

PAST WORLDS
ATLAS

HarperCollins

of **ARCHAEOLOGY**



Underwater sites

Underwater archaeology has tackled a wide variety of sites, from wells and springs to submerged lakeside settlements, and of course marine sites, including drowned cities, sunken harbours and shipwrecks. Although it was originally an activity largely associated with treasure-hunting, it has developed into a valuable complement to terrestrial archaeology.

The first recorded underwater excavation took place in 1854, when Adolphe Morlot, with a glass-fronted bucket over his head, used a pick and butterfly net to recover remains from the bottom of Lake Geneva. The systematic investigation of wreck sites, however, only really began after the Second World War. This was due largely to new technology. The invention of miniature submarines, other submersible craft and, above all, of scuba-diving gear greatly improved the archaeologist's ability to locate and study sites. Underwater sites can be found in many different ways: through information from fishermen and divers; by dredging operations in rivers and harbours; through aerial survey; and from actual exploration. Suspected wrecks containing metal can be investigated from the surface using side-scanning sonar, as iron and steel cause anomalies in the magnetic field. For wooden wrecks with little metal, however, it is necessary for divers to approach to within a few metres, and use metal detectors or a portable magnetometer to produce a detailed plan. Even buried clay jars or Roman amphorae have been detected in this way from the iron oxide impurities in their clay.

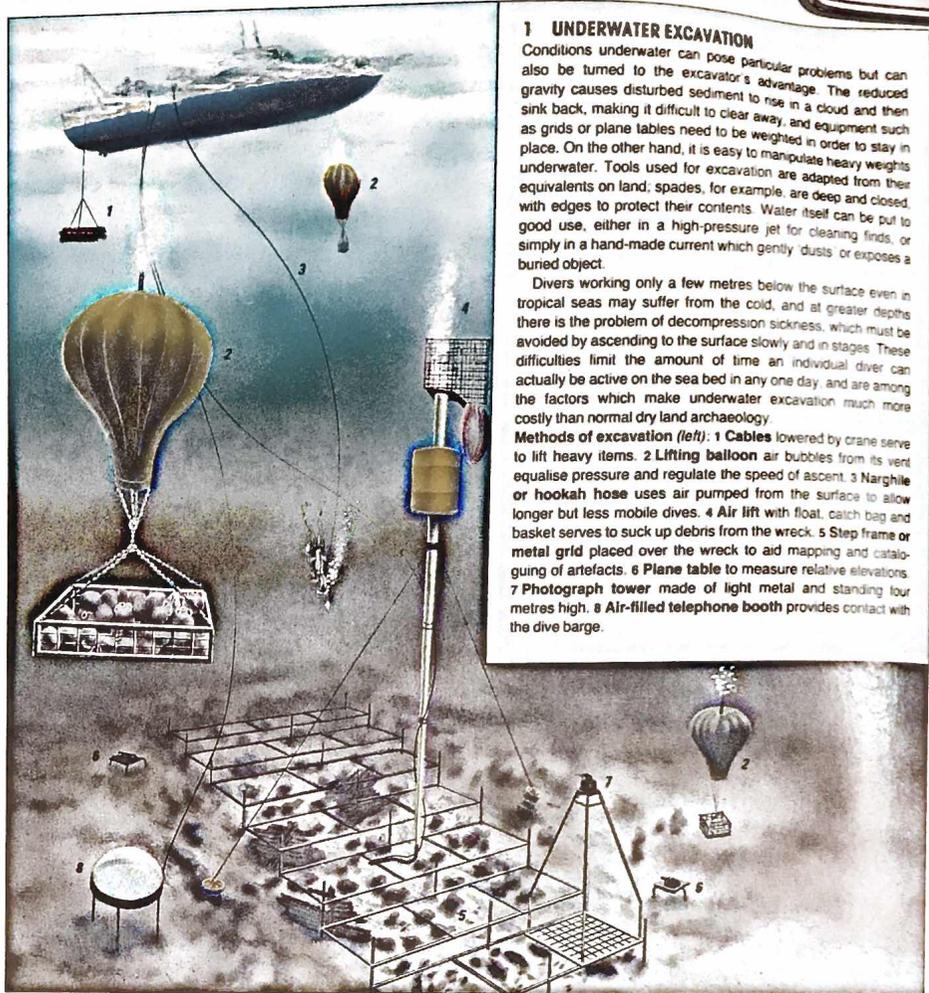
Settlement sites are usually less deeply submerged and hence pose fewer technical problems for their excavators, though working on a sea or lake bed is nonetheless costly and time-consuming. At sites such as these, however, the organic remains such as timber and textiles are considerably better preserved than at normal dry land excavations. The Alpine lakes, for instance, have provided a fuller picture of Neolithic life than almost any other part of Europe.

Since it is rarely feasible to lift an entire vessel to the surface or transport it to land, even on wreck sites, much of the archaeological work has to be done underwater. This can often be hazardous and difficult, but the rewards are great; the yield of well-preserved organic remains has been tremendous, while every wreck adds to our knowledge of shipbuilding, trade routes, and of the importance of maritime traffic at different periods. Coming suddenly to grief in the midst of their everyday operations, shipwrecks can act as time capsules. The merchantman of the 4th century BC discovered at Kyrenia, for example, had amphorae from Samos and Rhodes, grindstones from Cos, and a large cargo of almonds from Cyprus, and was probably leaving the latter island when disaster struck. Like any archaeological site, each wreck poses new problems. The condition of vessels can range from almost totally destroyed to virtually intact, from freestanding to completely buried. Much depends on how and why they sank, the type of bed they lie on, the depth of water and the existence of currents. Strong tides and currents can cause rapid burial by sand, which helps to preserve the remains. Few underwater sites are easy to see at first, since sediments, growths and concretions make excellent camouflage.

The position of the cargo on the sea bed results from the way in which the ship went down, its impact on the bottom and the angle of tilt. Test cores in different parts of the site can help to assess the nature, extent and number of layers of cargo, and the axis and orientation of the vessel. Cargo is usually stowed solidly from wall to wall, so it can often provide a clear idea of the ship's width, and sometimes of the length, though the vessel may not have had the same cargo from stem to stern.

The excavation of an entire vessel is rarely undertaken, because underwater work is long, complex and expensive, and if a ship has become buried under a mound there are vast quantities of sand and sediment to be removed. Apart from cargoes the most frequent remains encountered are the bottoms of ancient boats, usually preserved in good condition through the double protection of cargo and sand. Even though they are waterlogged, and often distorted by the shape of the sea bed, specialists may still be able to reconstruct something of the vessel's overall form and lines, and how its sections fitted together.

From this evidence it is slowly becoming possible to chart the history of maritime technology from the dugout canoes of the prehistoric period down to the invention of the three-masted ocean-going vessel in the 15th century and beyond. Indeed many of the best-studied shipwrecks date from the relatively recent period of European colonial expansion, and they too have a great deal to tell us about ship construction which is not available from other sources.

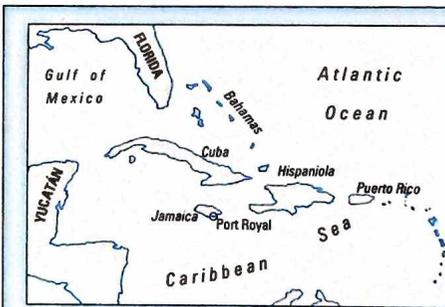


1 UNDERWATER EXCAVATION

Conditions underwater can pose particular problems but can also be turned to the excavator's advantage. The reduced gravity causes disturbed sediment to rise in a cloud and then sink back, making it difficult to clear away, and equipment such as grids or plane tables need to be weighted in order to stay in place. On the other hand, it is easy to manipulate heavy weights underwater. Tools used for excavation are adapted from their equivalents on land, spades, for example, are deep and closed, with edges to protect their contents. Water itself can be put to good use, either in a high-pressure jet for cleaning finds, or simply in a hand-made current which gently dusts or exposes a buried object.

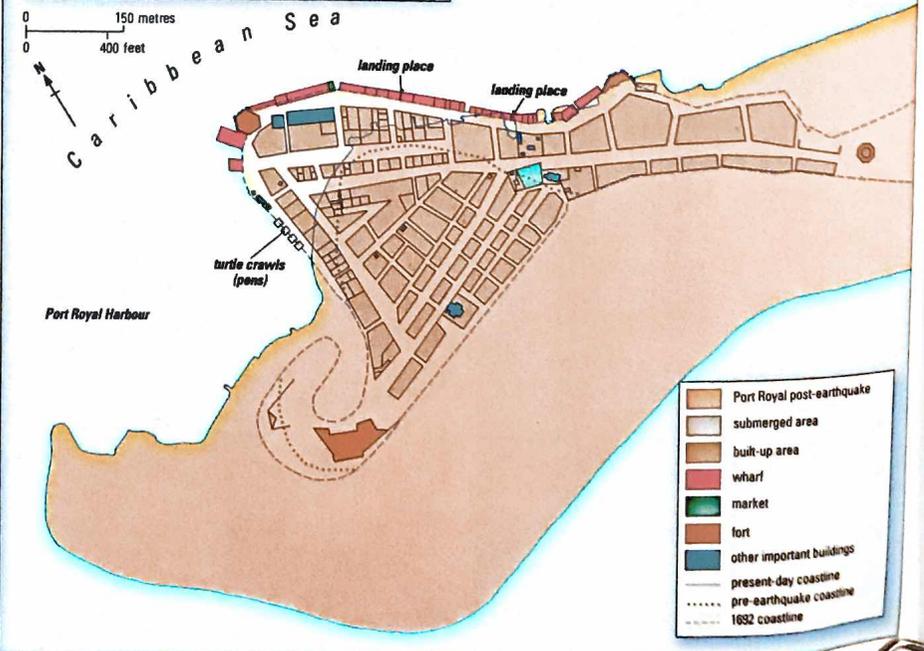
Divers working only a few metres below the surface even in tropical seas may suffer from the cold, and at greater depths there is the problem of decompression sickness, which must be avoided by ascending to the surface slowly and in stages. These difficulties limit the amount of time an individual diver can actually be active on the sea bed in any one day, and are among the factors which make underwater excavation much more costly than normal dry land archaeology.

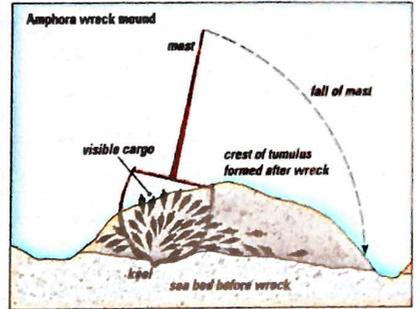
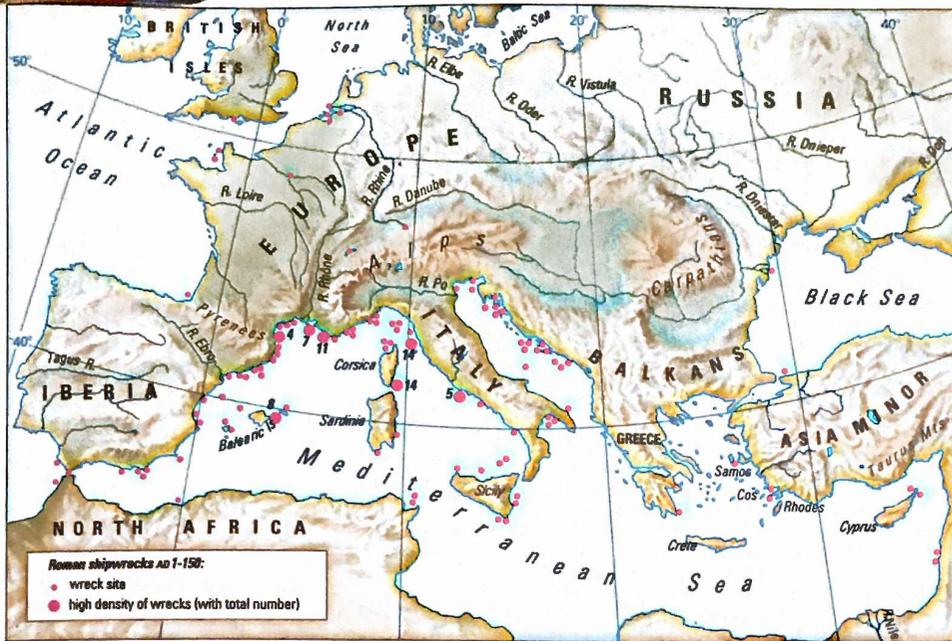
Methods of excavation (left): 1 Cables lowered by crane serve to lift heavy items. 2 Lifting balloon air bubbles from its vent equalise pressure and regulate the speed of ascent. 3 Narghile or hookah hose uses air pumped from the surface to allow longer but less mobile dives. 4 Air lift with float, catch bag and basket serves to suck up debris from the wreck. 5 Step frame or metal grid placed over the wreck to aid mapping and cataloguing of artefacts. 6 Plane table to measure relative elevations. 7 Photograph tower made of light metal and standing four metres high. 8 Air-filled telephone booth provides contact with the dive barge.



2 PORT ROYAL: A SUBMERGED TOWN

Port Royal, a thriving 17th-century harbour town on the south coast of Jamaica, was known as the wickedest city in the world from its association with buccaneers and pirates. It was almost totally destroyed by an earthquake on 7 June 1692 (which lasted three minutes and killed 2000 people). Only an inner nucleus of streets remained above water after the quake, an area of eight hectares having sunk into deep water. Modern excavations have used old maps together with echo-sounding equipment to establish the position of the vanished forts and the intermediate buildings. The harbour floor has been carefully examined, with sediment removed by air-lift onto barges and dumped elsewhere. Preservation is excellent, and a variety of objects has been recovered, including cannonballs, guns, utensils, clay pipes and bottles of rum, and a brass watch stopped at 17 minutes to 12, the time of the quake.

