BLOCK 1: SHIPWRECKS AND ARCHAEOLOGY

1 A ship is a complicated and highly organised entity, representing an integrated combination of resources, technology, and human ingenuity. It reflects in a wide variety of ways the aspirations, economic structures, technical achievements, and organisational abilities of the society which built and used it. A sea-going vessel must possess a structure which provides buoyancy and stability, and is strong enough to withstand the often hostile environment in which it operates. It requires effective means of propulsion, control, and navigation. The purpose for which it was built - whether for fishing, trade, passenger-carrying, war, or even pleasure - will influence how it is designed and equipped. To keep it functioning a wide range of specialist skills, together with the requisite tools, instruments, and materials, must be available on shore and on board. Finally it represents a self-contained human society similar (but not necessarily identical) to its parent culture ashore.

Should it suffer the misfortune of wrecking a ship becomes a time-capsule, or in more scholarly parlance a closed context containing complex integrated assemblages relating both to the vessel itself and to the wider society of which it was a part. But the evidence encountered by archaeologists on the sea bed usually bears little similarity to the ordered entity of the ship before it became a wreck. Complicated and often very violent natural forces - physical, chemical, and biological - will have destroyed, degraded, dispersed, scrambled, and ultimately stabilised the surviving evidence so that, at first sight, little if any of the ship's original order and coherence may be recognised. But the observed remains are not haphazard or meaningless. They are the result of natural processes of change brought about as the anomaly of the ship interacts with the environment into which it has sunk. It is a maritime archaeologist's job to understand these processes so that, in conjunction with the

archaeological remains, s/he can work backwards though the stages of 'wreck formation' and draw informed conclusions about the ship and its contents before it became a wreck.

2: This section looks at aspects of the formation processes which have taken place on a wreck which lies off Duart Point on the Isle of Mull off Western Scotland. The site lies just off the headland on the right, 10-12 metres deep at the base of a rock face which slopes down from the shore. The bottom is composed of shingle, sand, and some intrusive boulders. During the flood tide there is little water movement over the site. Throughout the ebb a strong current flows from west to east, running smoothly across the seaward part of the wreck but forming eddies closer inshore. In stormy weather these currents deposit silt picked up from the wide bay beyond. This combination of water movement and sediment transport has profoundly influenced formation processes associated with the wreck.

3: The wreck was first revealed by the discovery of a number of heavily concreted iron guns scattered across the sea bed. Concretion is a mixture of natural stones, sand, and shells cemented to the surface of the iron by its corrosion products. The process is complex, and influenced by several factors - salinity, temperature, currents, and seabed characteristics. Scientific examination of the concretions has shown that not all the guns have corroded at the same rate or in the same way. Some appear to have been exposed since deposition, while others seem to have undergone periodic episodes of burial and exposure. Observations of this kind help to identify different micro-environments within the site, and lead to a fuller understanding of the formation processes at work.

4: Two distinct mounds of stones - this is one of them - lie on the site. They are not of local origin, and can be identified as ballast once contained within the hull of the wrecked ship.

An investigation into their possible source (or sources) is being conducted through geological analysis.

5: Between the two mounds of ballast the remains of eroded timber structure are visible. This is part of the lower hull. The timbers are probably much better preserved under the ballast stones, where they are protected from abrasion and biological attack. For this reason it has been decided to leave them undisturbed.

6. A closer view of the exposed timbers shows that not long before this photograph was taken they had been buried. Juvenile kelp plants (*Laminariae hyperboriae*) are beginning to colonise their surfaces. But no adult specimens are present, and this suggests that the timbers had been covered in the recent past. However the abraded and biologically degraded nature of the wood indicates that there have been considerable amounts of exposure at earlier periods. The likely explanation is that these remains are sometimes uncovered and sometimes buried. Along with the evidence from the concreted guns, this seems to suggest that from time to time parts of the site alternate between environmental stability and processes of change.

7. This slide shows that as well as cyclical destabilisation on some parts of the site, previously undisturbed features have recently become exposed for the first time. The left-hand side of this carved wooden cherub from the ship's decoration is still buried in silt, preserved (as excavation was to show) in excellent condition. The left cheek is likewise largely pristine, showing that it has only recently been uncovered. Beyond the eyebrows, nose, and mouth, however, the wood is severely infested with barnacles (*Balanus crenatus*) whose density and maturity increase towards the right-hand edge of the wing. The oldest

specimens are not more than six months old, and there is no evidence of earlier infestation. As the top part of the object is 15 cm above its lowest exposed part, these observations show that that the silt level at this point has dropped by 15 cm during the previous six months, and that this is the first time it has done so since the carving was deposited. Also visible is a small stave-built vessel whose upper components have disintegrated as the silt has receded. Between it and the cherub is a human *ulna* (lower arm bone).

