundant enough to suggest what the texts themselves never explicitly say, namely that Dilmun's copper was in fact that of Magan by another name. Yet, by 1800 BC, Dilmun was so adept at its role of middleman in the copper trade between Magan and Mesopotamia that the scribes of Ur no longer identified incoming shipments of copper as that 'of Magan'.

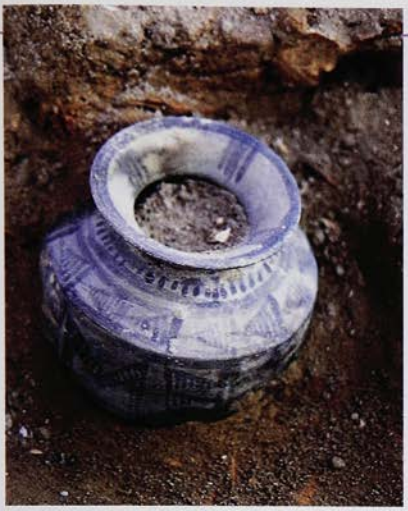
ABOVE LEFT: *Another jar from Bahrain, where it finds very close parallels, was discovered in the tomb. This, and several like it, have clear vertical striations where the paint has been worn through, suggesting that the vessel was hung in a cord net.*

ABOVE RIGHT: *PIXE/PIGME analysis demonstrated that this group of sherds (our alpha group) had a chemical composition identical to a sub-set of the red-ridged pottery excavated by a British team at the settlement of Saar, on Bahrain. (photo: Russell Workman)*

LEFT: *The base of a typical Barbar red-ridged vessel (base diameter c. 7.5cm).*

OPPOSITE TOP LEFT AND TOP RIGHT: *Ancient Dilmun had its own style of stamp seal. The earliest variety is characterized by scenes without humans, but with a variety of animal and vegetal motifs. This ivory example of a so-called 'Persian Gulf' seal, which was found in the tomb at Tell Abraq, is typical of the earliest type of seal used on Bahrain.*

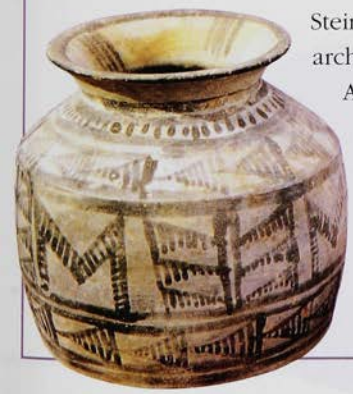
A soft-stone seal from an early second millennium context in the settlement at Tell Abraq recalls the so-called 'Dilmun' seals which were slightly later than the earlier 'Persian Gulf' ones. Yet it is clearly not a real 'Dilmun' seal. It appears inspired by the genre, and may be a local example produced by a craftsman in Magan familiar with the Dilmun variety.

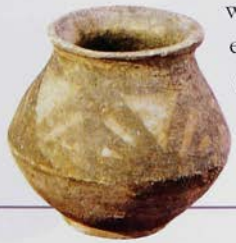


LEFT AND BELOW *Fine black-on-grey ware, fired in a reducing atmosphere, i.e. one in which the interior of the kiln has insufficient oxygen for the complete combustion of the fuel. Fired in such an atmosphere pottery which would otherwise turn out red ends up grey. This sort of pottery was produced in southeastern Iran or Baluchistan and is well-attested at sites like Bampur, Khurab and Damin. Three complete black-on-grey ware vessels were found in the tomb at Tell Abraq.*