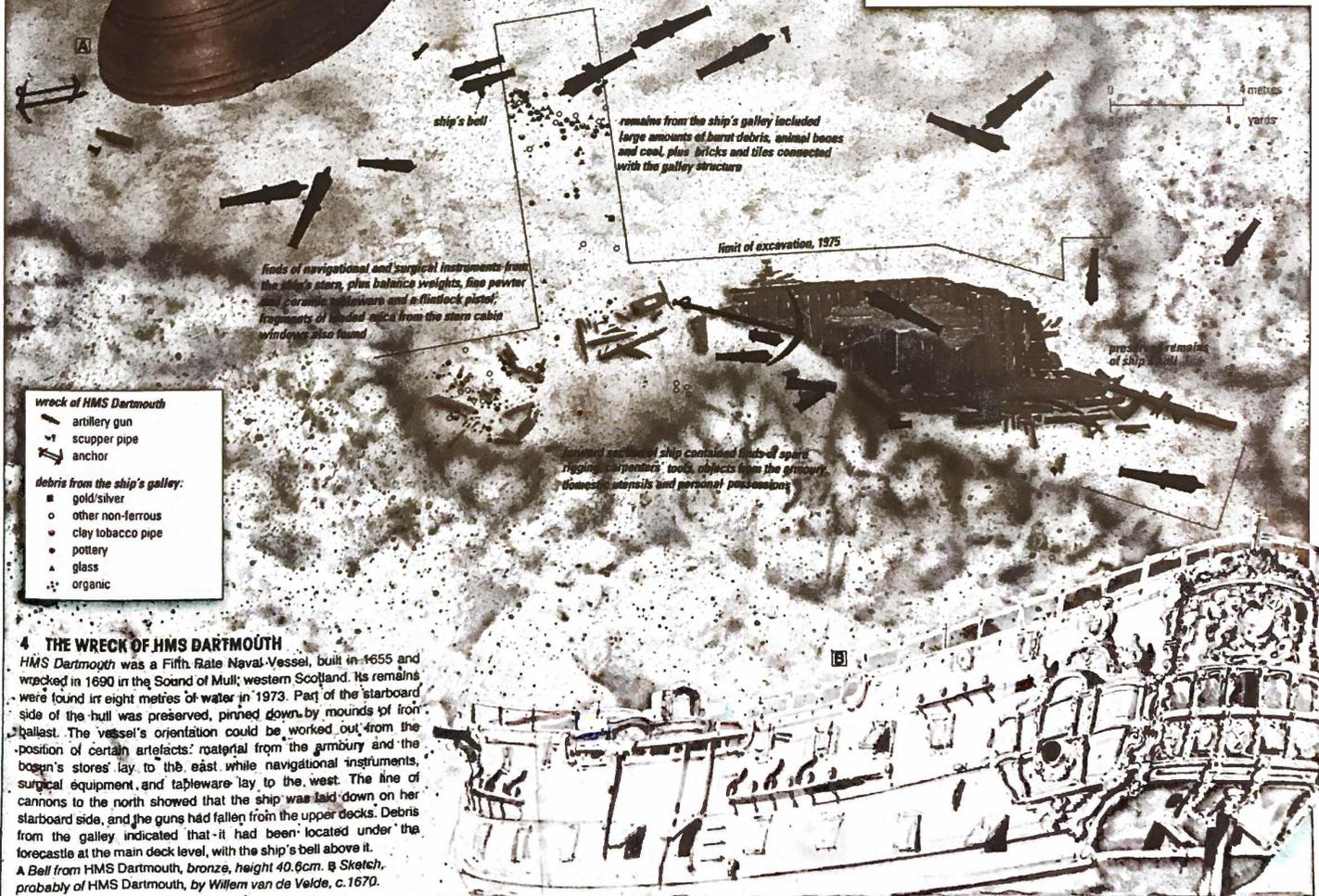
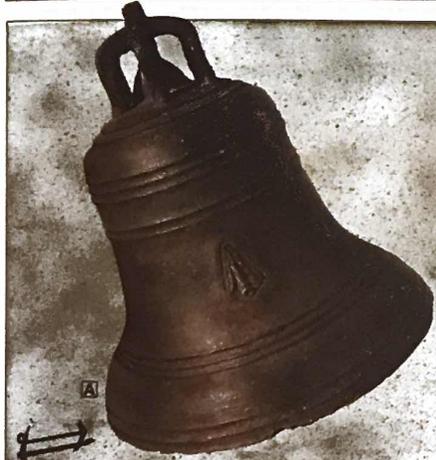




3 SHIPWRECKS OF THE ROMAN WORLD

Roman shipwrecks provide information about maritime technology, trade routes and cargoes. Many of these ships carried thousands of amphorae. The amphorae survive well and often bear abbreviated names of the potter, producer or exporter, making it possible to identify their date and provenance. Residues inside can sometimes be analysed to reveal the original contents, while the number of amphorae give an indication of a vessel's size. A ship will spill open when its wood becomes waterlogged and collapses under the weight of the cargo (diagram above), which then protects the bottom. The softened hull adopts the shape of the sea bed, while the amphorae will fan out in accordance with the slope. Sand then gathers around and over everything.

Top Amphorae, some still containing wine, from a shipwreck near Toulon, France. 1st century ac.



4 THE WRECK OF HMS DARTMOUTH

HMS Dartmouth was a Fifth Rate Naval Vessel, built in 1655 and wrecked in 1690 in the Sound of Mull, western Scotland. Its remains were found in eight metres of water in 1973. Part of the starboard side of the hull was preserved, pinned down by mounds of iron ballast. The vessel's orientation could be worked out from the position of certain artefacts: rostral from the armory and the bosun's stores lay to the east while navigational instruments, surgical equipment and tableware lay to the west. The line of cannons to the north showed that the ship was laid down on her starboard side, and the guns had fallen from the upper decks. Debris from the galley indicated that it had been located under the forecabin at the main deck level, with the ship's bell above it.

A Bell from HMS Dartmouth, bronze, height 40.6cm. B Sketch, probably of HMS Dartmouth, by Willem van de Velde, c.1670.

ANALYSIS Food

There can be few aspects of life more fundamental to human existence than food. For much of the past 3 million years the life of the hunter-gatherer was largely devoted to the food quest, and usually there were no means of storing food supplies. The change from reliance on wild foods to domestic animals and crops was a very recent development, beginning only about 10,000 years ago. The ability to provide a stable food supply and to create a storable surplus of food, soon led to the development of more complex societies.

When archaeologists recover the remains of our distant ancestors and their tools, they also look for clues about their foods. The process is essentially one of detective work, and direct evidence may survive in a variety of different forms: animal bones, sometimes showing butchery marks, or traces of burning during cooking, and plant remains, preserved as charred seeds or fruits, or buried in conditions which favour preservation, such as waterlogged soil, desiccated environments and permanent frost (permafrost), or as impressions in mud-brick or pottery. Only in rare instances do prepared foods such as loaves of bread or large vessels filled with mead or wine survive. The study of the tools used for food preparation – cutting, grinding, pounding and cooking – enables us to understand the range of cooking techniques which were available to a given society, and to see how they developed through time. Representations of foods and of food preparation in contemporary art, wall paintings and pottery may also supplement this information.

Human remains also provide evidence of diet. Careful excavation of the stomach regions of skeletons may reveal the contents of the last meal. The Iron Age bodies recovered from the bogs in Scandinavia and Britain had their stomachs preserved intact; their last meals consisted of a range of cereals, linseed and a great number of weed seeds – some possibly added as flavourings. Human coprolites (fossil faeces) are another important source of information in waterlogged or desiccated conditions. The most important crops were those which supplied the farmers with easily storable supplies of carbohydrate – wheat, maize, rice, barley, oats, rye, millet, sorghum. In parts of the tropics carbohydrates are supplied by the sweet potato, taro, yam, manioc, banana and bread fruit. In addition to carbohydrates the human diet must contain

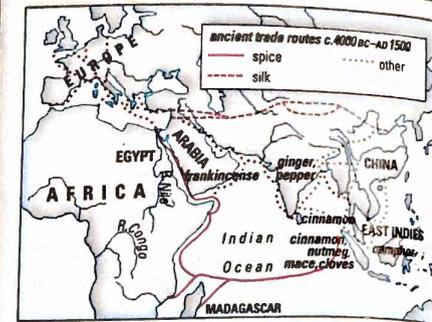
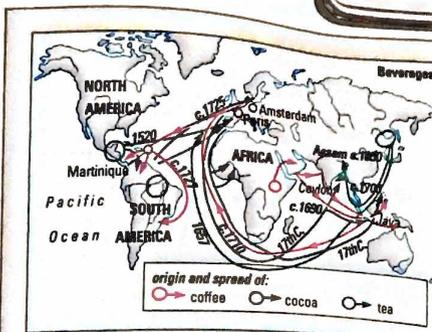
fats and proteins. Domestic animals provide the main sources of these. Vegetable proteins are found mainly in the legumes, the most important in the Old World being beans, peas and lentils, which were domesticated at the same time as cereals.

The present-day distribution of foods owes much to trade and the introduction of domestic plants and animals to new areas. The Greeks and Romans built up extensive trade in plant foods, olive oil and wine, and imported spices from the Far East. The next influx of food plants into Europe was brought by the Arabs to Spain. They introduced lemons and oranges, peaches, pomegranates, bananas, figs, aubergines, asparagus, rice, liquorice and sugar cane. The discovery of America brought further new crops to Europe: maize, potatoes, tomatoes, beans, red and green peppers and peanuts. In exchange Columbus carried vegetable seeds, wheat, chickpeas and sugarcane to the Caribbean islands.

Alcoholic beverages were traded early in human history. The first known recipe for beer comes from a clay tablet in southern Mesopotamia dating to c.2500bc. Mildly alcoholic drinks have been made throughout history using a wide range of ingredients: honey, rice, agave, cereal fruits, grapes. The keeping qualities of some of these drinks allow them to be transported over long distances without deterioration. Wine was perhaps the first to be traded extensively round and from the Mediterranean, providing one of the sources of income on which the civilisations of Greece and Rome were based.

Animals were domesticated for a number of different purposes – for draught, wool and hair, as beasts of burden, for riding and for food. As sources of food, animals provide meat, and may also be used for milk and milk products, and for blood. A total of only about 50 animals have been truly domesticated, if the honey bee, the silkworm and fish such as carp and trout are included. Of these only cattle, pigs, goats and water buffalo have a wide global distribution. Fish and seafood have also played an important role in man's diet. From the Palaeolithic period onwards people valued the harvest of the seashore, and the remains of shellfish are found in huge middens around many temperate coastlines.

Availability and distribution of different types of food has had a powerful influence on the ways in which human societies have organised their annual round of everyday activities. The study of food is a critical element in the understanding of these societies and their development.