8. Apart from the heavily abraded plank at top centre, which is probably part of the outer hull, these timbers are not from the vessel's primary structure but are finely moulded panels from the interior fitting-out of the ship. They too have recently become exposed. Their survival suggests that the inside of the hull quickly filled up with silt brought in by the eddying current and then collapsed downwards, layering the dislocated panelling in a kind of archaeological lasagne. The wood's condition indicates that most of it has been securely buried since deposition, but the plank which extends towards the left shows evidence of previous exposure and reburial. Its upper end is abraded and cracked, while a little lower down there is a clear 'tide mark' of barnacle infestation which reveals the maximum extent of the earlier exposure.

To the right of the scale a human *scapula* (shoulder blade) is trapped between the timbers, while the circular object partly obscured by the end of the central plank is the top of a wooden lantern.

9. This hand-built Hebridean pottery vessel shows evidence of post-depositional movement - indeed it was rescued while 'running away' from the site! A careful assessment of its biological associations explains the mechanics of this process. Most of the surface shows

little indication of barnacle infestation, suggesting that it had been almost wholly buried since deposition. The few animals evident on its lower part were alive when the object was found, and so must have colonised its surface very recently. Only a circular zone around the top of the vessel (as it lay originally on its side in the sand) had been intensively populated by barnacles, showing that this part had been exposed for some time. In the fairly recent past it provided an anchor-point for a kelp plant (*Laminaria hyperborea*), which began growing towards maturity. As it did so, we may infer, the silt level dropped as observed elsewhere on the site. In time this released the pot from its matrix of silt so that, under the influence of its uninvited guest's developing fronds, it began to be dragged away by the current.

10. The investigation of wreck formation processes requires the gathering of many kinds of data. Current speed and direction must be measured (as here); sediment transport and deposition studied; water temperature and salinity recorded; surface conditions and wave action quantified and analysed; sedimentary and solid geology studied. Often the archaeology will provide horizons not otherwise available to scientists which may help to understand and quantify natural processes, as some of the previous examples have demonstrated. Work of this kind can only be done through scholarly collaboration , and requires the integration of many disciplines.

11. Wreck formation inputs have many strands, and often involve complex interactions. This squat lobster (*Galathea squamifera*), for example, does not actually eat the timbers amongst which it has made its burrow. But the wood it has exposed is attractive to other organisms, whose borings degrade and weaken the cellular structure, rendering it vulnerable to further physical abrasion and bacterial attack. Such processes, once begun, are therefore likely to continue and accelerate.

12. The best protection for archaeological remains underwater - especially organic ones - is for them to remain buried, where the lack of oxygen and water movement protects them from biological degradation and mechanical abrasion. Within a relatively short period after the event most wrecks go though a dynamic stage which is often highly destructive, and may disperse and scramble much of what survives. When a wreck reaches a state of balance within the undersea environment, however, what remains tends to become stable and well-protected, and may survive in this condition for centuries or even millennia. But it will always be susceptible to environmental impacts or human intervention. In the case of the Duart Point wreck natural factors - as yet not fully understood - have triggered serious destabilisation in the recent past. This is temporarily being controlled by sandbagging. Following an assessment of threats to the site it has been decided to excavate the most vulnerable areas prior to stabilising the rest.

BLOCK 2: ARCHAEOLOGICAL TECHNIQUES UNDER WATER

13. Archaeology is concerned with investigating the human past from its material remains, and to do this archaeologists study and record the contexts, associations, and relationships of the evidence they find. Only by linking and interrogating data can meaningful questions be posed and addressed. At the core of this process is the identification and recording of archaeological evidence in the field, and whether this is conducted on land or under water the same principles and rigorous standards apply.

Archaeological survey is the process of recording the special relationships of evidence relating to human activity within the natural environment. On a shipwreck these are likely to include seabed topography, visible remains of the vessel, and the distribution of associated

objects. Often a survey will yield the required information without the need for further intervention, and such investigations avoid the responsibilities and potential damage associated with excavation. If excavation is to be carried out it must be preceded by non-intrusive survey, to which new features are added to the record as they are revealed in succession when the upper ones are removed.

On the Duart Point wreck datums have been established at various points on the sea bed, and these provide fixed references for the survey. Triangulation from these points is used to position grids of various sizes built from aluminium scaffold poles, within which detailed recording takes place. The grid in this slide is 3 m square. Data recorded within the grids is then transferred to a master site plan.

14. Within the larger grids 1 m square drawing frames are positioned. These are graduated at 20 cm intervals, strung at top and bottom so that the archaeologist can obtain a vertical viewpoint by lining them up. Features within the drawing frame are recorded on a gridded drawing board at a scale of one-tenth. Waterproof drafting film taped to a plastic board is used, to which the pencil must be securely tied to prevent it floating away! When all the survey data have been consolidated a final plan can be drawn up, as shown in Slide **49**.

15. Photography complements and enhances the drawn survey, but does not replace it. It is particularly useful for recording parts of the ship's structure, which may extend over quite wide areas. This is done by taking a series of vertical photographs using the self-levelling bipod shown here. These are digitised and rectified in a computer before being joined together to form a 'mosaic'. Such composite views of the vessel's remains can never be seen in real life because of the restricted visibility underwater.

