

BRONZE WOOD

At over 3,000 years old, the Bronze Age boat discovered during construction work on the A20 near Dover is one of the oldest boats in the world. The boat's construction methods prove that ancient boatbuilders were far more sophisticated than has ever been imagined.

Robert Holtzman visited the site

When the remains of an ancient plank-built boat were dug up at Dover in September (see "Tell Tales", CB 53, Nov '92), archaeologists were initially excited at the thought that it might be as old as the Bronze Age boat known as Ferriby 1. Dated at about 1300BC, Ferriby 1 was then the oldest plank-built boat outside Egypt. The location of the new find also offered an insight into Bronze Age trading patterns; the Ferriby boat was probably a river ferry, the Dover boat may have been a coaster or even a cross-Channel freighter. Here at last was a plausible explanation of how Continental trade goods and technology reached Britain in the Bronze Age.

Although it is barely out of the ground and still awaits years of preservation work and study, the Dover boat is already revealing much more information than the archaeologists ever dared hope for. The Dover boat represents an emerging concept of boat design, one that was struggling to move beyond the technology of the dugout canoe, but had not yet arrived at the skin-and-skeleton concept of the plank boat as we know it.

As the most complete Bronze Age wooden artefact ever found in Northern Europe, the Dover boat has given us startling evidence of the skill of Bronze Age boatbuilder. Working with small bronze hatchets as their most sophisticated tool, these ancient carpenters produced work that rivals the quality of today's well-equipped craftsmen.

Almost any sizable excavation in Dover



Deep in the caisson-protected hole, archaeologists used video cameras, sketches and measurements to record what will be completely lost after the road is completed. The watersoaked ground was the boat's salvation, the anaerobic environment preserving the wood.

is likely to unearth something from the city's past. The A20 roadwork had already uncovered the remains of a medieval city wall and, below that, a Roman quay. Members of the Canterbury Archaeological Trust were at the site when the first pieces of timber from the boat were dug up, and their significance was immediately recognized. The National Maritime Museum, English Heritage, and the Ancient Monuments Laboratory were quickly called in to help.

The Department of Transport originally consented to a mere 24 hours delay in con-

struction, but as more of the boat was uncovered and archaeologists pressed the find's importance, three days were granted. Working within the confines of a 20-foot (6m) square coffer-dam, conservators decided the only way to save the boat was to cut it into pieces and lift them out separately. "There's a part of me that doesn't want to do it," said Colin Slack of the Ancient Monuments Laboratory. "But it's better to cut it where we can choose the cuts, than to try to lift it out whole and have it break along its natural joints. This way, we lose minimal information."

After every detail was scrupulously recorded, the boat was cut up with a diamond-toothed circular saw. The sections were swathed in bubble-wrap, and liquid polyurethane foam was poured over and around them. The foam expanded and hardened, giving support to the wood which, in spite of its sound appearance, was so degraded that one could literally have grabbed chunks out of it. Planks and steel pipes were driven through the mud beneath the boat sections; platforms were lifted with a crane. Then the plastic was stripped off and the sections submerged in tanks of water.

The cell walls of the wood were broken from millennia of constant immersion in fresh water. It was only the water itself that continued to support the fragile tissue of cellulose, and this could not be allowed to drain out. With the artefact now safe in the holding tanks, Slack and another conservator are studying how best to stabilize the structure.