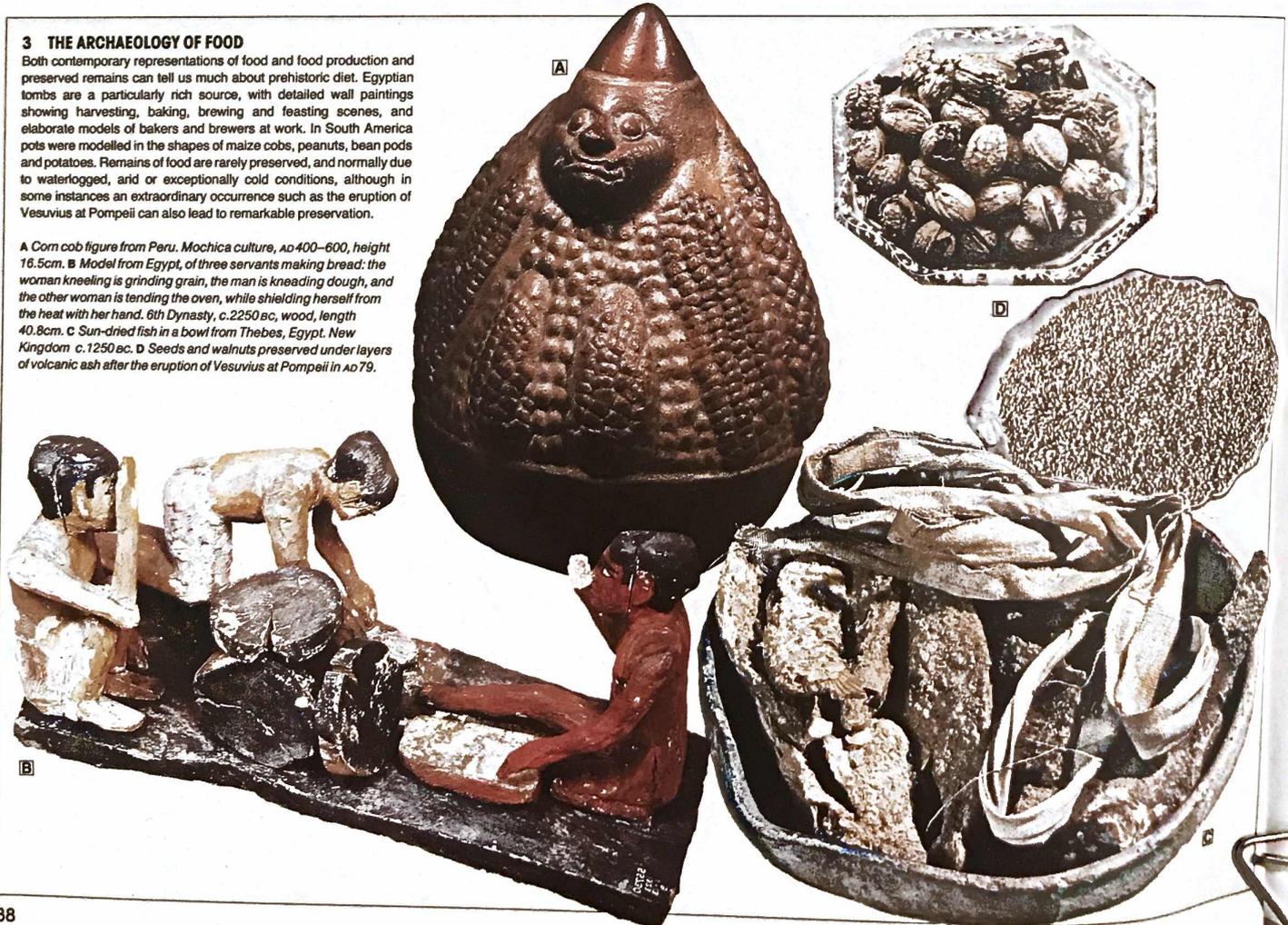
1 FOOD, TRADE AND COLONISATION

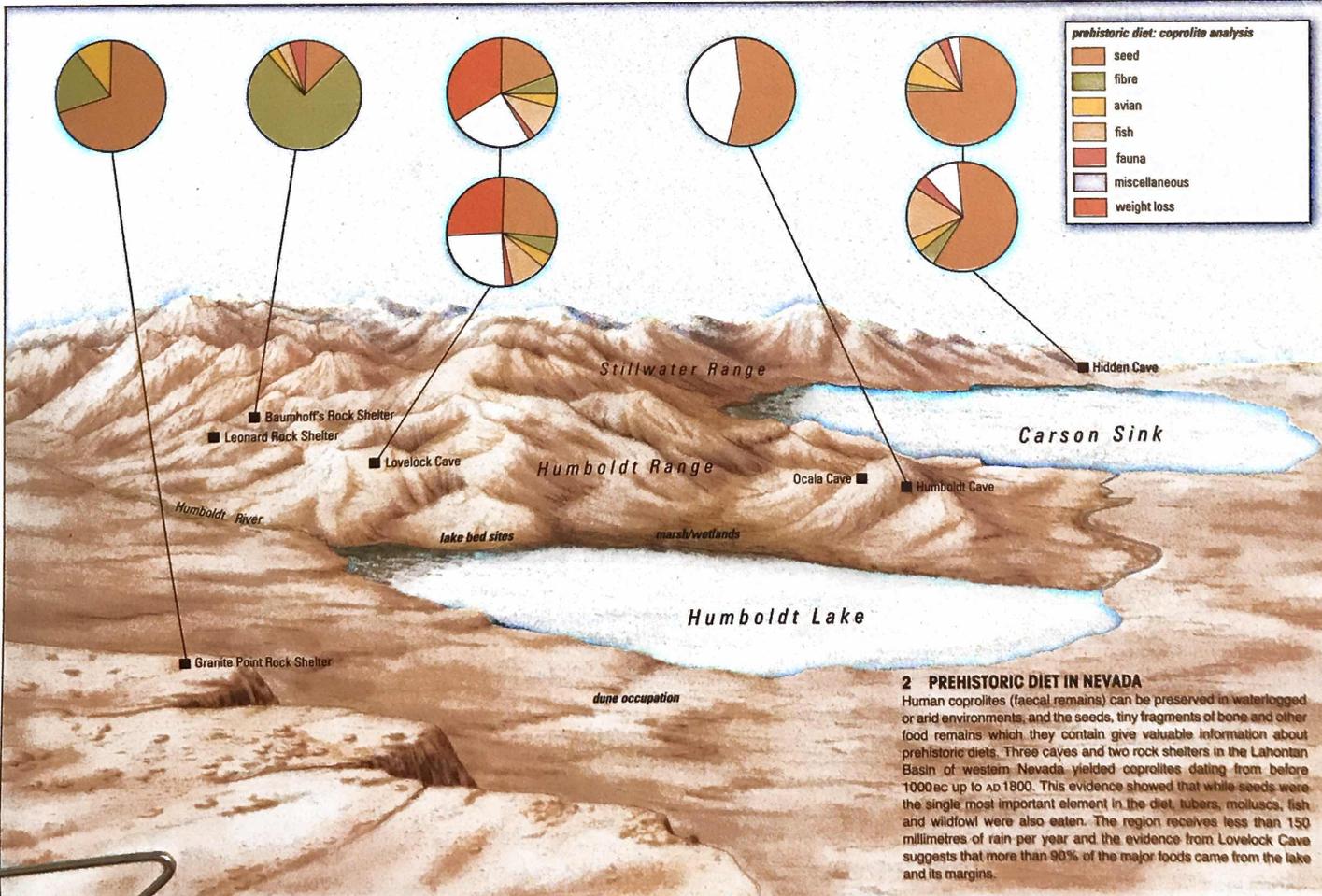
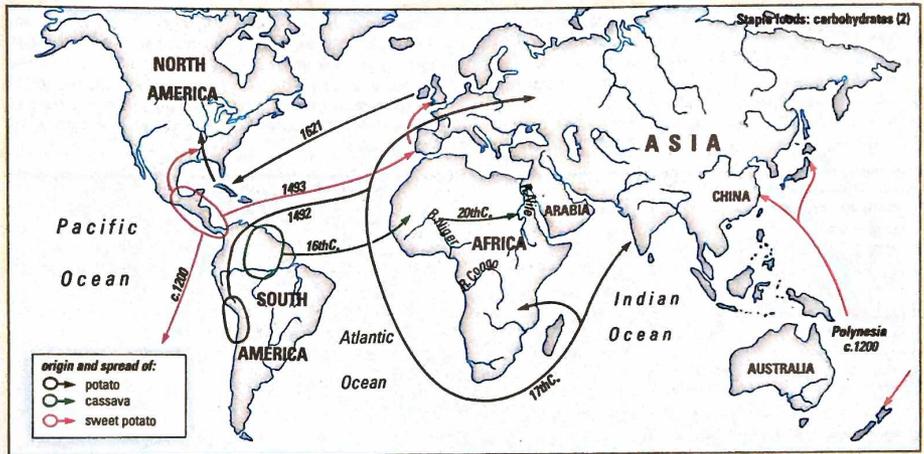
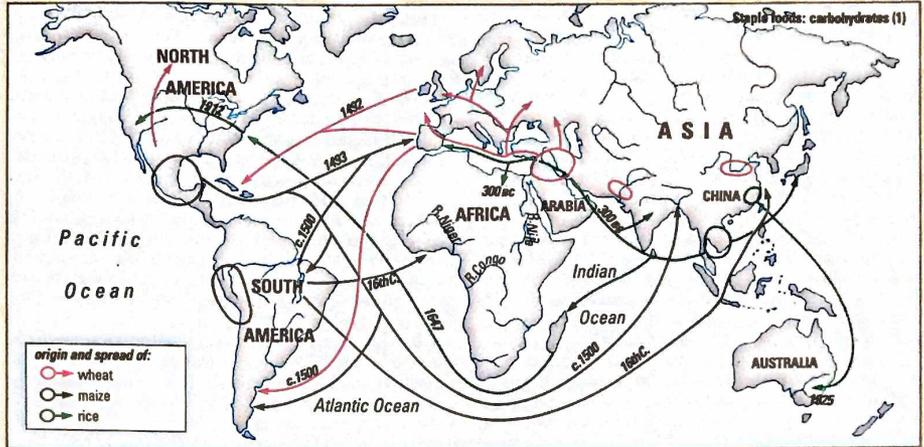
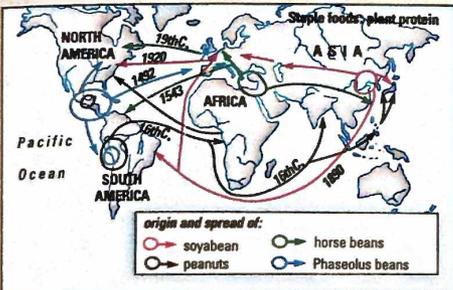
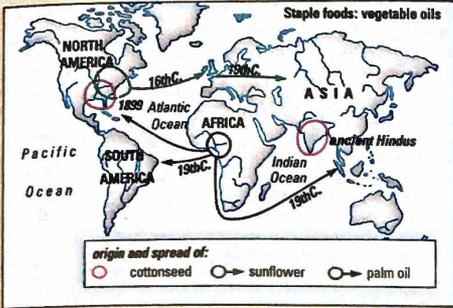
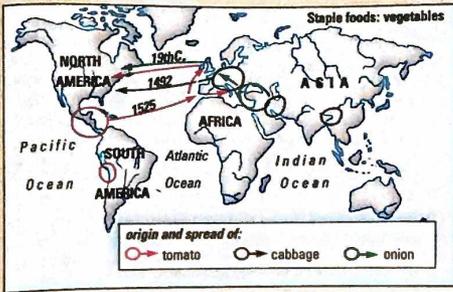
The spread of crops across the world reflects the expansion of trade and colonisation from the period of the first civilisations to the European conquest of America (see maps right). One group of plants – the spices – have themselves been responsible for stimulating much early exploration (above). They were highly prized by early civilisations in China, Greece, Rome and Egypt. Even earlier, in c.3000bc, the Sumerians were using cloves from the Moluccas, and the Old Testament refers to cinnamon from Ceylon. Spices added variety to the diet, concealed the flavour of meat that was not fresh, and increased the rate of perspiration thus having a cooling effect on the body. They have always been rated as an expensive luxury, and indeed were so valuable that the one surviving shipload returning to Europe from Magellan's ill-fated voyage round the world (1519-22) paid for the entire expedition.

3 THE ARCHAEOLOGY OF FOOD

Both contemporary representations of food and food production and preserved remains can tell us much about prehistoric diet. Egyptian tombs are a particularly rich source, with detailed wall paintings showing harvesting, baking, brewing and feasting scenes, and elaborate models of bakers and brewers at work. In South America pots were modelled in the shapes of maize cobs, peanuts, bean pods and potatoes. Remains of food are rarely preserved, and normally due to waterlogged, arid or exceptionally cold conditions, although in some instances an extraordinary occurrence such as the eruption of Vesuvius at Pompeii can also lead to remarkable preservation.

A Corn cob figure from Peru. Mochica culture, AD 400-600, height 16.5cm. B Model from Egypt, of three servants making bread: the woman kneeling is grinding grain, the man is kneading dough, and the other woman is tending the oven, while shielding herself from the heat with her hand. 6th Dynasty, c.2250bc, wood, length 40.8cm. C Sun-dried fish in a bowl from Thebes, Egypt. New Kingdom c.1250bc. D Seeds and walnuts preserved under layers of volcanic ash after the eruption of Vesuvius at Pompeii in AD 79.





Textiles

Clothing and textiles have been among the most important products of human skill for well over a million years. It is only because of clothing that man has been able to spread beyond his original tropical homeland into cooler and less hospitable regions. Clothing and textiles have also played a crucial role in social life. Particular woven designs in carpetry, for example, are sometimes the mark of a clan or tribe, and fine or expensive clothing has always been a major expression of social status.

The character of early textile production was closely related to regional climatic conditions, and methods of spinning and weaving were adapted to locally available fibres. Climate has also directly influenced the survival of textile remains – cold, dry and waterlogged conditions are ideally suited to the preservation of fabrics.

Plant fibres were the first to be utilised by prehistoric man. The earliest known Old World textiles are linens from Çatal Hüyük in Anatolia dated to c.6500 bc; the first northern European textiles do not appear until 3500 bc. In China silk was being woven by c.2700 bc, while in the New World there are textiles in Peru before 1000 bc.

After man's domestication of animals it was found that the wool and hair of sheep, goats and members of the camel family could readily be spun, their surface scales interlocking to give a stable yarn. The animals were plucked or, after the introduction of metal tools, shorn. In China, on the other hand, it was discovered that the domesticated silkworm, *Bombyx mori*, extrudes a fila-

ment that requires no spin to give it strength.

Vegetable fibres, in contrast, require more labour to convert into textiles; they have to be extracted from the stem or bark of the host plant, and vigorously pounded and combined before they can be spun. Until the introduction of the spinning wheel (in the Middle Ages in Europe, but earlier in China) raw fibre was converted into yarn on the hand-spindle, a short wooden stick that could be rolled on the thigh to give the yarn twist, or rotated between finger and thumb, either supported in a bowl or hanging free. The free-hanging spindle was normally weighted with a whorl, a pierced disc of bone or pottery, to give it momentum. Spinners – notably in ancient Egypt and Inca Peru – were capable of creating extraordinarily fine yarn. The direction in which the spindle was rotated, either clockwise or anticlockwise, was dictated by local social tradition.

Weaving, the act of interlocking weft and warp threads, required a loom, if only a simple one. A range of immensely complex patterned fabrics was woven on the Peruvian backstrap loom. A similar loom, mounted at ground level, was characteristic of Dynastic Egypt, and is still in use among the Bedouin. Much of our knowledge of ancient Egyptian weaving techniques comes to us from wall paintings and tomb models. The first vertical frame loom, in which the warp was extended between two beams, appeared in Egypt in 1200 bc. The best-known loom of Europe and the Near East was the warp-weighted vertical loom, on which a set of weights tied to groups of warp threads replaced the lower beam and gave the loom great flexibility.

In the last three centuries bc Chinese weavers were experimenting with raised horizontal or obliquely mounted looms on which elaborate warp-patterned designs were achieved. Independently, craftsmen in western Asia had learnt by ad 200 to weave damask and other patterned silks on a raised horizontal loom with multiple heddle rods. Rapid technical evolution between ad 300 and 1000 led to the development of the drawloom for structurally complex silks, and to the basic handloom for everyday wool fabrics.

Pattern weaves gave each region its distinctive textile imprint. Check patterns, whether in Iron Age Europe, the Islamic East or Inca Peru, relied on planned use of contrasting colours in both warp and weft. Hand-plated braids, abundant in the New World, also involved pre-planned patterning. Tapestry weaves, popular in Central America and the Mediterranean, were freehand designs in weft yarn over bare warp. More complex weft-faced weave structures, especially in silk, were associated with the Chinese and Byzantine horizontal looms; but Peruvian weavers were noted for double-cloth, made from two separate fabrics with interlocked patterns. Various forms of looped or knotted pile for cloaks, carpets and hangings are recorded. Embroidery, however, despite its versatility, took second place to woven patterns, and both were ultimately in competition in some regions with tie-dyed, resist-dyed or printed fabrics.

The dyer's craft depended on colouring agents extracted from plants, molluscs and insects. A branch of empirical chemistry, it helped the weaver to satisfy the urge of humans to adorn as well as to cover themselves.