16. This 5 m square photomosaic of part of the Duart Point wreck's lower hull is made up of 25 conjoined 1 m squares, rectified to ensure geometrical precision. The triangular targets used to make these adjustments are visible at the corners of each square. The vertical feature left of centre is the ship's much abraded keelson. To its right, close to the top, is part of a transversely set mainmast step, and just beyond it, close to the edge of the mosaic, is the square base of a pump well. Left of the keelson the main framing and planking of the hull's starboard side can be seen: the port side timbers close to the turn of the bilge are visible close to the right of the frame. The light area between the keelson and the timbers on the right is a lining of grey clay, used to prevent the gravel ballast from damaging the timbers (this is where the intrusive pottery was found - see **32**). Ridges and hollows can be discerned in the clay: these were to stop the ballast from shooting sideways in heavy seas.

17. When excavating under water is important to avoid destabilising the seabed by creating unfilled depressions and adjacent mounds of spoil. On environmentally sensitive sites such as Duart Point such changes can trigger erosion elsewhere. The traditional methods of using an air-lift or water dredge to carry sediments away and displace them elsewhere make it difficult to retain the original sea-bed contours, and so at Duart all excavation is done by hand. A transverse trench across the base of the proposed excavation area is opened by gently wafting away the spoil and putting it into sandbags. These are then set to one side, and the excavation is progressed by pulling spoil back into the original trench on an advancing front. Features and objects encountered during this progression are recorded, and their stratigraphic relationships noted. When the advancing trench reaches its destination it is filled with the spoil retained in the sandbags, leaving the seabed configuration unchanged.

Water is an excellent sorting medium, and fanning by hand allows excavation to be carried out with sensitivity and precision. Overburden can quickly be removed by vigorous strokes, while more delicate deposits are dissected with much gentler movements - sometimes no more than a slight waggling of the fingers. Using such techniques an underwater archaeologist can work as carefully as his/her land counterpart does with trowel and fine brush.

18. When features and finds are exposed they are recorded and photographed. Here a small medicine jar has been uncovered, nestled between collapsed interior panelling on the right and the remains of a gun carriage on the left. A tag records the unique find number, and a centimetre scale is provided for reference. Inside the jar were the remnants of its original contents, and these were carefully preserved for analysis and identification.

19. Applying rigorous archaeological standards underwater requires organisation and ingenuity. This archaeologist's tool tray contains sequentially-numbered finds tags backed by lead strips to hold them in place, triangular targets for photomosaic work, weighted shot bags to secure delicate items during excavation, bandages to support fragile finds, and polythene bags to put them in. That ubiquitous tool of all land archaeologists - the builder's pointing-trowel - also finds a place in this underwater archaeologist's kit.

20. The contexts within which finds are made must also be recorded and interpreted. Here an archaeologist is recording the stratification, or sequence of layers, within the remains of a seaman's wooden chest.

21. Bagged finds are raised to the surface, supported by a plastic tray. Specially delicate or large items may require special containers or pallets, and these often have to be designed and fabricated on the spot. Once on shore the finds are unpacked for recording and first-aid conservation before being packed wet for transport to the laboratory. The position and description of each find is entered within the framework of a computer data-base.

22. Unless they are too fragile for handling, finds are measured and drawn while still wet. With delicate organic items this work demands care and ingenuity. It is important that each object's attributes are carefully recorded as soon as possible after recovery, so that any subsequent changes can be identified and monitored.

23. Photography is another valuable part of the recording process. By taking pictures under controlled conditions with artificial lighting subtle attributes can be identified and recorded. A translucent sheet isolates the subject from its background. As well as the formal record photographs, more general 'pictorial' images are taken for publicity and popular publication.

24. Finds are stored wet in polythene-lined tanks before being taken to the conservation laboratories at the National Museums of Scotland in Edinburgh. There they undergo conservation procedures which may last for several years before being put on display or stored for scholarly access. Even then they will require constant supervision and monitoring. Any excavation demands expert and often expensive conservation back-up and wreck projects, with their large and often exotic collections of water-damaged finds, usually require more than most. For this reason, and others, underwater excavations should not be lightly undertaken.

BLOCK 3. ARTEFACT ANALYSIS - THE WRECK'S DATE AND PROVENANCE

25. Because a wreck occurs at a single moment in time, and represents a self-contained 'capsule' of human enterprise, it is reasonable to assume that everything connected with it was in current use when the event took place. If finds associated with the wreck can be dated that will help to determine when the wreck took place; conversely, once the date of the wreck is known all the other finds will be dated by association. Likewise, if the places where particular objects were made can be determined this may provide clues as to the nationality and origin of the ship. This section explains how the date and origins of the Duart Point wreck were determined by an assessment of the archaeological evidence.

Coins display evidence of their nationality, and usually carry dates. However the nationality of a coin does not necessarily indicate the nationality of the ship that carried it. Past coinage, the value of which was based on the metal it contained rather than on bankers' guarantees, was widely interchanged. Neither does the date on a coin indicate the date of the wreck: all it confirms is that the event could not have taken place before that date. Evidence of this kind is referred to as *terminus post quem* (TPQ) - 'time after which'. A large group of coins is better than a single one, because if they show a wide range of dates the latest one is likely to be fairly close to the date of deposition. Levels of wear may also indicate whether or not a coin has been in circulation for some time, although this is not always a reliable indicator: coins may, especially if of high denomination, have been hoarded and rarely handled for many years.