Baluchistan and Seistan

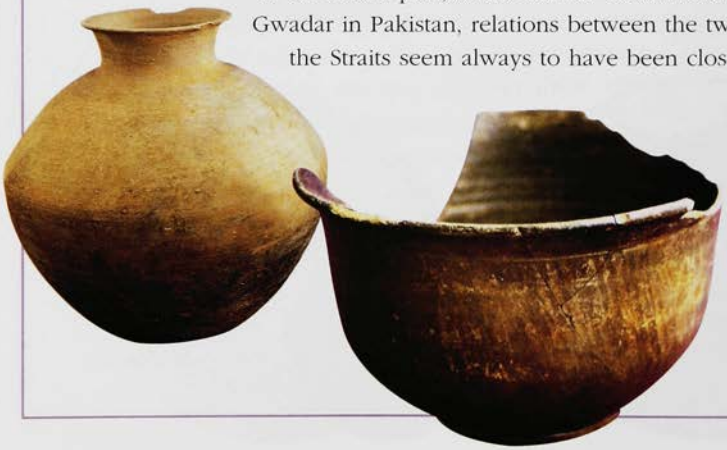
Archaeological excavations were first conducted in the territory of ancient Magan in 1958, when a Danish expedition began work on Umm al-Nâr island, in Abu Dhabi, and an American team conducted a season at Sohar, on the coast of Oman. The discovery of a very distinctive type of black-painted, fine greyware in the tombs on Umm al-Nâr was quickly followed by the recognition that similar pottery had been found at such sites as Bampur, Damin and Khurab in Iranian Baluchistan in the early 1930's by the legendary orientalist Sir Marc Aurel Stein. Over the past few decades the amount of archaeological material from sites in southeastern Arabia showing close affinities to sites in southeastern Iran (Kerman, western Baluchistan), east-central Iran (Seistan) and the western portion of Pakistan (eastern





Another type of greyware associated with southeastern Iran in the late third millennium is burnished greyware. These pieces, discovered in the tomb, were undoubtedly imported from the other sides of the Straits of Hormuz like their black-on-grey companions.

Baluchistan) has grown steadily. While most of the pottery and stone vessels from tombs of the late third millennium in the Oman peninsula was locally manufactured, some of it, to judge by the rarity of the shape or material in the local repertoire, was most probably imported from the other side of the Straits of Hormuz. Mesopotamian texts name a number of eastern lands, the precise locations of which have long eluded scholars, but some experts believe that the area of Kerman and Baluchistan may represent the ancient land of Marhashi, while Seistan has been identified by a few specialists with the (semi-) mythical land of Aratta. In any case, as we know from the existence of Arab tribes settled on the Iranian coast in the recent past, or the former Omani enclave at Gwadar in Pakistan, relations between the two sides of the Straits seem always to have been close.



RIGHT: *This unusual soft-stone beaker on a square, openwork base is completely unlike anything else ever found in the Oman peninsula. But comparable examples, both in bronze and in soft-stone, are known from Shahdad in Kerman province and Susa, in Khuzistan (Iran), This, too, is undoubtedly an import from across the waters.*

BELOW: *Although soft-stone vessels are a dime a dozen in ancient Magan, alabaster or calcite vessels were relatively rare. We recovered over half a dozen in the tomb, including this pair excavated in 1998. During the third millennium vessels such as these were produced at Shahr-i Sokhta in Iranian Seistan. They are well-attested on sites in Central Asia as well.*

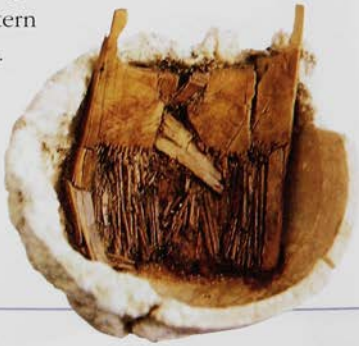
The first comb discovered in the tomb at Tell Abraq in 1993 had a distinctive floral decoration consisting of a three-petalled tulip, elongated stem, and serrated leaves. Precise parallels for this floral decoration on soft-stone flasks from sites in northern Afghanistan and southern Uzbekistan make a Bactrian origin for this piece a virtual certainty.