2 TEXTILES: RANGE AND USES

Not content with wearing the skins of other mammals, early man experimented with every conceivable source of natural fibre that grew around him. The use of an extraordinary range of strong fibres (mainly of vegetable origin) for ropes, netting and basketry has been attested. Linen, the earliest known Old World textile, was transported, with the spread of Neolithic farming techniques, far from its centre of discovery in Mesopotamia. Cotton, which grew both in the Near East and in the Americas, later became more important. For woven textiles only a limited number of fibres proved over time to be fully satisfactory. The cultivated silk of China was highly prized, and traded vast distances along the trans-Asian Silk Road to the markets of the Mediterranean. Sheep and goats were important wool-bearing animals in the Old World, and vicuña, llama and alpaca in the New.

1 TEXTILES: PRESERVATION AND AVAILABILITY

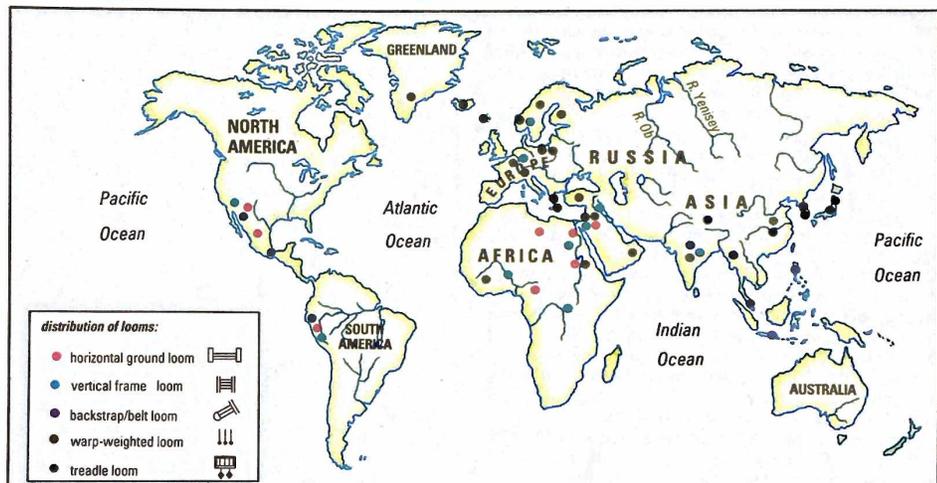
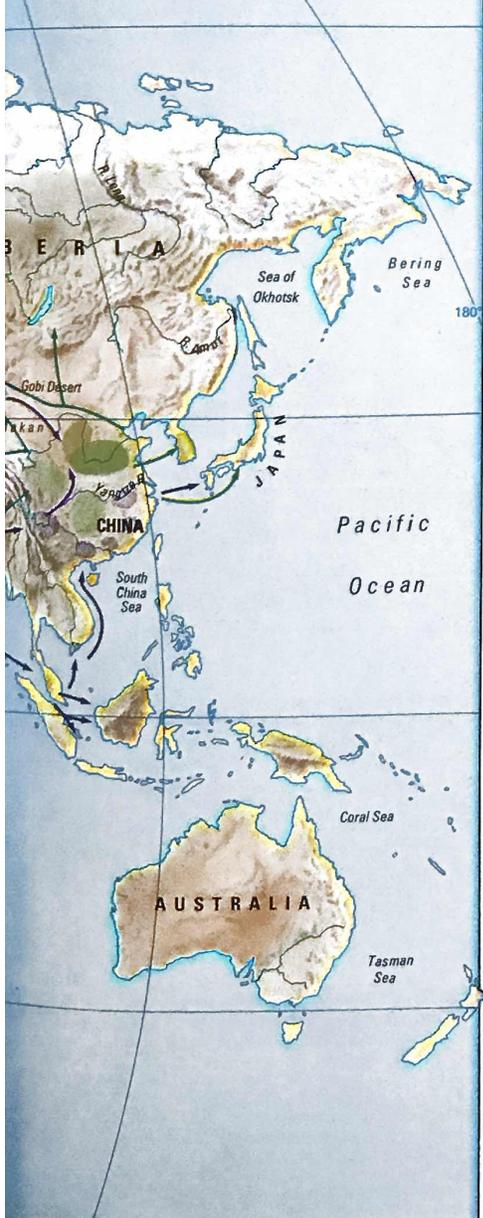
Cultivated flax (*Linum usitatissimum*) had been developed from the wild flax of Mesopotamia by the 7th millennium BC, and subsequently its use spread into Europe and the Indus Valley. Indigenous species of cotton are found in both the Old and the New World, and the potential of the cotton boll's fibres was discovered independently in several centres. Sheep had been domesticated in western Asia by 9000BC, but were not wool-bearing until perhaps 3000BC: woolly sheep are found everywhere in Europe by the beginning of the Bronze Age. Yarn was spun from the cocoons of several varieties of wild silk moth throughout Asia but sericulture did not reach the eastern Mediterranean until the 6th century AD.

Preserved textiles A An embroidered cloak fringe from the Peruvian coastal desert. c.200 BC, height 59cm, width 15cm.

B The woollen dress of a Bronze Age girl buried in a mound at Egtved, Denmark. c.1120 BC. C A fully clothed baby of about six months buried in the permafrost at Qilakitsoq, western Greenland. c. AD 1475.

Natural materials used in textile production

function	animal skins		animal fibres		plant fibres	
	Old World:	New World:	Old World:	New World:	Old World:	New World:
cloth and clothing	wolf bear ox deer wildcat sable otter leopard colt sheep	moose dog rabbit buffalo musk ox caribou seal deer bear/polar bear jaguar	silkworm sheep goat camel rabbit dog mollusc (pinna marina) horse cow beaver mineral - asbestos	guanaco vicuña alpaca llama dog rabbit human hair bear buffalo mountain goat leathers	cotton flax ramie jute mallow nettles hemp	cotton yucca leaves apocynum maguey cabuya puya tilandsia
	matting, basketry and cordage		goat	human hair bast from lime	flax hemp esparto grass mallow nettles corn-straw	apocynum yucca leaves shredded juniper bark willow ixtle agave junco tatora pisa penca milkweeds vines

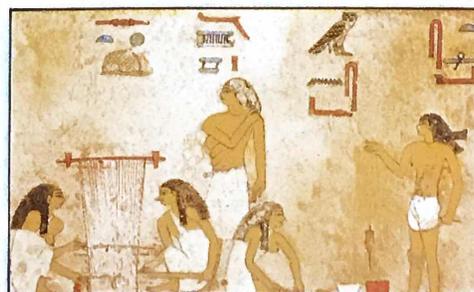
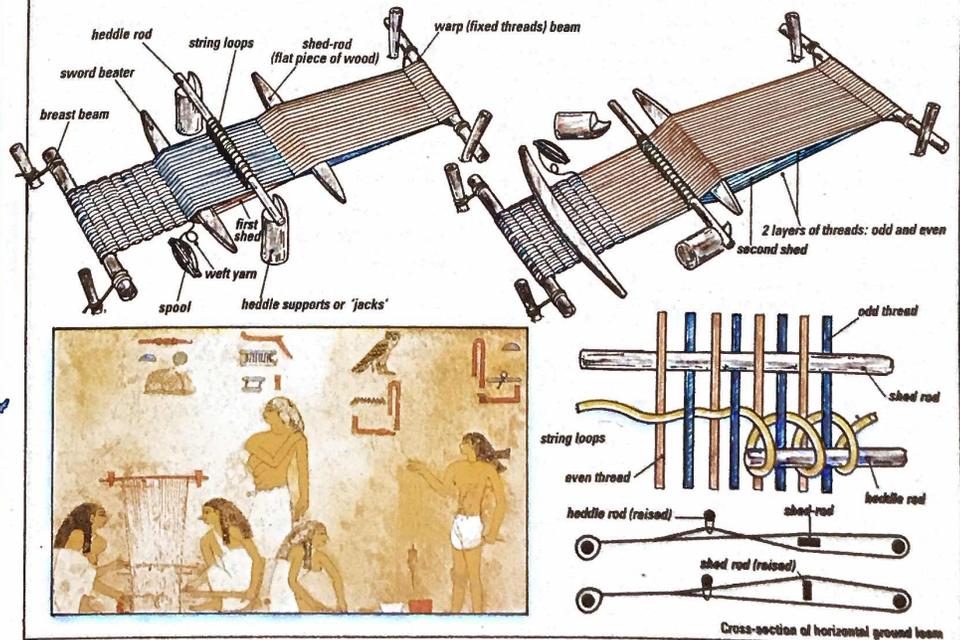


3 ANCIENT EGYPT: WEAVING METHODS

The horizontal ground loom of ancient Egypt, reconstructed below, illustrates the main principles of weaving. The warp threads, spanned between the warp beam and the breast beam, are divided into two layers. Odd-numbered yarns (blue) are raised by a heddle rod linked to them by string loops to open the first shed through which the weft yarn is passed on a spool. The weaver compacts the new weft against

the cloth already woven with a sword-beater. The second (counter) shed is opened with a shed rod alone. The same principles are used in the vertical warp-weighted and two-beam frame looms of Europe and the simple backstrap looms of the Americas and South-East Asia (see map above for global distribution of looms).

Below left tomb painting from Beni Hasan, Egypt, showing weavers. c. 1890 BC, 10.4 x 6.7m.



ANALYSIS Disease

Palaeopathology is the study of disease in ancient peoples. Human remains are perhaps the closest we can get to ancient people, closer to their experience than their artefacts or settlements, and while archaeology strives to be objective, we need to remind ourselves that we are researching the lifestyle of real individuals from the past. A small amount of work with skeletons can indicate many things: the age and sex of the individual and the height and build can frequently be estimated. It is even possible to reconstruct facial features, as forensic scientists do in crime cases. The faces of many early human types, such as Neanderthal man, have been reconstructed, and as part of the work of the Manchester Mummy Project a medical illustrator produced paintings, drawings and models of the heads of several of the mummies.

A surprising amount of information can be gained from human bones about a person's genetic inheritance, natural environment and social conditions. Bones present evidence of sickness, deformity, inadequate diet, injury - accidental or as a result of violence - early death or a suffering old age. On the other hand, we can often find evidence of robust good health, sound healing of severe injuries or long survival through serious illness.

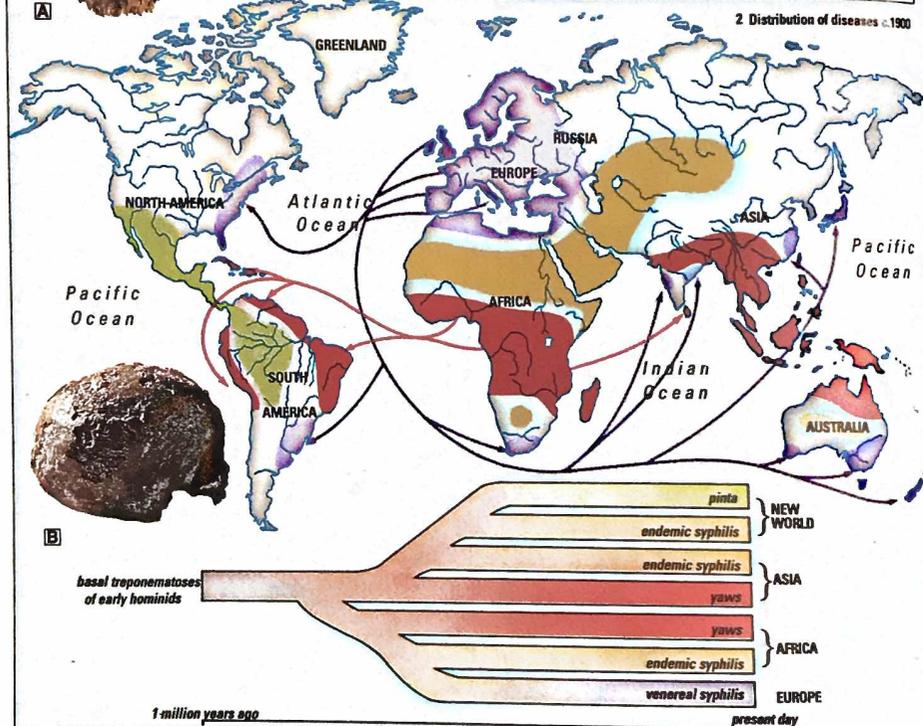
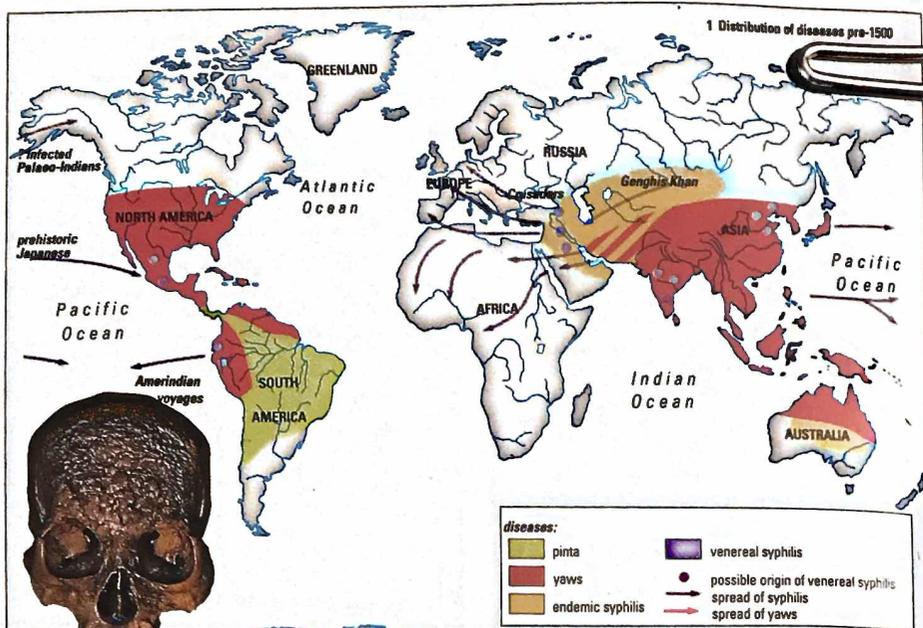
Bone changes throughout life. The skeleton is an organ of the body, and bone contains within itself, not only structural cells (*osteocytes*), but also cells that can break the structure down (*osteoclasts*) and others that rebuild it (*osteoblasts*). A membrane called the *periosteum* surrounds every bone, and this contains many *osteoblastic* cells, which contribute to bone growth in the earlier years and to repair in later life. The *periosteum* disappears after death, but evidence of its activity in response to infection or injury can be found in many diseased bones.