Several hundred silver coins have been recovered from the Duart Point wreck, mostly in corroded clumps such as this one. These were evidently contained in cloth bags, of which

imprints of the weave can be seen on parts of the concretion. Conditions on this site, perhaps as a consequence of the high concentrations of organic material, are not well suited to the preservation of silver. It would be possible to dissect the concretions and perhaps identify most of the coins, but it has been decided that for museum purposes it is best to conserve the clumps as single objects, as here. Archaeological and display requirements do not always coincide. The few identifiable coins within the clumps are English, and range from the last quarter of the 16th century to 1606. This prompted an initial suggestion that the wreck had taken place quite early in the 17th century.

26. That this was not the case is revealed by a later find. This coin is a silver half-crown of Charles I, minted at Exeter during the Civil War. The king could no longer produce coins in London because it was in Parliament's hands, so this example is an unusual (and rather low-quality) wartime production. Though it does not carry a date it is known that this coinage was struck in 1645/6. However the coin is quite badly worn, so the actual date of the wreck could be quite considerably later.

27. These coins suggest, though they do not prove, that the Duart Point wreck is English. Better evidence comes from this lead merchant's weight, which is one of three recovered from the site. They show values of half a pound, one pound, and four pounds, and are evidently part of a set. This is the four pound example, and its weight conforms with - to four places of decimals - the English pound of 453.6 grams.

28. The weights' English origin is explicitly confirmed by marks stamped on their surfaces. All three have identical markings: a crowned letter 'C' which denotes Charles I, under whose authority the value of the weights are guaranteed; a sword which symbolises the City of

London; and the figure of the Archangel Michael holding a set of scales - the seal of the Worshipful Company of Plumbers, who were responsible under the Crown and the City for ensuring that the weights were accurately calibrated.

Weighing and measuring rations to the correct national standards was a routine and highly regulated part of shipboard life, so these three weights strongly suggest that the Duart Point wreck was English.

29. Pottery provides evidence of a rather different kind. It is usually possible to determine where a pot was made by analysing the source of clay, techniques of manufacture and decoration, and other identifying features. Although pottery is almost never dated like a coin (though rare instances are known) its styles changed with usage and fashion through time, allowing broadly-dated 'typologies' to be built up. By comparing a find with the appropriate typology an indication of date can be established, though the process is rarely precise and may sometimes be misleading.

The pottery recovered from the Duart Point wreck, though of considerable interest, has not been helpful in refining the ship's date. This stoneware jar, with its characteristic speckled salt glaze and scowling face mask, was made at Frechen near Cologne in the Rhineland. It is one of several recovered from the wreck. These were mass-produced in huge numbers and distributed widely throughout Europe, usually as containers for spirits. So although we know exactly where it came from this jar gives no indication as to the origin of the ship. Neither is it of much help for dating. The shape of these vessels changed little over much of the 17th century, while the impressed masks and decorative medallions were made with moulds which were often in use for several decades.

30. This small tin-glazed earthenware pot still has its contents in place - in this instance apparently some kind of paste or ointment. Drug pots like this were very common throughout Europe during the 16th and 17th centuries, and virtually identical forms were made in Holland, England, Spain, and Italy. Apart from its intrinsic interest, therefore, it is of little value in dating the wreck or determining where it came from.

31. This pot is impossible to date closely but easy to identify. It is traditional hand-built ware (*crogain*) from the western part of Scotland, made of local clay baked over a bonfire. Such pottery was common in the region from late prehistory to the early 20th century (see also Slide **9**). Though we already know that the ship must have had some kind of association with the area in order to be lost there, it is worth reflecting that had the wreck occurred somewhere else this item would have indicated a probable link with western Scotland at some time during the vessel's history.

32. These potsherds were all found at the very bottom of the hull, amongst the shingle ballast laid on the lower timbers atop a ridged clay lining (see Slide **16**). Had their context not been carefully recorded this evidence might have been highly misleading. The three sherds on the left come from Spanish olive jars, and were made in or near Seville during the late 16th or 17th centuries. The remaining four sherds in the top row are probably English, and of late medieval date, while those lower down may be of Spanish and French origin. None of these pottery types have been identified elsewhere on the wreck, and it should be noted that the broken edges of most of them are rounded by wear. These observations, and their association with the ballast gravel, suggests that they had not come aboard as complete pots but as discarded sherds among the ballast. Ships regularly dumped and took on ballast at

recognised ‘banks’ in the vicinity of ports, and these sherds probably originated from ships belonging to other countries and earlier periods.

33. Although pottery has been of relatively little value in dating or provenencing the Duart Point wreck, another ceramic form - clay tobacco pipes - has provided more helpful information. Like pottery the form of these varied according to where they were made and changing fashions through time. Some bear stamps which indicate their origins and makers. Like pottery, clay pipes have been grouped and dated by archaeologists in typological series, and because they were easily broken they were usually discarded soon after they had been acquired. They can therefore be good chronological indicators of the contexts in which they are found.