Bactria

Although Russian archaeologists have worked in Central Asia since the late 19th century, the recognition of a coherent, Bronze Age civilization in the region of the Murghab and Amu Darya river basins known as the Bactrian-Margiana Archaeological Complex (BMAC) is a relatively new phenomenon. In recent years, however, the character and wealth of this extraordinarily rich area have become abundantly clear and it is obvious that we are dealing with an important cultural region, situated adjacent to the civilizations of the Iranian Plateau and the Indus Valley, which was just as important as the other, previously known cells in the mosaic of cultures spread across Western, Central and South Asia in antiquity.

Although the Bactrian heartland, in what is now northern Afghanistan and southern Uzbekistan, may seem far removed from our area, the fact is that more and more material of Bactrian origin is coming to light at sites in Pakistan, southeastern Iran, the Oman peninsula and even Bahrain.

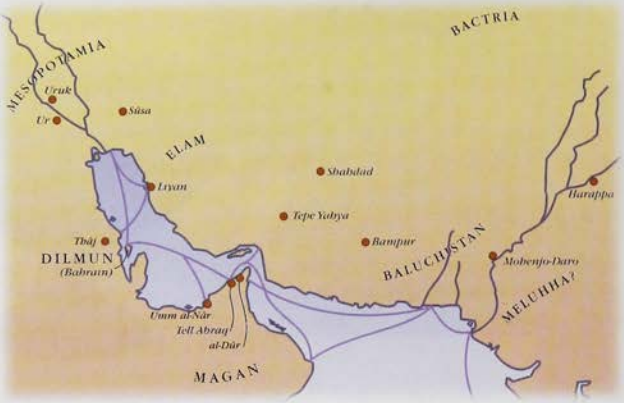
The tomb at Tell Abraq yielded a number of intriguing finds which, on the basis of their form or iconography, can be convincingly attributed to Bactria. Because similar material has been found in southeastern Iran and Baluchistan, however,



A typical Central Asian vessel is this hollow-footed chalice with deep bowl found in the tomb in 1998. Comparable pieces are known from dozens of sites in Bactria and neighbouring areas of Central Asia, and exported examples have been found at sites like Mehrgarh in Pakistani Baluchistan and Tepe Yahya and Khurab in southeastern Iran.

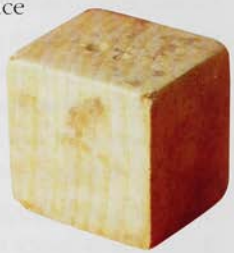
we cannot be absolutely certain that the finds from Tell Abraq came directly from Bactria. The possibility exists that they arrived via one or more sites closer to home, such as Shahad, Tepe Yahya or Khurab in southeastern Iran. Be that as it may, the existence of links with Bactria, even if these were indirect ones, is important because it suggests that contact could have occurred between Tell Abraq, a consumer of tin, and Afghanistan, a known source of this vitally important raw material.

OPPOSITE AND RIGHT: *In 1998 a second comb with floral decoration was discovered in the tomb, resting in a badly preserved calcite or alabaster bowl. Because of its fragility our conservator decided to consolidate it and leave it in the bowl. As the close-up of the floral pattern shows, the petals of the tulip are shown closed, rather than open, but the serrated leaves are clearly like those on the previously discovered comb. The main difference is that here the floral pattern runs horizontally along the upper portion of the comb, whereas on the comb found in 1993 it ran vertically.*



Harappan civilization

In 1924 Sir John Marshall announced R.D. Banerji's discovery of a 'long forgotten civilization' at Mohenjo-Daro in what is today the Sind province of Pakistan. With that, a 'new' civilization took its place alongside Mesopotamia, Egypt and Shang China as the Old World's fourth great riverine civilization. Ultimately, this came to be called the Indus Valley or 'Harappan' civilization, after Harappa, the name of another important site in the Punjab province of