In the foetus and growing child, the skeleton develops according to its hereditary constitution, and some pathologies result from inherited disease, for example brittle bone disease and congenital deformation of the hip. Thus family relationships can sometimes be identified. Palaeopathologists also look for a number of 'non-metric traits' (harmless variations in bone size and shape, position of nerves, etc.) which can run in families: the additional 'Wormian' bones, for example, found in the skulls of the so-called Princes in the Tower of London suggest that they were closely related. Environmental influences can affect normal growth in the child, one of the commonest effects being slowing or halting of growth due to sickness or inadequate diet. The lines of faulty bone production at the growing ends of a long bone show up on X-rays; these are called Harris lines.

The bones of an adult constantly renew and repair themselves. Fractures are often found in ancient skeletons, some are cleanly healed, some have occurred shortly before death and show no signs of healing. Splinting appears to have been uncommon in the past, so we find many broken limb bones shortened or twisted by the tightening of powerful muscles. Even horrific head wounds have been survived: some ancient Egyptian skulls have had the braincase shattered - presumably by blows from a heavy weapon such as a mace - but the injuries have healed well and the person has lived on into old age. Trepanation, the cutting of holes in the skull for relief of pressure, or perhaps for magical reasons, is known from archaeology and ethnography, and the recovery rate is extraordinary; the largest number known in one skull is seven, all well-healed. On the other hand, in societies where medical and dental treatment was poor, severe illness or death could result from apparently trivial causes, for example dental abscesses. The dental health of the ancient Egyptians was appalling, and more than one pharaoh suffered from abscesses which would have caused great pain, and may even have hastened death.

Disease patterns change through time. When looking at a particular group - from one grave, from a burial ground or even from a whole area or country - it is useful to look at the pattern of disease and mortality. How and at what age did people die, and are there status- or occupation-linked differences in disease patterns? For example, it was common for sailors in the past to suffer or even die of scurvy, a deficiency of Vitamin C resulting from a lack of fresh fruit and vegetables. We also have to consider whether the group being studied was representative of a wider population, or was distinctive in some way, such as an isolated community where genetic variants might be found. Palaeopathology shows that early populations were subject to disease on a scale which makes it a significant factor in human history.

Archaeology is able to produce ancient bone material - and occasionally mummified soft tissue - which allows the nature, development and prevalence of disease to be charted. The resulting picture makes the cultural achievements of disease-affected and undernourished early societies even more impressive.



1 THE SPREAD OF TREPONEMAL DISEASES

It has long been thought (map 2) that venereal syphilis spread through Europe in the 1st century AD, and throughout the world from the 16th century AD. Recent research (map 1) suggests, however, the spread of an ancestral disease from Asia into the Americas. The diagram (above) suggests that multiple forms have evolved from a common ancestor.

The archaeology of disease

Congenital and developmental

divarism and gigantism
Down's syndrome
hydrocephaly
spina bifida
cleft palate
congenital dislocations (such as hip joint)
additional or missing bones
congenital anaemias (radiographic 'hair on end' appearance to skull)

Trauma and surgery

fractures
cuts and puncture wounds (from sword or arrow perhaps)
trepanation
amputation
deliberate deformation of bones (such as head flattening and foot binding)

Communicable diseases

leprosy (destruction of small bones)
treponemal diseases (such as syphilis, yaws: destruction and regeneration of bone)
tuberculosis (septic arthritis at joints)
polyomyelitis (restricted bone growth in a paralysed limb)
peritonitis/osteomyelitis (reaction to infection - appears as rough, irregular areas of bone destruction and regeneration)

Deficiency diseases

rickets (childhood)/osteomalacia (adulthood) (light and brittle bones, long bones bowed and/or fractured)
scurvy (calcified haemorrhages below the bone surface)
iron deficiency anaemia ('hair on end' radiographic appearance, possible sieve-like appearance within eye orbits)

Non-communicable diseases

osteoarthritis
rheumatoid arthritis
gout

Dental diseases

caries (tooth decay)
periodontal disease (gum infections, often leading to erosion of the bony support of the teeth and tooth loss)
abscesses
impaction (usually wisdom teeth)

Neoplasia - tumours

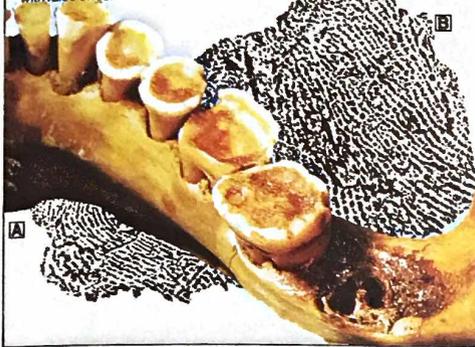
malignant tumours of bone or other tissues (such as bone marrow cartilage and connective tissue)
benign tumours and cysts (variously sized and shaped congenital or bone cavities)
secondaries (metastases) from primary malignant tumours (small, irregular perforations throughout skeleton)

A Facial view of skull with widespread inflammation of forehead due to treponemal disease. From Cueva de Candelaria, Mexico, pre-Columbian. B Cranium of mediaeval woman from London, showing the characteristic bone erosion of the late stages of syphilis.

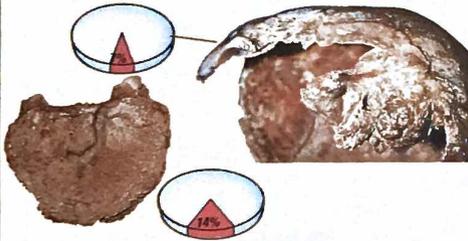
2 SOFT TISSUE: THE MANCHESTER MUMMIES

Mummified tissue can be even more informative than skeletal. A team at Manchester, England, has been working on a collection of Egyptian mummies using techniques such as radiography, electron microscopy, fingerprinting, rehydration of desiccated tissues and facial reconstruction.

A The jaw of Nekt Ankh shows tooth wear, probably due to coarse bread. Severe dental decay was very rare. **B** Fingerprint taken from Asu, Chantress of Amun, which indicates that she died in her early 40s having done little or no manual work. However, she could not avoid arthritis in her fingerjoints (X-ray (C)) or intestinal parasites (electron micrograph (D)). **E** The unwrapping of mummy 1770 showed that this teenage girl had lost her lower legs before death – perhaps by crocodile bite – but the embalmers had replaced them with false ones.

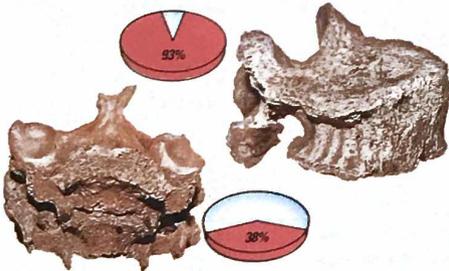


1 Infection of auditory meatus: roughening and erosion of the ear canal resulting from infection



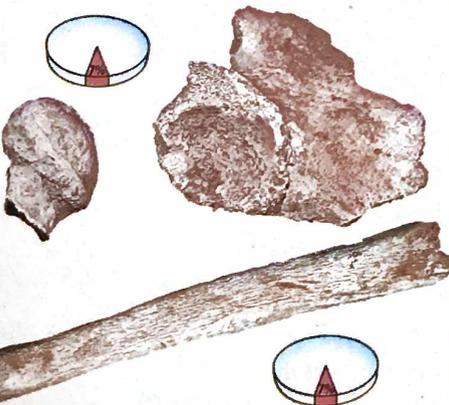
2 Schmorl's nodes: erosion of vertebral surfaces due to pressure from intervertebral discs, resulting from stress to spine

3 Osteoarthritis: erosion of joint surfaces and 'lipping' at joints, particularly in the spine

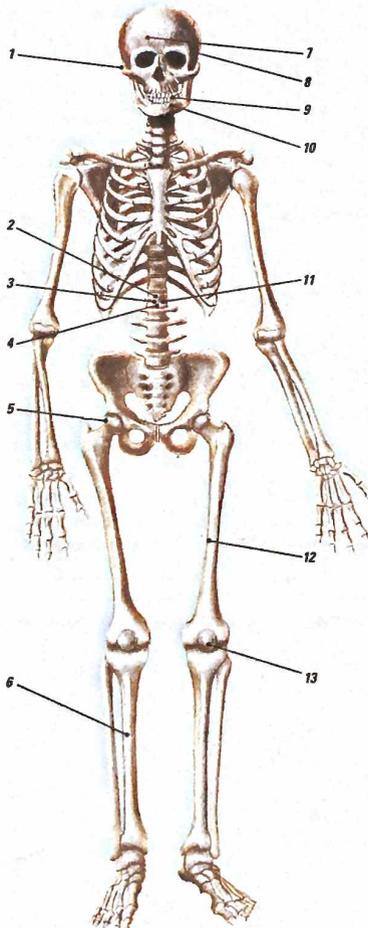


4 Ankylosis: fusion of bones at joint or fracture

5 Perthe's disease: degeneration of head of femur resulting in distortion of hip socket



6 Periostitis: reaction to infection found mainly on long bone shafts

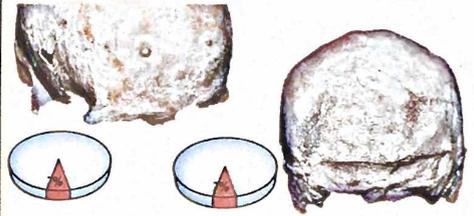


3 GRAFTON REGIS: A MONASTIC COMMUNITY

The 14th-century burial ground of the monastery of Grafton Regis contained a roughly contemporaneous group of skeletons, 14 men between 30 and 55. The majority of these men had arthritis and ankylosis. More than half had broken bones, several multiple. Although documentary evidence tells us that the monks of this period did not do manual labour, a heavy workload is implied by stress fractures of the feet and compression fractures of the spine. Compared with the ancient Egyptians they had little tooth wear, but they had even higher rates of dental decay than most mediaeval people.

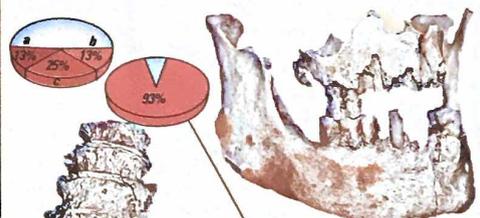
Above The relative percentages of diseases suffered by the monks of Grafton Regis in Northamptonshire, England.

7 Burton osteoma: benign bone tumour, appears as one or more small 'buttons' on skull



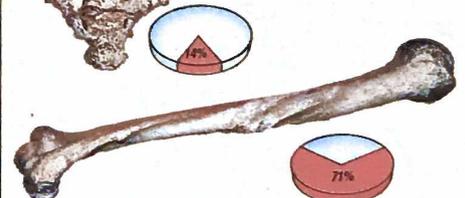
8 Porotic hyperostosis: dietary deficiency resulting in pitted or spongy texture to bones of skull vault

9 a caries (tooth decay) b abscesses (large hole at tooth root showing site of abscess) c tooth loss



10 Periodontal disease (gum infection affecting bony supports of teeth)

11 Scoliosis: spinal curvature from misshaped or collapsed vertebrae



12 Fractures: displacement of long bone shaft with growth of bony callus



13 Eburnation: polishing of bone surface when cartilage has been destroyed, resulting in direct bone-to-bone contact

ANALYSIS Warfare

Aggression has long been an integral part of human nature, perhaps ever since the emergence of the earliest hominids in Africa over two million years ago. However, organised group conflict is first attested only about 10,000 years ago, from evidence in a prehistoric cemetery just north of Wadi Halfa near the Egyptian-Sudanese border. Here no fewer than 24 of the 58 individuals – men, women and children – appear to have met a violent end, in some cases with stone blades actually embedded in the bones. A little later, rock art in south-eastern Spain shows groups of Mesolithic archers firing arrows at each other.

The development of group conflict was closely linked to changes in economy and society, and probably became more serious after the adoption of agriculture. Larger populations placed greater pressure on land and resources, and thus increased tension between neighbours. Settled farmers also had food stores, herd animals and standing crops to steal. The stresses associated with the emergence of more hierarchical societies ruled over by chiefs and kings may also have played an important part in the growth of inter-group conflict.

As human communities became organised into larger units the warfare they waged became ever more lethal. States had greater resources available for aggression, defence and the development of new weapons. Clay tablets from Greece and Mesopotamia tell of full-time specialists employed by the state to produce armour and weaponry, and expensively equipped elite forces such as

chariotry and armoured cavalry came into being. Sometimes the whole social and economic order was moulded around the demands of warfare; the feudal system of mediaeval Europe had as one of its principal objectives the maintenance of a force of armoured knights.

Changes in weaponry and equipment had a dramatic effect on warfare, and archaeology can unravel the development of such innovations. Much can be learnt from armaments deposited as grave-goods or as offerings to the gods. Skeletal remains are a further source of evidence, the wounds made by sword cuts sometimes indicating the nature of combat; almost all the cuts in the 14th-century Japanese war cemetery of Zaimokuza, for instance, had been made from horseback against victims who do not appear to have worn helmets.