34. The pipes found in association with the Duart Point shipwreck fit typologically into the period 1640-1660. Most show characteristics which suggest that they were made in the vicinity of Newcastle. The four examples at the bottom all have impressed heel marks with the letters ‘NW’ set in a heart.

35. These are undoubtedly the initials of the maker, and although his name is not known almost all the pipes which bear this mark have been found in and around Newcastle. A particularly important group was discovered sealed in a pit which archaeological and historical evidence suggests was dug when the city was defended against the Scots in 1644. NW pipes therefore appear to have been current around Newcastle during and shortly after the Civil War.

36. A very few NW-stamped pipes are known outside the Newcastle area. Six occur in Scotland - one at St Andrews, one at Kirkwall, and four on the Duart Point wreck. A seventh has been found in Belfast. This somewhat peculiar distribution is best explained by the activities of Cromwellian armies in Scotland and Ireland during the early 1650s. Their main supply base was Newcastle, and this map shows the distribution of their Scottish garrisons in 1654. It seems that there is a clear association between the distribution of NW pipes and the activities of Cromwell's forces. The Duart Point shipwreck may therefore be connected with this period and these events.

BLOCK 4. HISTORICAL RESEARCH - IDENTIFYING THE SHIP

37. The latest closely datable item from the wreck is the Charles I half-crown of 1645/6, while the three lead merchant's weights of the same monarch strongly indicate that the ship was English. Evidence from the pottery is less conclusive. The bulk of it suggests an imprecise date in the seventeenth century and gives no indication of the ship's possible origins, while the small group found among the ballast might have been seriously misleading had its archaeological context and associations not been properly interpreted. Much the best evidence of date and origin comes from the clay pipes, which originate from Newcastle and belong typologically to the period 1640-1660. Distribution of the NW maker's mark suggests an association with Cromwellian operations in Scotland and Ireland, which took place in the early 1650s.

The archaeological evidence therefore suggests that a historical context for the wreck is most likely to be found in the naval activities of Cromwerllian forces on the west of Scotland shortly after 1650. Archival research could then be focussed on this period and location.

38. Only one episode which fits the archaeological criteria can be found in the documentary sources. It concerns the fate of a small task-force sent to quell a royalist revolt led by the earl of Glencairn, in which the Macleans of Duart participated. In September 1653 six ships entered the Sound of Mull intent on capturing Duart Castle and crushing the revolt. They brought with them 1000 troops and siege artillery, and were commanded by Colonel Ralph Cobbett, a hard-line officer of the New Model Army. When they arrived at Duart they found the castle abandoned, and were able to land most of their men and supplies without opposition. Then a storm struck the anchored fleet. A contemporary account describes what happened next:

"… the 13th instant there hapned a most violent storme, which continued for 16 or 18 houres together, in which wee lost a small man of Warre called the *Swan* that came from Aire, the *Martha and Margarett* of Ipswich, wherein was all our remayning stores of ammunition and provision, only the great Guns and Morterpeeces were saved. But that which was most sad was the loss of the *Speedwell* of Lyn, where all the men that were in her, being 23 seamen and souldiers (except one) were drowned. The rest of the Men of Warre and others of the fleete were forced to cutt their masts by the board, and yet hardly escaped: wee lost alsoe 2 of our shallops; and all this in the sight of our Men att land, who saw their friends drowning, and heard them crying for helpe, but could not save them".

39. The matching of archaeological and historical evidence leaves little doubt that the wreck off Duart Point is one of these three Cromwellian ships. But which one? The contemporary account of the wrecking makes it clear that two of the vessels were merchant ships from East Anglia, while the third was a small warship called the *Swan*. Further historical research

revealed that a small vessel of this name had been built for Charles I in 1641. During the first part of the Civil War she had fought for the Royalist cause, mainly in the Irish Sea and its approaches, but in 1645 she had been captured by the Parliamentarians. Eight years later she was apparently based at Ayr on the west coast of Scotland.

Among the finds recovered when the wreck was exposed by erosion, and during later excavations, were a number of wooden carvings. This cherub is one of them. Such decoration would have been out of place on a workaday merchantman, but well suited to a royal warship, particularly one belonging to Charles I. Like other European monarchs of the time Charles firmly believed in the divine right of kings, and used his ships to project an image of authority, prestige, and power. Much of this was achieved by the elaborate imagery with which their hulls were decorated.

40. Another piece of carving shows a helmeted warrior in classical style. Seventeenth century monarchs frequently used such images to underpin their belief - real or imagined - that they emulated the immense power and dignity of Roman emperors.

41. Allusion was also made to classical gods and goddesses, symbolising the king's perceived virtues. This carving depicts Hope, with her attributes of a rose, a crow, an anchor, and trees. Similar carvings graced Charles I's much larger warship *Sovereign of the Seas*, launched in 1637. Pictures and descriptions of the *Sovereign's* decorations survive. They range from a figurehead showing the mythical English King Edgar on horseback trampling down seven kings to a gigantic depiction of Victory on the stern.