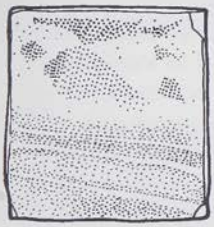


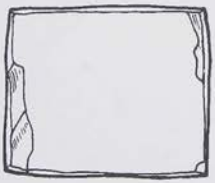
One of the hallmarks of the Harappan civilization was the use of a highly standardized system of weights, the basic unit of which had a mean value of c. 13.63g. Most Harappan weights were made of a distinctive, pale, banded chert quarried in the Rohri hills of upper Sind. A small number of Harappan weights have been found at sites outside of the Indus Valley proper, such as Susa in Iran and Qalat al-Bahrain on the main island of Bahrain. At Tell Abraq we were fortunate in finding three weights. The smallest,of brown jasper, weighs 14.20g and measures 2.1 x 1.9 x 1.6cm. The larger two, of banded chert, weigh 53.95 and 54.06g and measure 3 x 3 x 2.5 and 2.8 x 2.8 x 2.5cms respectively.

Harappan jars often had one or more signs incised on the upper surface of the rim. Examples of such pottery have been found elsewhere in Oman and we have a few sherds with crudely incised signs, such as this one, from Tell Abraq as well which are probably imports.

Pakistan. Of all the Old World civilizations, the Harappan was the largest, extending at its height from Shortugai in Afghanistan in the north to Sutkagen-Dor on the Makran coast in the south. It was a civilization whose great cities, like Harappa, Mohenjo-Daro and Dholavira, were built of baked brick on a scale which dwarfs the architecture of most of its neighbours.

It is still unclear whether the Sumerian name Meluhha stood for the Harappan civilization but it is certainly a widely held belief amongst archaeologists. In ancient Mesopotamian sources Meluhha was noted as a source of ivory and carnelian, both of which are indeed found on Harappan sites and available locally (Gujarat is one of the world's major carnelian sources). A particular type of carnelian bead, etched with an alkali solution, and known to have been manufactured in the Indus

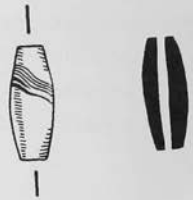




This classic example of a Harappan weight is made of the typically banded chert favoured for the manufacture of weights by the ancient Harappans. To the best of our knowledge, the highly sought after stone of which weights like these were made was obtained from one particular quarry in the Rohri hills of what is today Pakistan (3 x 3 x 2.5cm, weight 53.95g).

Valley, found its way to a large array of sites in Mesopotamia, Iran and eastern Arabia, including Tell Abraq. Although we cannot prove it as yet, I suspect that most of the carnelian and agate beads found at Tell Abraq are of Harappan manufacture as well. An ivory bird of Meluhha, mentioned in a Mesopotamian text from Ur, may have looked not unlike the small tufted duck of ivory found in 1998 in the tomb at Tell Abraq. Three cubical chert weights of Harappan type were also found in the fortification at Tell Abraq and pottery of Harappan type has been recovered at several settlements.

Large, black-slipped storage jars made with micaceous clay are typically Harappan. A number of sherds of this sort were recovered at Tell Abraq. What the Harappan vessels may have contained is unknown but some scholars have suggested dairy products.



ABOVE AND LEFT: *A banded agate bead, the body of which has turned white and the bands black through exposure to heat. Whether this was intentional heat treatment designed to make the bead appear black and white, or accidental exposure, we do not know (1.7cm long, .6cm diameter).*

Bead production in the Indus Valley was carried out on an industrial scale. Literally millions of paste beads and thousands upon thousands of agate and carnelian beads were produced. The tomb at Tell Abraq yielded over 600 beads made of a wide range of materials including lapis lazuli from Afghanistan, etched carnelian and agate from the Indus Valley, shell, paste and serpentine.