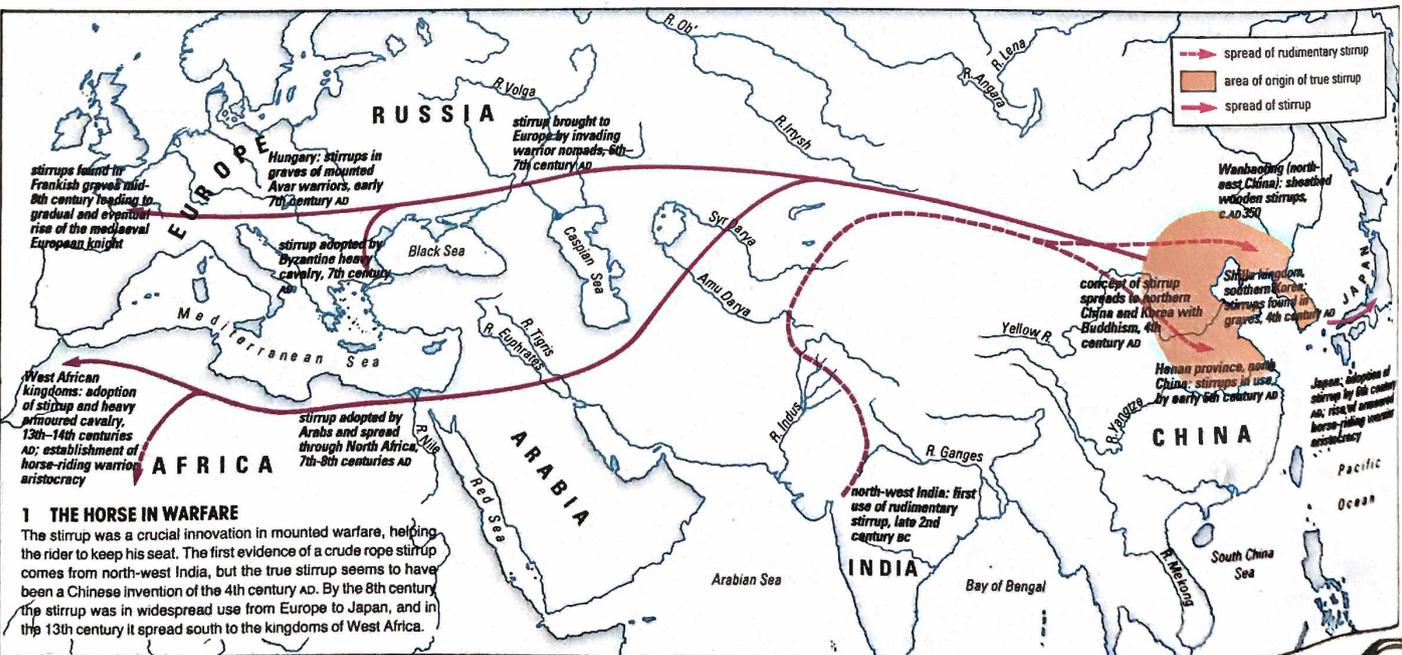
The use of the horse has been one of the most versatile and important factors in the history of warfare up to modern times. First domesticated in the south Russian Steppes in about 4400 BC, its earliest military use seems to have been as a draught- and later as a chariot-animal. The light, two-wheeled war chariot, pulled by a pair of horses, developed in the Near East soon after 2000 BC and chariotry formed the elite arm of both the Egyptian and the Hittite armies during the 2nd millennium BC. In about 1000 BC light cavalry was developed, followed a few centuries later by heavy armoured cavalry, though the cavalry charge only reached its full potential after the adoption of the stirrup in the 1st millennium AD. Another innovation that had a great impact on warfare is the Chinese invention of gunpowder, conventionally dated to AD 1161. Military application soon followed, with the

development during the 13th century of the first rockets and cannon. The new invention soon spread to the west, and by 1500 western Europe and the Arab world had both heavy cannon and smaller handguns. The military superiority conferred by firearms was a significant factor in the success of European colonial ventures.

Archaeology can also throw considerable light on the course of individual battles and military operations. The most common examples are sieges where the excavation of a city or fortress may encounter evidence of attack or destruction. In some cases these archaeological traces can be linked with a known historical event. The fortress of Masada in Israel, ringed by Roman siege works and with a massive siege ramp built up against one side, is a spectacular example. The archaeological investigation of battlefields is less common. The Battle of the Little Bighorn, however, is an excellent illustration of the way in which archaeology can supply details of a military action that are missing from the historical record, even of a battle that took place only a little over a hundred years ago.

In the study of warfare archaeology is circumstantial and is thus, to some extent, able to avoid the bias inherent in historical accounts written by victor or vanquished. It also provides detailed information about military technology, on which written records are often vague or uninformative. Archaeology's greatest strength is that it is able to fill in details about periods for which there are no historical documents, allowing us to look back into the remote past of our hunter-gatherer ancestors and chart the progress of human conflict from small-scale tribal skirmishes down to the present nuclear age.

Warfare: development of technological skills	War wagons and mounts	Naval warfare	Other weaponry
Projectile weapons 16,000 BC stone bow and flint-tipped arrowhead	4400 BC domestication of horse (south Russian Steppes) 3600 BC wheeled vehicles (Mesopotamia) 2500 BC 4-wheeled war wagon (Mesopotamia) 1800 BC 2-wheeled chariot	1500 BC warships in Aegean frescoes	7000 BC stone maceheads (Near East)
2500 BC composite bow (Mesopotamia)	1000 BC cavalry (W. Asia)	700 BC development of trireme (E. Mediterranean)	2500 BC bronze spears and daggers (Mesopotamia) 1700 BC bronze body armour (Near East)
800 BC siege catapults (Mesopotamia)	700 BC armoured cavalry (southern Steppes) 600 BC elephant (India)	260 BC quinquireme (E. Mediterranean)	1400 BC heavy bronze slashing swords (Europe and Near East) 1000 BC iron weaponry (Europe and Near East)
400 BC crossbow (China)	AD 350 stirrup (China) AD 700 mediaeval knight with spurs and lance (W. Europe)	AD 800 Viking longships (N. Europe)	250 BC chain mail body armour (Europe)
AD 1150 trebuchet (counterweighted siege catapult) (W. Europe) AD 1161 gunpowder (China) AD 1250 primitive cannon (Mongols)		AD 1350 use of cannon at sea (Europe)	AD 1300 mediaeval plate armour (Europe)
AD 1425 matchlock gun (W. Europe) AD 1500 arquebus (W. Europe)		AD 1501 warships with broadsides (W. Europe) AD 1571 last major galley (oared vessel) action	AD 1663 plug and ring bayonet (W. Europe)
AD 1620 matchlock musket (W. Europe) AD 1810 rifled musket (W. Europe)		AD 1803 first steamship (W. Europe) AD 1827 last fleet action under sail	
AD 1841 explosive shells (W. Europe)		AD 1850 first steam-powered warship	



1 THE HORSE IN WARFARE

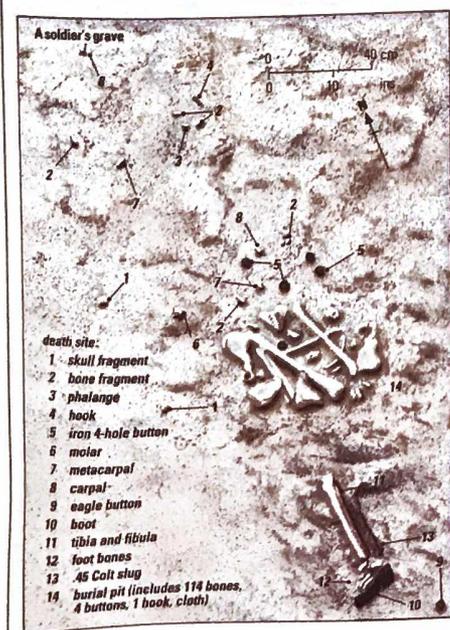
The stirrup was a crucial innovation in mounted warfare, helping the rider to keep his seat. The first evidence of a crude rope stirrup comes from north-west India, but the true stirrup seems to have been a Chinese invention of the 4th century AD. By the 8th century the stirrup was in widespread use from Europe to Japan, and in the 13th century it spread south to the kingdoms of West Africa.

2 THE BATTLE OF THE LITTLE BIGHORN

In June 1876 the US Seventh Cavalry was defeated by a large force of Cheyenne and Sioux Indians on the banks of the Little Bighorn River. The battle lasted less than an hour, and left some 210 men under the command of Lt. Col. Custer dead. Archaeologists have attempted to reconstruct that single hour's action. The soldiers were issued with Springfield carbines and Colt revolvers, and by mapping spent cartridges fired from these weapons it was possible to identify their positions.

By studying the position of cartridges fired from the same weapon it was possible to show the progress of the battle, with the collapse of the various positions, and finally the convergence on Last Stand Hill. Several years after the battle, markers were erected over the graves of the soldiers. Although the bodies had later been exhumed and reburied in a mass grave, it was thought that if a man had ever been buried near one of the markers, small bones, buttons, boot nails and other items might remain. At marker number 128 archaeologists found an articulated lower leg en-

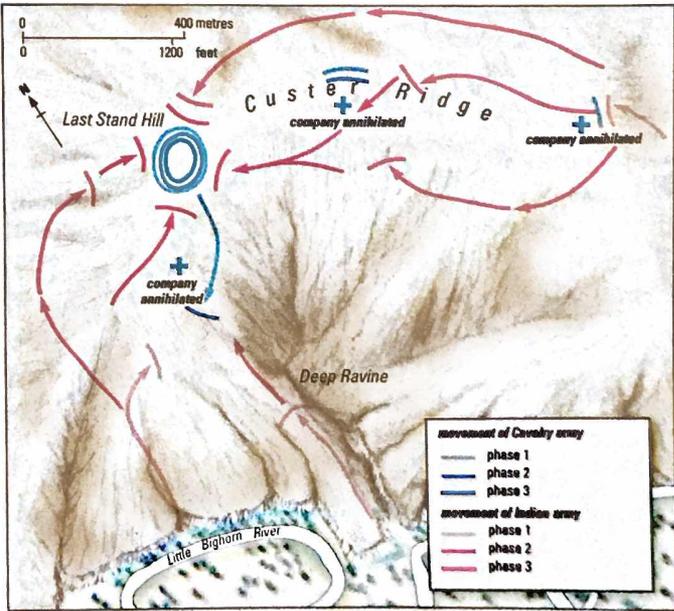
cased in an eroding cavalry boot. A little deeper lay most of the skeleton. The soldier was between 19 and 22 years old, and about 5' 8" tall. He had one wound on each side of his rib cage, and a bullet wedged in his wrist. These wounds may not have been immediately fatal, and it is likely that this soldier had ridden down the ridge, out of the firing line. As he lay in the grass, bleeding badly and dead or dying, the battle line above him was quickly breached and his death was ensured with a swift savage blow from a rifle butt or tomahawk.



Above tibia and fibula with boot in situ from grave (left).



Above (left to right). .50/.70 Indian cartridge case, .45/.55 Indian carbine cartridge, .45/.55 Army cartridge case.



ANALYSIS Valuables

The first creature we regard as truly human, *Homo habilis*, was distinguished from his ancestors by his capacity to create stone tools. Other animals were more agile, fleet of foot or stronger, but it was the tool-making ability that ultimately prevailed. Far from being restricted to utilitarian objects, however, from the earliest times onwards humans have devoted enormous effort and energy to the creation and acquisition of items that have little practical use but are nonetheless highly valued for their cultural, symbolic or religious significance. Such items often play a major part in social organisation by acting as indicators of rank and power, and sometimes

serve as repositories of wealth. These valuables, as they may be termed, form a prominent part of the archaeological record.

Many of the materials considered valuable by ancient and prehistoric communities came to be regarded as precious independently, and at different times, in several parts of the world. Jade is an example, valued in prehistoric Europe, in Central America until the Spanish conquest, and in China and New Zealand up to relatively recent times. Gold, similarly, became highly valued both throughout most of Eurasia and, independently, in parts of Central and South America. This tendency for widely separated communities to attribute value to the same substances clearly demonstrates that all these materials possess special qualities. Among these special qualities

three of the most important are attractiveness, durability and rarity.

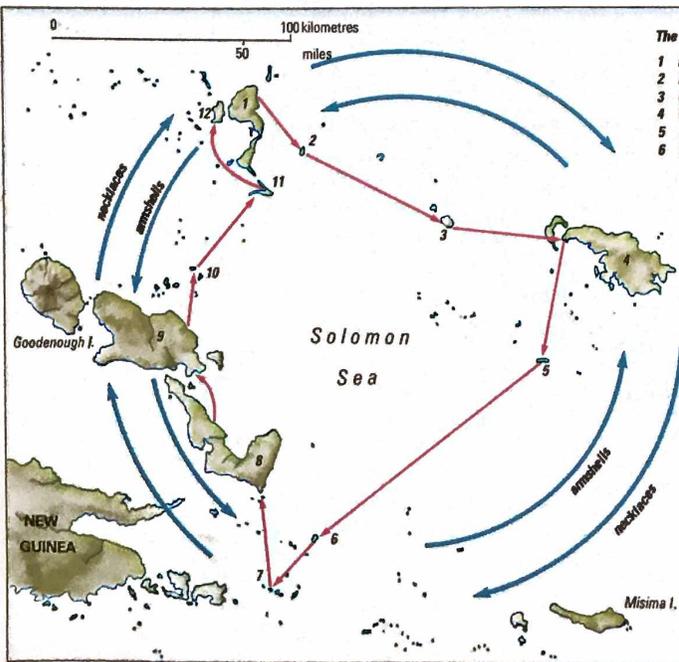
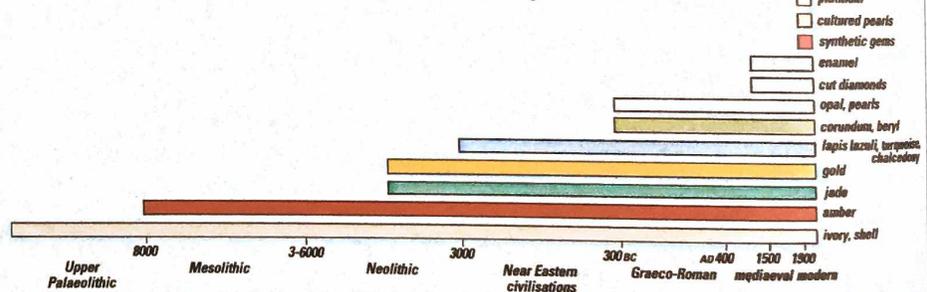
Precious materials are intended to be seen and to impress, and appearance is therefore a prime consideration. Many, such as metals or precious stones, are brightly coloured, translucent or shiny. Durability is also vital, which explains why minerals and metals predominate. The especially high value placed on gold is due to the fact that if it is sufficiently pure in composition it does not tarnish or discolour like other metals. Finally, rarity or limited access is necessary if a material or craft product is to retain its value. For this reason the sources of many valuables are geographically remote and often distant from the places where they are used. Gold, amber, turquoise and jade are all scarce, and the high cost of their