42. Other carvings from the Duart wreck appear to symbolise the countries over which Charles I claimed dominion. This is the harp of Ireland.

43. And this is the Scottish thistle.

44. A royal warship would undoubtedly have carried the king's coat-of-arms prominently on the stern, but no traces of this have yet been found on the Duart wreck. However the carving at the top shows part of the badge belonging to the heir to the English throne - a coronet and ostrich feathers with the familiar motto 'Ich Dien'. This would have probably been placed beneath the royal arms, emphasising the continuity of the royal succession.

45. Together these carvings indicate that they were once part of a royal warship, and prove beyond reasonable doubt that the shipwreck off Duart Point is that of the *Swan*.

46. Further evidence of the ship's high status comes from the area of its stern, where the woodwork of the captain's ornately fitted out cabin has collapsed into a well-preserved but chaotic jumble of its component parts. This is the framed and panelled door of a small cupboard…

47. …while this is a full-sized door, complete with its lock. It was perhaps the main door into the cabin.

48. The cabin's opulent appearance was enhanced with decorative embellishments, including these turned pieces which were glued to the panelling to give a solid three-dimensional effect. Like the carvings, this internal finery emphasised the dignity and status of the king, his ship,

and her captain, but it also added weight above the waterline which would - to some extent at least - have compromised the stability and performance of the vessel. The lining of the cabin with wooden panelling may have had further negative effects. According to a contemporary critic, such unnecessary luxuries reduced the flexibility of the hull and harboured rats.

BLOCK 5: THE SHIP AND ITS EQUIPMENT

49. The archaeological plan of a wreck site will often allow the apparently disparate remains on the sea bed to be analysed and interpreted in such a way as to help reconstruct the ship of which they were once a part. On the *Swan* wreck the most obvious features are the heavy guns and anchor which fell from the upper decks when the ship broke up. Also visible are two mounds of stone ballast which were loaded into the forward and aft ends of the holds, and which now pin down and protect the lower hull. Between the mounds the ship's frames, keelson, mast step and pump well can be identified. Beyond the edge of the left-hand ballast mound part of the forward structure has been exposed. Towards the right lies the collapsed stern.

50. A closer view of the stern area shows how the cabin's structure, complete with its elaborate panelling and doors, has collapsed in on itself, probably under the weight of the silt which accumulated inside. Amongst this jumble were numerous finds, including a sword, carvings, navigational equipment, a small iron gun complete with its carriage and port lid, and domestic objects including a pewter plate, wooden utensils, rope, and pieces of clothing and footwear. Scattered among the deposit were many human bones, apparently belonging to a single individual who may have been trapped inside the cabin when the ship sank.

We know relatively little about the *Swan* from documentary sources. She was built for Charles I in 1641 as a *pinnace* - that is, a fast, light, and flexible ship modelled on the privateers which were wreaking havoc off England's coasts. At around 200 tons she carried some 20 guns and 40 crewmen. By employing a ship of this design, it was hoped, piracy could be countered in the king's seas. However the archaeological evidence suggests that the hull was more strongly built than necessary. While this would have extended the life of the ship, and made her more able to endure heavy seas, it would have reduced her ability to out-sail the pirates she was designed to catch. These problems would have been exacerbated by the top-heavy extra weight of the decorative carving, and the stiffening effect of the interior lining of the stern cabin. The king's prestige and the comfort of his captains evidently out-weighed operational efficiency on Charles I's ships.

52. Beyond the after part of the wreck lay this wooden mariner's compass. It is upside down and virtually intact, although its bottom has been pushed in by water pressure as the ship sank. Traces of cloth can be seen sticking to the base.

53. When the compass was recovered the remains of its glass face lay where it had broken on striking the sea bed.

54. The compass bowl after recovery. Its brass gimbal rings, on which it was pivoted so that it remained level as the ship pitched and rolled, are still in place. No trace was found of the magnetic needle and card on which the points of the compass would have been marked.

55. This wooden structure is the back of the ship's binnacle - a wooden box in which the compasses were housed. The pieces are fastened with hardwood pegs, since iron nails would

have attracted the compass needles. Ships normally carried two compasses, one in a compartment at each end of the binnacle. The remains of the dividing panels which formed these compartments can be seen. This arrangement was because the ship was steered by a whipstaff - a long lever attached to the head of the tiller which the steersman had to move from one side of the deck to the other. He could therefore view a compass from whichever side of the binnacle he happened to be standing. A third compartment between the two compasses contained a candle or lantern to illuminate them at night.

On one occasion an inattentive steersman aboard the *Swan* had evidently allowed the illuminating flame to burn its way through the top of the binnacle. The charred hole can be made out above the central compartment. It has been rather crudely repaired with a wooden patch, secured - most inappropriately - with iron nails.

55. Brass navigator's dividers. They are of the traditional bowed-head design, which allowed them to be opened or closed with one hand.

56. A wooden block, complete with its sheave or pulley wheel. A ship would possess many hundreds of simple mechanical devices such as this, which allowed human muscle power to be translated into the forces which set and trimmed the sails, tensioned the rigging, steered the ship, raised the anchor, and worked the guns.