Found jammed up against the eastern wall of the tomb was this ivory bird figurine. The bird has a squared-off tail and tufted crest, reminiscent of a tufted duck (Aythya fuligula), *described in Colin Richardson's* Birds of the United Arab Emirates *(1990) as a 'fairly regular winter visitor…on creeks, ponds, lagoons and reservoirs in the Northern Emirates'. It is intriguing to think that Mesopotamian references to imported ivory birds from Meluhha may indeed refer to just such an object as this.*

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GLOSSARY

In writing this book I have tried to keep technical terms to a minimum. In some cases, an entire chapter is devoted to explaining an archaeological concept, such as stratigraphy, and I have therefore left it out of the glossary. The following clarifications are not meant to be the last word in archaeological terminology, merely a series of working definitions of terms liable to come out of an archaeologist's mouth – terms such as you would encounter listening to a lecture or reading an archaeology book – which may not always be explained fully enough because of an assumption that their meanings are so obvious. In fact, such is often not the case. I apologise in advance for omitting even more terms which might have benefited from a few words of explanation.

articulation: In discussing human skeletal remains, archaeologists and anthropologists talk of 'articulated' and 'disarticulated' bones or 'elements'. Articulation refers to bone which is in anatomical position, e.g. all of the bones which go to making up an arm or leg or foot are 'articulated' if their positions in the ground are as they would have been when the body to which they belonged was put there. Disarticulated bones are ones which have been disturbed – by people, animals, wind, weather or other natural forces – and are no longer in the 'correct' position, i.e. the position in which they normally sit within our body.

balk (baulk): A balk is a wall of earth left standing in an excavation, normally between two trenches (s.v.). It may be 50cm thick, or 1m, or even more depending on the nature of the excavation. It is left standing, i.e. unexcavated, so that the excavators have a physical record of the soil deposits through which they have dug in the rest of the excavated area.

casting: The process of making objects by pouring molten metal (copper, bronze, tin, gold, silver, iron, etc.) into a mould. The molten metal will fill in the void of the mould and when it cools off it will be removed as a solid object. This is the way most metal tools and weapons are made.

centre-periphery (core-periphery): Some economists, historians and more recently archaeologists talk about 'centre-periphery' or 'core-periphery' relations in the past (and in the modern day as well). This entails identifying a city or a region as a central or core area, and consequently labelling other areas around them which are thought to have had less power, influence, economic clout, etc., as peripheries. For example, one can speak of a large city and its periphery (the agricultural land, desert, forest, villages, smaller towns around it). One can also speak of a region like ancient Mesopotamia as a centre or core, and an area like Magan as part of its periphery. By the very use of such terms, however,

scholars assign a first grade status to cores/centres, and a second grade status to peripheries, but in this they may be very wrong. Was Magan in the periphery? Mesopotamia may have been home to many wealthy cities, but Magan had the copper it desperately needed. Who, therefore, was dependent upon whom? I prefer to view the ancient world as a mosaic of numerous interacting regions without privileging a few centres and denigrating a mass of others by the slightly pejorative term 'periphery'

chronology (relative and absolute): Chronology refers to the arrangement of objects or sites in temporal order, e.g. from earliest to latest or vice versa. Included in this exercise is the process of determining which sites or objects are contemporary, i.e. of similar date. The term 'relative chronology' refers to establishing a chronological arrangement on the basis of pottery or any other type of artifact which changes through time. In this way we might mentally arrange a series of sites into an order from earliest to latest, based on what sorts of artifacts each contains, without actually putting precise dates to the sites themselves or the periods represented by them. 'Absolute chronology', on the other hand, refers to firm numbers being assigned to sites or objects. This might be done on the basis of inscriptions, e.g. a tombstone which has a date '1786' engraved upon it is earlier than one with a date of '1813'. Or, in the absence of writing, it might be done by a physical method, such as radiocarbon (C14 dating) in which a sophisticated physico-chemical process is used to determine an 'absolute' date for an object. Chronology is important, and rightly occupies much of the brain power of quite a few archaeologists, because until we understand where our sites and objects sit on the time-scale, we cannot discuss development, evolution or change of specific categories of material culture (e.g. pottery, seals, architecture) or of entire sites, regions or peoples.