 <p>IVORY</p> <p>Smooth, white variety of dentine from tusks of elephants and walrus. Its porosity makes it suitable for staining and colouring. <i>Venus of Lespugue</i>, c.20,000 BC, height 10-12cm.</p>	 <p>LAPIS LAZULI</p> <p>Brilliant blue variety of the mineral lazurite, used as a gemstone. Very popular for inlay work in Egypt along with other precious stones. <i>Lapis lazuli and gold pectoral from Fiqqah, Egypt</i>, c.1900 BC, height 4.2cm.</p>	 <p>AMBER</p> <p>Translucent rich-golden brown fossil resin derived from extinct coniferous trees. It has a smooth, warm feel and when rubbed has a magnetic quality attracting straw and paper. When ignited, amber burns slowly to give off a pleasant smell.</p> <p><i>Amber bear from Magelse, Denmark</i>, 7th millennium BC, length 7.5cm.</p>	 <p>SHELL</p> <p>Very durable but often brittle substance used for ornaments and currency (cowrie shells); cool and pleasant to handle in delicate creamy colours, shells travel far from original source to become an exotic and valuable commodity.</p> <p><i>Human skull with cowrie shell eyes from Jericho</i>, 7th millennium BC.</p>	 <p>TURQUOISE</p> <p>Exotic mineral mined in Khorasan, Turkmenistan, Sinai, China and Mesoamerica. Its opaque rich, striking sky-blue colour made it as popular as lapis lazuli for Egyptian inlay work.</p> <p><i>Turquoise mask from Mexico</i>, c.15th century AD, height 16.8cm.</p>	 <p>JADE</p> <p>Semi-precious hard translucent stone perhaps most renowned for its beautiful shades of green. Smooth and often highly polished, jade is linked with burials because of its indestructibility. When struck it emits an unusual sound.</p> <p><i>Jade flare from Belize</i>, c.AD 100-300, diameter 17.8cm.</p>
<p>USES</p> <p>Ornaments, vessels, inlay, statuary/figurines, jewellery.</p>	<p>USES</p> <p>Inlay, jewellery.</p>	<p>USES</p> <p>Ritual objects, ornaments.</p>	<p>USES</p> <p>Jewellery, ritual objects, armlets, decoration of clothing.</p>	<p>USES</p> <p>Ritual objects, inlay, jewellery.</p>	<p>USES</p> <p>Axes, jewellery, ritual objects, musical instruments, decoration of clothing, ornaments.</p>

3 PRECIOUS SUBSTANCES

The earliest precious materials were organic: seashells, ivory and bone. The wearing of personal ornaments – necklaces of perforated teeth, and shells sewn on to clothing – began during the Upper Palaeolithic period some 30,000 years ago. In the Neolithic period substances of mineral origin, notably jade and gold, were added to the inventory of valuable materials, and pearls and attractive semi-precious stones such as lapis lazuli and turquoise soon followed. Long-distance trade introduced new precious materials, bringing diamonds and sapphires to the Mediterranean from India and the East in the Hellenistic period. At about the same time the development and spread of coinage marked the start of a new symbolic use of precious metals, although in China and Mesoamerica jade remained the most valued material. Only with the spread of European influence during the last 500 years did gold become the world-wide standard of value.

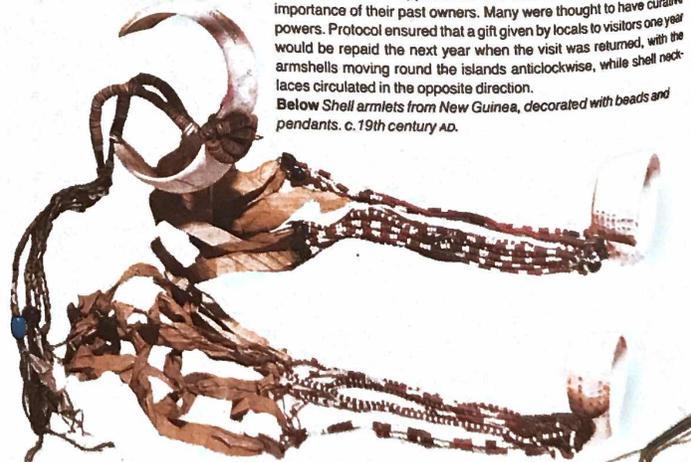
The use of precious substances through time



2 THE KULA NETWORK

Studies of pre-industrial peoples have thrown new light on the ways in which valuable objects are used and exchanged. The Kula is a cycle of gift exchange practised in recent times among a group of small islands off eastern New Guinea. The islanders travelled long distances by canoe to exchange highly valued *mwali*, cut and polished armshells, and *soulava*, necklaces of red spondylus shells, which were given as gifts by the local to the visiting chiefs. The value of the shells depended not only on their appearance but also on their history and the importance of their past owners. Many were thought to have curative powers. Protocol ensured that a gift given by locals to visitors one year would be repaid the next year when the visit was returned, with the armshells moving round the islands anticlockwise, while shell necklaces circulated in the opposite direction.

Below Shell armlets from New Guinea, decorated with beads and pendants, c.19th century AD.



long-distance transport added greatly to their value. In the case of many minerals the expense and labour of mining or extracting the material from the earth had to be added to the cost of transport. It was this high cost, which meant that only the richer and more powerful members of society could acquire these materials, that led to their recognition as symbols of rank and power, a role that many of them have retained down to the present day.

Precious materials were generally worked by skilled craftsmen to produce ornaments or regalia. In the process, the symbolic value of the raw material was sometimes used to convey a message in the object produced. Thus gold in Egypt and jade in China, both materials symbolic of eternity, are especially common in the graves of the rulers, a good example being the gold sarcophagus

and mask from the tomb of Tutankhamun. These two materials were often conspicuous in royal regalia, as in the gold crowns and sceptres of historical Europe and the jade sceptres of ancient China. Precious materials also figured prominently where contact with the supernatural was being made or sought: on the western wall of the Temple of the Sun at Cuzco the Spanish invaders found a huge gold plate engraved with a representation of the Sun god. Gold, lapis lazuli and carnelian were all buried as foundation offerings beneath Mesopotamian temples and gold chalices are still used in Christian churches today. Historical examples lead us naturally to suppose that precious materials had similar roles in prehistoric societies. The finely polished jade axes from Neolithic Europe, for instance, may well have been symbols of

authority. Placed in the graves with the dead, such objects provide an important clue to the social position occupied in life by the deceased.

The increasing use of precious materials since the Upper Palaeolithic period not only reflects the increasingly hierarchical nature of human society, but may actually have helped to bring it about. Striking in appearance and limited in availability, these symbols of wealth and power strengthened the social position of their owners and made their political authority more natural and acceptable. As society became more complex and sophisticated, a continuing search for material symbols of power and privilege ensued. This quest provided a further stimulus to long-distance trade and brought with it advances in both technology and craft skills.

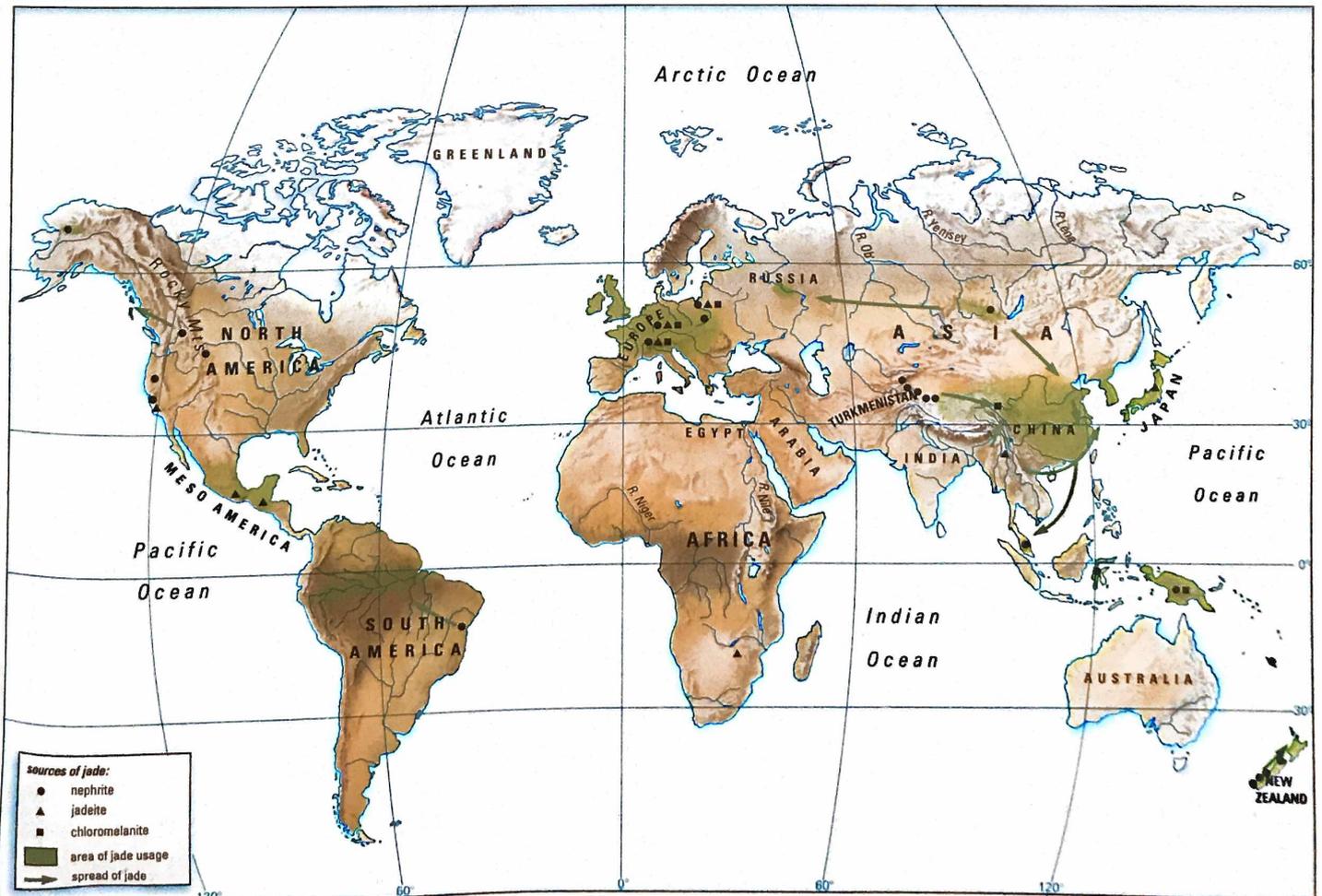


1 THE VALUE OF JADE

Jade was highly prized in widely separated parts of the world in ancient times, notably China, New Zealand, Mesoamerica and Europe. Its smooth texture and translucency when polished have always made it a particularly attractive material. It exists in a variety of forms, the three principal ones being nephrite, jadeite and chloromelanite, and colour varies according to its mineral composition – it can be green, red, blue or black. In China and Europe the earliest jade objects date to about 4000bc. This early date is especially remarkable both because of the hardness of the material, which would have made it exceedingly difficult to work without the benefit of metal tools, and because of its rarity; sources are limited and often lie far from the places where it came to be so important. China, the principal consumer of jade, had no source within its ancient frontiers, and had to import the material from Central Asia, over 3000 kilometres away. The jade used in Aztec Mexico and prehistoric western Europe was also traded over long distances, indicating the value placed on it by these far-flung communities.

Jade had both ritual and symbolic uses, especially in China and Mesoamerica. Caches of jadeite objects, mainly axes but in one case including human figurines, were deposited at the Olmec centre of La Venta in the early 1st millennium bc, and plaques and other jade objects figure prominently among the offerings found in the sacred cenote or water hole at Chichén Itzá (page 48). In China, jade became associated with immortality; in the Han period, royal burial suits were made consisting of over 2000 jade plates joined together by gold, silver or bronze wire.

A Maya jade mask from Central America. c.AD 100-300, height 17.8cm. B Jadeite axe from Sweet Track, Somerset. c.4000 bc, length 20.3cm. C Jade peka peka pendant for ears and neck from Maori New Zealand, width 5.7cm. D Jade water buffalo. c.AD 1280-1640, width 43cm.



sources of jade:
 ● nephrite
 ▲ jadeite
 ■ chloromelanite
 ■ area of jade usage
 → spread of jade

ANALYSIS Ritual

For at least the last 35,000 years, ritual and religion have been a universal feature of human society. Burials from Neanderthal sites in Israel and south-western France take the origins of ritual back to 50,000 BP. It is difficult to say what beliefs were held by these early human communities, though it is thought that some of the scenes from cave art were connected with hunting magic and the fertility of the herds on which these early hunters depended. Even at this relatively remote period people were prepared to devote considerable time and energy to the creation of works of ritual or religious significance. This basic human impulse can be traced throughout the archaeological record down to recent times in temples, tombs and iconography. This record of ritual and religion can be divided into two parts: the remains of the special structures constructed for religious purposes; and the surviving traces of the ritual activities themselves, in the form of offerings, sacrifices and cult objects.

Temples have a prominent place in the archaeology of many parts of the world. One of the earliest and simplest was found at the base of the tell at Jericho. This was a roughly rectangular structure only 3.5 x 6.5 metres in size. Two large stone blocks with holes bored right through them are thought to have held totem poles, and the interior of the structure had been kept scrupulously clean, though the adjacent area was littered with debris. If the interpretation is correct, this modest affair was a spring-side shrine of hunter-gatherer groups who occupied the

region in about 11,000 BP.