57. A wooden sheave and two wooden pins for securing similar sheaves in their blocks (neither is the right size to fit the sheave illustrated). The two pins show evidence of asymmetric wear, which means they would not have run true in their blocks, increasing friction and reducing efficiency. Observations of this kind help to assess a ship's level of

serviceability and efficiency - in the *Swan's* case these seem to have been rather poor, no doubt she was a relatively old ship which had seen much service and relatively little maintenance. These factors may conceivably have contributed to her wrecking.

58. Rope was another commodity used in great quantities by a ship. In the seventeenth century it was almost exclusively made from hemp fibres, as these examples from the *Swan* testify. These relatively light 3-strand ropes have been 'parcelled' - that is, wrapped around with thinner twine.

59. We have no record of how many guns the *Swan* carried, but as a 200-ton pinnace it is not likely to have been more than around 20. Only eight guns have been recorded on the site, so more may be buried while others might have been salvaged at the time of wrecking. The largest seem to be 6-pounders. This slide shows a wooden guncarriage for a small *Drake* - a short, light type of gun with a tapered chamber to reduce pressure at the breech. Drakes were developed in the 1620s and '30s to increase the firepower of ships by reducing gun weight. Because of their lightness such guns had a particularly violent recoil, which was absorbed by fitting the rear of the carriages with solid chocks rather than wheels, as on this one.

60. Next to the carriage was the gun itself - a 3-pounder about 4 feet long, weighing around 300 pounds. It is shown here being raised with lifting bags prior to transport to the laboratory for the removal of concretion and conservation.

BLOCK 6: SHIPBOARD LIFE

61. Close to the forward part of the wreck the collapsed remains of the galley were identified. They included this cauldron, riveted together from sheets of copper, which has a

capacity of 50 litres (about 88 pints). This would have allowed sufficient soup or stew to be prepared for the ship's normal complement of about 40 men.

62. The galley would have been situated immediately beneath the forecastle deck. Its floor and firebox was built of brick, of which these are examples. Fragments of tiles have also been found: these would have lined the small cubicle within which the galley was housed to make it fireproof. Fire was an ever-present hazard aboard a wooden ship, and smoking - a habit we would not associate today with the preparation of food - was only allowed in this area.

63. Coal was evidently used as cooking fuel, as these specimens indicate. Peat has also been found on the wreck, suggesting that the ship may have been provisioned locally.

64. Among the ship's timbers brushwood and even leaves have been found. These would have been used for packing and securing the barrels and other containers for provisions in the hold. As the food was used the packing would have become available for fuel. These examples include birch twigs and an oak leaf.

65. These animals bones were recovered from inside the ship's hold, among the ballast. Many show evidence of butchering. They include many pig and cattle bones, and these may have been from salted meat packed in cask. However there are also bones of other animals, including birds and fish, which may perhaps have been obtained locally. A full study of these remains will be carried out when the excavation is complete.

66. Wet environments often preserve fragile organic material, reminding us that in the past most everyday artefacts were made of wood, leather, bone, or fibre. On terrestrial sites most organics decay, leaving only durable material such as pottery, stone, or metal. This lack may give a skewed impression of the nature of a society's material culture. A shipwreck can help to correct this skew by providing examples of common utensils made of organic materials, like this turned wooden bowl from the *Swan*.

67. A wooden spoon from the *Swan* reinforces the message.

68. Many wooden items were made up of staves, like barrels. Shown here during excavation are the disintegrated but complete remains of a small wooden tankard.

69. The pieces of the tankard, disassembled for conservation. Its capacity can be calculated as 285 millilitres, or half an English pint, suggesting that it is a standard tankard for a moderate English beer drinker.

70. This turned wooden object, photographed *in situ,* is the top of a wooden lantern. It lies upside down: the central hole was the chimney set above the candle flame. The smaller holes around the rim - five in all - were for upright slats rising from a base on which the candle was placed.

71. Two wooden lantern tops after recovery and (right) an upright associated with this type of lantern. The edges of the upright are grooved for the thin sheets of translucent horn through which the light of the candle inside shone. Commonplace domestic items such as this are now extremely rare, for they were invariably thrown away as worthless when worn

out or broken, while their organic nature militated against survival in most archaeological contexts. Only in waterlogged environments are they likely to survive, and they are often found on shipwrecks.

72. A contemporary woodcut shows a wooden lantern similar to the ones identified on the *Swan*.

BLOCK 7: SOLDIERS AND SAILORS

73. When she was lost the *Swan* was part of a military invasion force, so not surprisingly the wreck contained evidence of weapons and equipment used by the soldiers on board. This is the lock-plate of a snaphaunce pistol, a forerunner of the flintlock. Pistols of this kind were made in matching pairs, and this one comes from a left-handed weapon. Its ornate character and decoration suggests that it did not belong to an ordinary soldier but to someone of relatively high status, perhaps an officer. The design is Scottish, and the piece is marked with the initials 'G T' - perhaps the mark of George Thompson, an Edinburgh gunsmith who flourished around the middle of the seventeenth century.