conservation: The activity of stabilizing, consolidating, cleaning and preserving objects, whether excavated or unexcavated. Conservation concerns paintings and drawings in museums as much as objects excavated by archaeologists. Anything taken from the ground may require conservation, usually involving chemical treatment, to insure that disintegration does not occur.

coordinates: When speaking of the locations of archaeological sites coordinates generally refer to latitude and longitude measurements. Equally, coordinates refer to specific locations east and north of a zero point on a local grid, i.e. the imaginary grid over an archaeological site. Archaeologists often lay out an *x*-*y* axis with a north line (running north-south) to the west of the site, and the east line (running east-west) to the south of the site. In this way, the entire archaeological site is enclosed or bounded by the *x* and *y* axes. Thus, any point on the site, whether it be the corner of a trench, or the place where a particular object was found, can be located with reference to the two axes, e.g. 75.16m north (of the east-west line), 42.38m east (of the north-south line). In addition, an elevation above or below a chosen datum (s.v.), provides a third coordinate. In this way, a 3-dimensional plot of all archaeological finds made within an excavation would be possible to construct. Keeping track of precise findspots is important in an excavation. Often it is

impossible for an excavator to be aware of spatial patterns in the distribution of artifacts when they are being excavated, but these may emerge after the excavation when the findspots of artifacts are plotted in three dimensions.

datum: An arbitrary point on an archaeological site, above or below which elevation measurements are made. Even if one does not know the absolute height above sea level of, e.g. the top of a mound like Tell Abraq, one can still make measurements by assigning a point on the surface (or the top of a permanently cemented metal stake) a value, such as +100 or +10, and then measuring down from that using an instrument called a 'level'. All measurements will then be registered from this 'datum', and may appear as a negative number, e.g. the elevation of a find may be -7.56m, which means 7.56m below the datum.

domestication: A general term used to describe the process whereby wild animals or plants become 'domesticated'. This often involved behavioural, physical, and genetic changes. During the last Ice Age, i.e. prior to about 10,000 years ago, human groups all over the world subsisted largely on protein and other nutrients derived from wild animals, fish and shellfish, and when they did use cereals (e.g. barley, wheat, sorghum) these were wild ones which were available in many parts of Eurasia. Intensive hunting and gathering led to attempts to propagate plants and to control animals within human communities. This was the process of domestication.

excavation season: Archaeologists generally talk about 'seasons' of excavation, although these can be of widely varying length. A season might be two weeks, or two months. It might be ten days one year, and four months the next. There is no specific length of time for an excavation season, just as there is no prescribed number of seasons required of an archaeological project. The goals of the project, research design, other commitments, funding and many other factors will all influence whether a site is excavated for one season or for twenty. Sometimes archaeologists have what is known as a 'study season'. This is a period when no new excavation is undertaken. Rather, material excavated in earlier seasons is studied (drawn, catalogued, etc.).

feature: A feature may be almost any physical part of a site other than an individual artifact. Features include hearths, graves, pits, walls, layers of burning, concentrations of broken pottery, etc.

groundstone: When it comes to stone tools, archaeologists generally refer to two broad categories: 'flaked' or 'chipped stone', most often seen in the form of flint, chert or quartzite arrowheads, spear points, scrapers, burins, drills, etc., and 'groundstone', by which such items as grinding stones, hammerstones, pounders, mortars and pestles are meant.

inter-disciplinary: An academic study which cross-cuts the boundaries of a single field or academic discipline is generally called 'inter-disciplinary' Archaeology has long been one of the most inter-disciplinary fields in existence because expertise is usually needed from fields as diverse as history, numismatics, linguistics, physics, chemistry, geology, geomorphology, biology, zoology, etc. As it is virtually impossible for any one scholar to master all of these fields, it is normal for research to be conducted by an entire team (s.v.) of experts.

locus (pl. loci) - Locus is a term widely used for the smallest individual unit in an excavation. It is often identified by a unique number. A locus may be an individual layer of soil of one colour, a fireplace, an unusual cluster of animal bones, or anything which an excavator would like to be able to separate from the rest of the material being excavated. Loci may be lumped together after an excavation, for example if apparent differences in soil colour led an excavator to give two areas different locus numbers, but subsequent work proved that these differences were due to dampness which had made one area darker than the other. However, once excavated and removed from the ground, the material from one locus can rarely be split after the fact into two loci. For this reason, it is usually considered better to assign too many locus numbers rather than too few.