During this stage of the excavation, archaeologists noted mainly the similari-

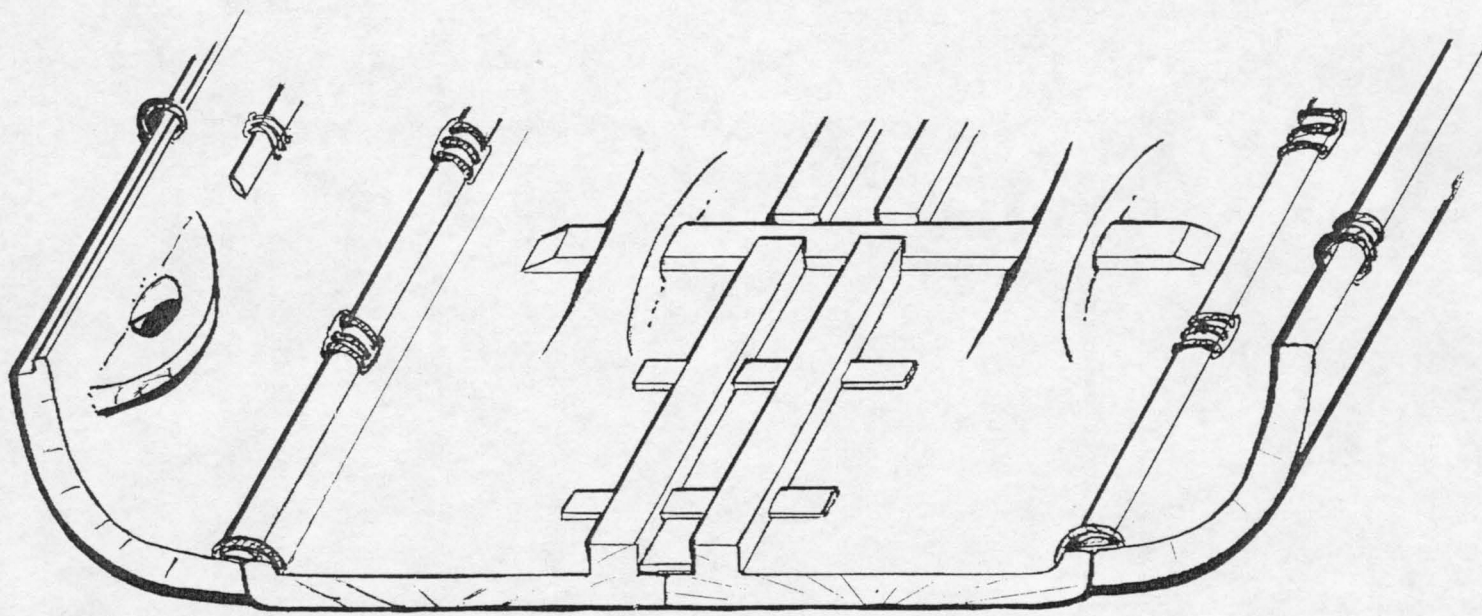
ties with Ferriby 1. Most obvious were the cleats and cross-timbers used to join the bottom planks, the lashings of yew withies to close the seams and the caulking method, consisting of moss covered with a batten. These similarities were of particular interest because they indicated the wide distribution of the technology — Ferriby 1 was discovered on the north bank of the River Humber, several hundred miles away from Dover and some 20 miles from the sea. But because of its location, Paul Bennet, director of the Canterbury Archaeological Trust, said he thought the new boat may have been used for coastal or cross-Channel trade, which in turn could spur reconsideration of the Ferriby boat's assumed purpose as a ferry.

Each bottom plank features two longitudinal ridges running proud along its entire length, set back some 2-3in (50-76mm) from the inboard edge. Long wedges were driven through mating keyholes in these parallel 'stringers' at about 2ft (0.6m) intervals. In addition, at least three larger transverse timbers passed through the stringers, their ends secured in cleats carved into the bottom planks.

A long, thin batten was placed over the central seam between the stringers which held down the moss caulking, and it in turn was held in place by the wedges and cross-timbers. The integrity of this seam seems dubious: there appear to be no secondary fastenings to hold the planks in place against the cross-members — no

were joined to it with lashings of withies, through lips carved into the outboard edges of the bottom planks. The moss-caulked seams between the planks and the *iles* were covered by half-round battens held in place by the lashings. The withies were probably made from slender yew branches, with the bark stripped, then twisted and cracked for flexibility.

The top edges of the *iles* have nicely-formed half-joints, with the step facing outboard. As rabbet planes were non-existent, the consistency of this joint is very impressive. Only the slightest fragment of a second strake was recovered, lashed to one of the *iles*, and one cannot ignore the possibility of a third strake, although no evidence of the strake has been found.



This cross-section, taken roughly amidships, shows clearly the tapered-wedge method of connecting the two bottom planks (see text) as well as the quartered section of log making up the sides. The heavy cleat mentioned in the text can be seen below the gunwale on the left. The rabbeted edge on the gunwale suggests a third strake.

The two 30 x 3in (760 x 76mm) bottom planks of the Dover boat were hewn from a single oak tree. After felling, the trunk was split with wooden wedges. Then, with the flat side down, a single heavy plank was hewn from each half, working from the bark inward, using axes and adzes of stone or bronze. As material was cut away, certain features were left standing proud which were critical to later assembly

"They were extremely sophisticated, brilliant woodworkers," said Valerie Fenwick of the Nautical Archaeology Society, "but still mentally in the dugout stage. The idea was to take a big tree and carve it to the shape you want." Supporting this notion, no plank scarfs have been found: the length of the boat was apparently determined by the length of the trees.

pegs were used anywhere on the boat. Fenwick thinks that the wedges might have been seasoned before being installed and, as the boat took to the water, the wedges swelled tight inside their keyholes and locked the construction together.

The transition from flat bottom to nearly vertical sides was made through a technique known as *ile* construction — a holdover from the dugout days — in which a quartered log is hollowed to form a plank that curves in section through 90°. The *iles*, or lower strakes, are about 10-12in (250-300mm) in radius and were hewn to a thickness of about 2in (50mm). According to Bennet, they appear to have come from one tree, as did the two bottom planks. He calls the Dover find a 'two-tree boat'.

After the bottom was assembled, the *iles*

Two heavy cleats, possibly cargo tie-downs, appear near the top edges of the *iles*, inboard, one on each side. The cleats are not opposite each other, and are not in line with the bottom cross-timbers, so it is unlikely they were used to secure frames.