74. A number of lead bullets have been found on the wreck. Their size is consistent at around 19 mm (0.75 inch) in diameter. Each weighs just under 38 grams (one and one third of an ounce). Twelve such balls make up an English pound, indicating that they were for weapons of 12-bore calibre. This was the size of the musket issued to New Model Army infantrymen, and these finds indicate that their weapons, in calibre at least, were reasonably well standardised.

The ball close to the upper left clearly shows the mould-flash of the scissors-mould in which it was cast, while clipped-off mould spigots can clearly be seen on those at the lower left and right.

75. These lidded wooden powder flasks each held a measured charge (about an ounce) for one musket shot. A set of twelve was generally hung on a bandolier across the musketeer's chest, giving rise to the nickname "Twelve Apostles". These three examples show differences in form and capacity, suggesting that the standardisation evident in musket ball sizes did not yet extend to the design of the apostles.

76. This concreted lump suggests the shape of a sword hilt. Ferrous materials corrode rapidly in sea water, forming an adhesive coating which attracts sand, shells, and other material to form a thick concretion. Sometimes the non-ferrous parts of an object, or other adjacent artefacts, become encapsulated in the concretion, which may also retain within it a hollow cast of the original iron object.

77. Dissection of the concretion in the laboratory - a process which often involves radiography - may reveal information about the form of the 'vanished' iron object from the negative impression left behind. Non-ferrous components, like this gold- and silver-wound hilt from the sword seen in the previous slide, are often preserved in excellent condition.

78. A ship's community lived in a very crowded environment. High levels of organisation and discipline were necessary to ensure the proper management of working routines, not to mention health and tolerable living conditions. Each man had a chest in which to keep his

personal possessions and, sometimes, the tools and equipment of his trade. Here a diving archaeologist carefully excavates the remains of a seaman's chest on the *Swan*.

79. In this instance the chest was empty, although it provided a stratified record of the silting which had taken place at this part of the site. Visible in the slide is a slot for a dividing partition. Similar chests have been recovered from the *Mary Rose* (1545) and *Kronan* (1676) wreck sites.

80. Textiles sometimes survive on wreck sites, though usually in extremely fragile condition. This example from the *Swan* is currently undergoing conservation. Textiles, including some complete garments, have been found on the *Mary Rose* and *Kronen*, as well as on the wreck of the Spanish Armada ship *La Trinidad Valencera* (1588).

81. Human remains are found on wreck sites less often than might be supposed, for even if the loss of life was high most of those who perished would have been on the upper decks attempting to escape when the ship went down, and would probably have floated clear. Only those trapped below, perhaps when a ship capsized like the *Mary Rose* or *Kronan*, are likely to enter the archaeological record. On the *Swan* the bones of a single individual have been found, disarticulated and scattered among the collapsed stern. This slide shows part of the pelvis.

As in any archaeological investigation human remains are treated with sensitivity and, after careful scientific examination, respectfully laid to rest.

82. Two human vertebrae are visible contained inside this leather shoe. This unlikely association shows how items may be redistributed during the wrecking process and its aftermath. Most probably the bones were brought here by crabs or other scavenging animals, which were no doubt responsible for the disarticulation and scattering of these remains.

83. Examination by a forensic anthropologist is building up a detailed picture of this anonymous member of the *Swan's* crew. The remains are those of a male aged between 23 and 25. He had suffered from severe rickets in childhood which left his legs badly bowed, and in consequence probably stood no more than 5'3" or 5'4" tall. However his upper body was exceptionally well developed. Muscular development of the arms and shoulders is usually unbalanced, for most activities which lead to such development normally involve a 'master' side - the serving arm of a tennis player, for example, which becomes much stronger and thicker than its less active partner. The *Swan* crewman's massive shoulders, arms, and wrists were developed equally on either side, suggesting that he had spent much of his life using these muscles in balanced conjunction with his whole body weight. Activities such as heaving on ropes or straining at a capstan bar would have demanded exactly such physical inputs. We can be confident, therefore, that the remains are those of a sailor.

Further physical evidence supports this conclusion. Sailors who work on square-riggers spend much of their time aloft. When they descend they slide adroitly down the shrouds, twisting inboard at the bottom to drop the last few feet to the deck.. Our sailor's hip joints show clear indications of repetitive activity injury, such as might have been caused by jumping regularly on to a solid surface from a height or around six feet.

84. Shipwreck archaeology is not about finding sunken treasure. Neither is it merely about recovering objects, interesting and evocative though many of these may be. It is about reconstructing seafaring peoples of the past through their ships, their equipment, and their possessions. By carefully recording, analysing, and interpreting such evidence we can begin to see the world as they saw it, unclouded by modern prejudice and preconception. Underwater archaeology allows us to enter these past worlds through the time capsules we call shipwrecks. A very few are almost intact, like the *Vasa* which capsized and sank on her maiden voyage in Stockholm Harbour in 1628, to be raised and magnificently preserved in the twentieth century. But most are like the *Swan*, reduced and scattered by nature and finally encapsulated and protected within their underwater environments. They are a precious and irreplaceable part of our heritage, and only through archaeology can their secrets be unlocked.