Martello tower: A type of defensive tower which takes its name from Cape Mortella on Corsica, a defensive position captured in 1794 by the English navy. Martello towers had massive walls, vaulted chambers within to house a garrison, and a gun platform on an elevated surface near the top.

micromorphology: The study of soils in archaeological sites, particularly with a view to detecting environmental changes (e.g. periods of drought or high humidity) in the life of a settlement. Soil samples are normally taken on site and then studied in a laboratory.

mudbrick: A combination of mud, often containing clay, to which chopped up chaff (straw) has been added as a tempering or binding agent. In those parts of the Near East which lack stone and timber, mudbrick is the most commonly employed building material.

parallel: A similarity noted between two objects. Archaeologists often speak of 'close parallels' or 'distant [i.e. general, vague] parallels' when comparing, e.g. pottery, from different sites or regions. Such parallels form the basis of a relative chronology (s.v. chronology). If someone goes overboard in citing parallels between sites without seeming to arrive at any meaningful conclusions, or in citing parallels between insignificant details (e.g. in painted decoration, shape, etc.), this is often referred to disparagingly as 'parallelology'.

post-hole: A hollow in the ground left where a wooden post once stood.

prehistoric: Prehistory literally means 'before history' or 'before historical time', i.e. before the invention of writing, but the absolute dates of the prehistoric past can vary depending on what part of the world one is in. Writing may have been invented in Mesopotamia c. 3400 BC, and the periods after that date may be referred to as 'historic' rather than 'prehistoric', but the same does not apply in the Emirates or in many other parts of the world. Writing is not attested in the Emirates before the Iron Age (since the discovery of an inscription in South Arabian characters at Muwailah, near Sharjah Airport), so one could call all preceding periods in the region prehistoric, but at the same time in other areas (e.g. southwestern Iran, Iraq) writing had been used for over two thousand years. Prehistoric should not imply 'primitive' since some 'prehistoric' technologies, such as metallurgy and ceramic manufacture, were quite complex.

pre-Islamic: A general term applied to all periods in the Near East prior to the birth of the prophet Muhammad (c. 570-580 AD). Some scholars use 'pre-Islamic' more narrowly in referring to the centuries (or

even the last thousand years) immediately prior to the coming of the Prophet, but this is not always the case.

residue analysis: The study of organic residues, such as liquids absorbed into the walls of pottery; remains of unguents, aromatics, perfumes or foodstuffs found adhering to the inner walls of pottery or stone vessels; or microscopic traces of blood on the cutting edges of stone tools. Various techniques, such as gas chromatography, are employed to identify the chemical compounds identified.

restoration: Restoration, as opposed to conservation, implies addition to and preservation of an object, a building or an entire site. This might involve building up the walls of a ceramic vessel with plaster-of-Paris in imitation of the contour of the original (whole) pot, or it could involve the substitution of new mudbricks and plaster to build up a new wall on the foundations of an old one, etc.

samples: Archaeologists take samples of all kinds. These are, by definition, a small portion of a material, whether charcoal for purposes of radiocarbon dating, soil for study by a geomorphologist or soil scientist, ceramics for neutron activation or PIXE/PIGME study, etc. Sample size may vary from a few milligrams (in the case of metal samples) to kilos (e.g. when dealing with soil or mudbrick samples) of the material to be analysed.