The development of agriculture led to the growth of larger settlements with more substantial architecture. Around 3500 BC there is the first evidence of an institutionalised priesthood, and the first monumental temples. In the early cities of Mesopotamia temples on raised platforms dominated the urban skyline, and extensive temple precincts frequently occupied a very large part of the walled area. Monumental religious structures were not restricted to states and empires, however, and some of the most famous examples, such as Stonehenge in southern Britain, were built by non-state societies. The power of religious beliefs and institutions is reflected in the scale and grandeur of these structures: often religious buildings, rather than the palaces of secular rulers, are an ancient society's most impressive remains.

Religion is not restricted to impressive public buildings, and archaeology can throw light on many other types of ritual site. Natural features were often endowed with religious significance by particular communities, and became the focus of elaborate sacrificial rituals. These include sacred pools and lakes, such as the Sacred Cenote or Well of Sacrifice at Chichén Itzá, or Lake Guatavita in Colombia with its rich offerings of gold. Perhaps the most famous examples of this kind of offering are the bog bodies of north-western Europe, the majority of which appear to have been ritually killed before deposition in peat bogs (page 180). Other bog finds include musical instruments, wooden boats, and whole suits of armour taken from defeated enemies and sacrificed to the gods.

Human sacrifice, the ultimate offering to the gods, is

well illustrated by the European bog bodies and by the skeletons from the Sacred Cenote of Chichén Itzá. Frequently, sacrifice played a part in the dedication of buildings, as at Anyang and other important Chinese sites of the Shang period. Sacrifices also often feature in the burials of wealthy or powerful individuals. The tomb of one early ruler in southern Egypt was surrounded by the opposite side of the world, subjects of the Polynesian ruler Roy Mata accompanied their lord to the next world. It is clearest information about the religions of the past.

The use of statues and other pictorial representations can make it possible to identify the type of deity or cult associated with a particular shrine. The iconography of the shrines at Çatal Hüyük, for instance, suggests that there was a fertility cult associated with a female deity, a bull cult with a male deity, and a death cult (page 82). The offerings made at a shrine can also throw light on the nature of the cult. At the Celtic shrine at the Sources de la Seine, a collection of carved wooden votive objects was discovered representing heads, limbs, eyes, internal organs and breasts. The intention was to solicit a cure by offering the deity a replica of the diseased organ or limb.

Without written records, archaeology can never give us the names of the gods and goddesses worshipped by ancient societies, nor the details of their mythology, but it does illustrate the pervasive and powerful influence of religious beliefs throughout human history, and the repeated recourse to supernatural agencies to protect against disease, natural disaster and fear of the unknown.

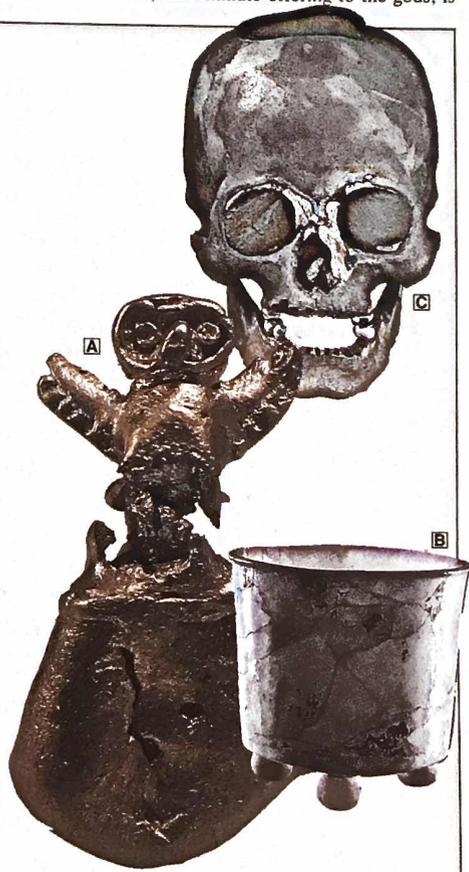
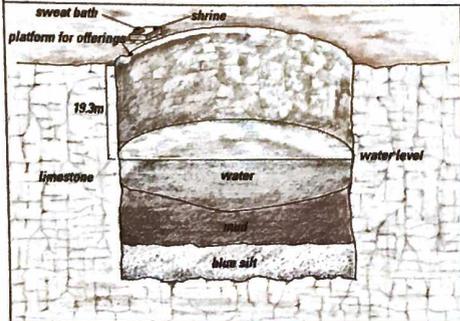
The chronology of the Sacred Cenote ritual at Chichén Itzá

AD	phases of cenote ritual	offerings
1539		Chichén Itzá becomes the focus of a more purely Maya ritual: pilgrimage made from Mayapán (new capital founded in 13th century AD), and there is more concern with deities and ancestors. Objects are poorer and more parochial. Less ritual 'killing' of objects than in earlier phases. Most common: copal and rubber incense (often in tripod bowls), wooden idols, copper bells, cotton textiles, and wooden sceptres associated with lineage rituals. At this time jade was rare and ancient carved jades and jade beads were taken from the tombs and votive caches of the early period (c.3000 BC-AD 800) and deposited in the cenote.
1461	LATE PHASE	
1283	(founding of Mayapán)	
1145		Chichén Itzá apparently abandoned by its elite population in 12th century AD; no offerings for over 100 years.
899	EARLY PHASE II	Items offered are more identifiably Toltec in style, frequently warrior regalia, which reflects the warrior cult of the Toltec people and the Toltec glorification of militarism. Items include: cast gold bells and pendants, sheet gold discs and masks and cast copper bells. Offerings become sparser and less exotic towards the end of this period.
770	EARLY PHASE I	Most objects found in the cenote appear to have been offered at elite ceremonies: valuable imported objects were ritually broken, crushed, melted and burnt before being cast in. The Toltec, central Mexicans who are thought to have been founding a new capital here at this time, consecrated the Sacred Cenote by their offerings, and many objects depict or symbolise their military victories, for example sheet and cast gold alloy figurines, brought back from Central America by warlords. Jade objects carved in Maya style, brought to Chichén Itzá from the Maya area outside Yucatán, were sometimes broken and thrown into the cenote. Domestic jars and basins indicate rain-making ceremonies.

Some human sacrifice also took place: the bones of 42 individuals have been found, more than half of which were younger than 20, and 14 were younger than 12 years old, but we do not know whether this practice was associated with the early or the late period of ritual.

3 THE SACRED CENOTE OF CHICHÉN ITZÁ

Several of the cenote or natural water holes of Yucatán became the subject of a religious cult, the most famous being that at Chichén Itzá. For roughly a thousand years, objects were thrown into its greenish black waters as offerings to the rain god.



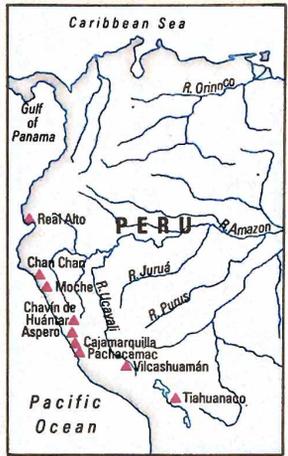
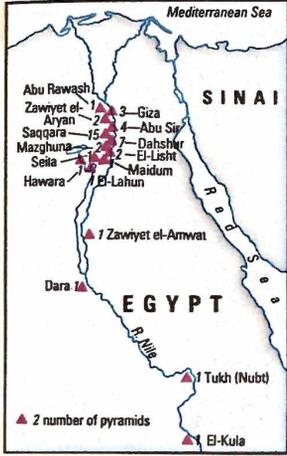
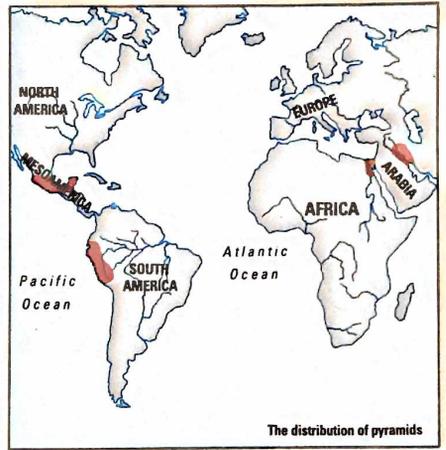
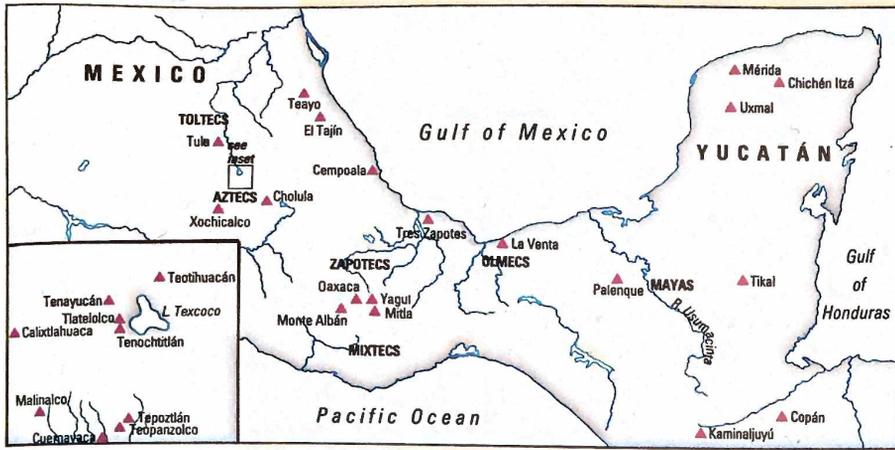
Offerings from the Sacred Cenote A Bell surmounted by owl, from Panama. AD 900-1150, gold, height 4.6 cm. B Tripod vessel of tealal, a translucent stone from Oaxaca, with painted decoration. AD 800-900, height 18.9 cm. C Skull of young man converted into incense burner. AD 1250-1539, height 16 cm.

2 THE BURIAL OF ROY MATA

Oral tradition tells of Roy Mata, a powerful ruler of central Melanesia who was buried with members of his retinue on the small island of Retoka. Excavations at the site have uncovered the graves of over 40 individuals, buried singly and in couples around their master in about the mid-13th century AD. Roy Mata himself was buried in a deeper rectangular pit, with a young woman at his feet, a secondary burial between his legs, his avast or keeper of the peace to his right, and another couple to his left. Many of the retinue buried in the surrounding graves were probably representatives of tribes and clans that owed him allegiance. The dead wore shell beads and perforated animal teeth. The table (right) represents the number and type of artefacts found within individual burials. The men had been heavily drugged before sacrifice. Memorial stones were raised over the most important of the graves, and the whole island was declared tabu.

Ritual: location of important regions

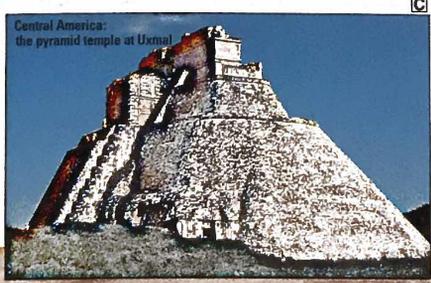
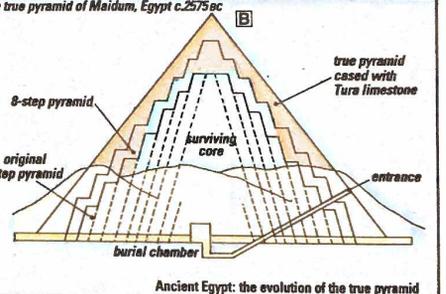
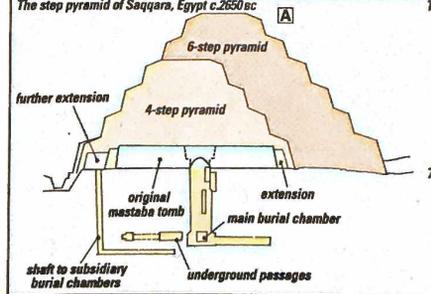




1 PYRAMIDS AND TEMPLE PYRAMIDS

The pyramid form was developed independently in different parts of the world for religious buildings serving two distinct functions. True pyramids, with four smooth sides culminating in a point, are restricted to Egypt, where they replaced an earlier stepped pyramid in about 2600 bc. Egyptian pyramids were closed structures containing the burial chamber of the god-king, but in Mesoamerica, Mesopotamia and Peru monuments of a similar form were built to serve as raised temple platforms. In Mesopotamia and the New World they are stepped or terraced, and are known as ziggurats and temple pyramids respectively. The similarity between the Egyptian, Mesopotamian and American examples is partly coincidental, but nevertheless demonstrates the importance of certain common requirements in the design, function and symbolism of monumental ritual structures. One important consideration was structural stability; the tapering pyramid shape reduced the risk of collapse and at the same time enhanced the impression of height. Height had a strong symbolic significance, raising the religious rituals above the secular events of everyday life and bringing them nearer to the heavens where the gods were thought to reside. The spatial separation between the priests and privileged individuals allowed access to the top of the temple pyramids and the watching populace below emphasised the status of the priesthood. The very size of all these structures is evidence of the great power of the religious establishment, closely associated with that of the state.

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Pyramid construction The first Egyptian pyramid (A) was built at Saqqara in about 2650 bc, and was the result of the progressive heightening and elaboration of a simpler flat-topped tomb. The royal burial chamber was deep within the mass of the pyramid, or cut into the rock beneath it. This evolved eventually into the smooth-sided true pyramid at Maidum (B). Mesoamerican pyramids sometimes also contained burials, but were primarily temple platforms, with a long flight of steep stairs leading to the sanctuary at the summit. The fine Mayan example at Uxmal (C) dates from the Late Classic period (AD 600–900), but has fewer terraces than most. Mesopotamian ziggurats (D) were also usually of terraced construction, as shown below by the reconstruction of the example at Choga Zanbil.