section: The vertical face of a trench (s.v.). When an excavation has taken place, the section shows the succession of deposits from the top of a site, closest to the surface, down to the deepest point excavated. Using tape measures and drawing at a pre-determined scale (e.g. 1:20), archaeologists normally make a scale drawing of every section in every trench excavated. This is a record for posterity of the soil deposits through which they have dug and is often supplemented by photographs of sections as well.

sequence: The sequence of a site or a region is its history as expressed in stratigraphic units, periods or phases, the latter determined by the archaeologist after excavation. When archaeologists speak of establishing a sequence at a site, they are referring to the process of excavating a succession of stratigraphic levels representing a span of time greater than a single period. Thus, Tell Abraq, which was occupied from c. 2200 to 300 BC, and again in the first centuries AD, has a 'sequence' composed of different levels, buildings, and other features, characterised by changing pottery types. The sequence at one site may be compared with the sequence at another site, just as the sequence in one region may be compared with that of another region. For convenience archaeologists often give names to sub-sections of a sequence, calling them periods or phases, either with an associated name (e.g. 'Umm al-Nâr Period') or number (e.g. 'Period I', 'Phase A').

significance: Significance in archaeology is a much discussed concept. A site may be significant because it is the only one in a region at which objects of type X (e.g. a kind of pottery) have been found, or because it has yielded the most examples of type Y (e.g. arrowheads of a certain shape). But objects which have no aesthetic value may also have great significance. A concentration of date-stones at a site may be of great significance if archaeologists believed there was insufficient water in the region when the site was occupied to

support date palms. A single piece of pottery may be significant if its place of origin tells something about a site's foreign relations. Significance is not necessarily a product of beauty, size, or material (e.g. gold or silver). The most unassuming looking fragment may have enormous significance depending on the questions one is investigating.

single-period site: A site which was only inhabited for a single archaeological period in time. This may, however, span several centuries if the material culture of a site was fairly stable, since a single archaeological period does not normally represent an instant in real time.

site-formation processes: All of the human-induced and natural processes responsible for the physical creation of an archaeological site. This includes human activities such as house-building, cooking, the digging of pits, the working of stone to make tools, etc., as well as natural processes such as erosion, the movement of soil by water, the deposition of sand by wind, the burrowing of animals and insects, etc.

smallfind: A general term used for individual objects, other than pieces of broken pottery. Smallfinds include pieces of metal, beads, seals, fragments of stone vessels, glass jars, grinding stones, etc.

sounding: A test excavation (s.v.). Cf. the French word sondage.

step trench:- A series of trenches (s.v.) opened along the slope of a mound or tell. Working from the top of a site to its base, the step trench appears like a staircase descending along the edge of the site. In absolute terms the trenches themselves may vary in size. At Tell Abraq the original step trench was 5m wide and 35m long.

team: The general word used to describe the full complement of students and scholars working on an excavation. This could be just a few or it might be several dozen. At Tell Abraq, with the faunal specialists and biological anthropologists present, our team sometimes reached 17 members.

test excavations: A limited excavation designed to quickly and economically investigate a site or an area on a site. Test excavations are normally small, sometimes 1 x 1m. By being small they are used to go down quickly through the deposits on a site in order to get an idea of what lies in store. Archaeologists often excavate test pits or trenches (s.v.) quickly and with less care than they would use in a 'normal' excavation, because they know that if the results are interesting, they may well open up a larger area on the site and go down through the very same deposits, only with much greater care.

trench: General term for a quadrangular or rectangular excavation with straight, vertical sides. Trenches vary in size. Depending on the nature of the excavation they may be as small as 50 x 50cm, or as large as 20 x 20m (even larger in the case of some of the early excavations in the Near East). Adjacent trenches are normally separated by a balk (s.v.).

INDEX

Tell Abraq , in the United Arab Emirates, has focussed new light on the early civilisation of Magan - a pivotal centre of international trade over 4000 years ago. Professor Dan Potts, director of this archaeological study, carries the reader on a fascinating journey of discovery, sharing in the excitement and adventure of a unique scientific investigation. A 'must-have book' for both specialists and the general reader.

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