The boat was almost certainly paddled, as there is no evidence for the use of oars in Britain at this time. With a probable laden weight of at least 10,000lbs (4,550kg), a crew of some 12-18 paddlers, plus possibly a helmsman on a stern paddle, seems an appropriate first guess. There is as yet no evidence of frames or thwarts, but the hull's structural requirements, and the need for the paddlers to sit somewhere, suggests that thwarts were probably fitted.

In the three days originally granted by the DOT, the archaeologists succeeded in

salvaging all of the boat that appeared in the coffer-dam. This included its complete width of about 8ft (2.4m) and almost 20ft (6.1m) of its length. As the section showed little or no taper, it was assumed to be a midships section, which in itself was disappointing in spite of the find's undeniable archaeological value. The ends of any boat are more complex than its midships and best demonstrate the level of technology available to the builder as well as their own skill. Until this boat, scientists had never recovered the end of a single British Bronze Age boat, and every reconstruction to date has relied upon a great deal of speculation. It would have been a terrible loss if construction had proceeded, destroying the information that was

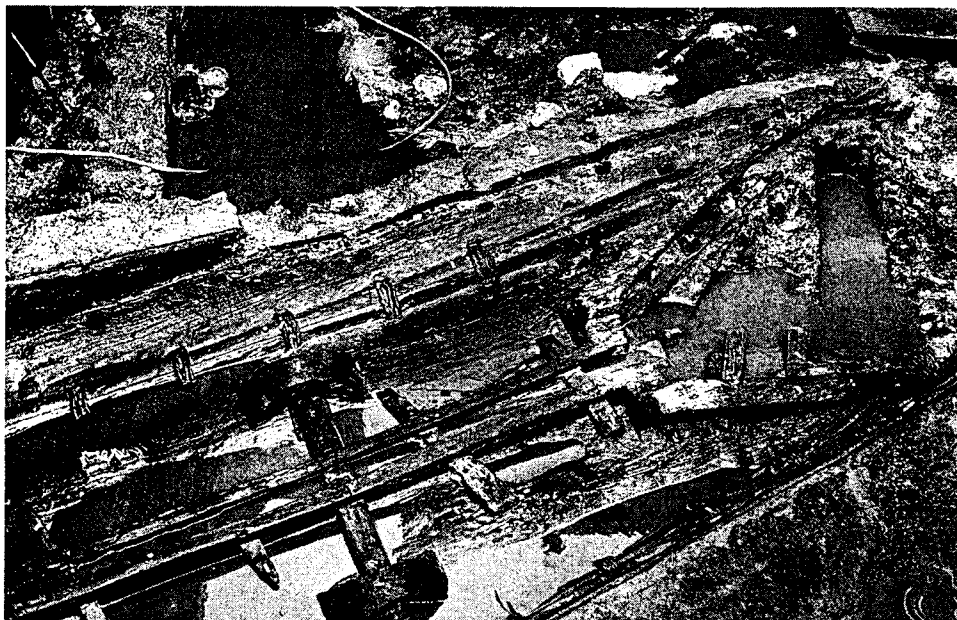
extending from the stringers to turn into substantial 'timbers.' These then angle forward again, and meet the *îles* in the eyes of the boat. The *îles* themselves continue forward several feet beyond the centre, tapering in thickness somewhat.

The strange 'bow' structure, presented in mirror image on both bottom planks, gives the appearance of a huge yoke with 4ft (1.2m) arms. Each arm is perforated in three places, and wedges, similar to those which join the bottom planks together were found in these holes. Inside the open end of the yoke were tantalizingly small remains of planks that once closed in the end of the boat. It is tempting to speculate about a recognizably boat-shaped, rounded or pointed bow, carved dugout-fashion

Noting also the absence of second strakes, she concluded that the boat may have been brought to there to be stripped of some of its planks, and then abandoned.

Assuming that the recovered sections represent about two-thirds of the boat, the total length was probably 50ft (15.2m), plus or minus 10 per cent, while its beam was about 8ft (2.4m). From bottom to sheer was probably 2ft 6in-3ft (0.8-0.9m) amidships. Although radiocarbon dating and dendrochronology will provide better insight, initial indications suggest a date of 1300BC, the same age as Ferriby 1.

The boat was flat-bottomed and probably straight-sided with no apparent rocker although the ends may have hogged during a millenia under ground. It was cer-



Above left: Looking from approximately amidships to what may be either the bow or the stern, the fork-shaped terminal structure is quite plain. The Y-shaped piece is cut from a single piece of wood. Note the yew withies joining the île to the bottom planks. The large semi-circular pieces resembling a boat trailer axle and wheels are the components of the main structural joint, with the 'axle' being the wedge. The close-up shot (right) shows a detail of the yew lashings .

almost surely still in the ground. "It's like taking the pyramids down because you want to build an airport," said Colin Slack.

Earnest, rushed negotiations ensued between the contractors and the DOT, and ultimately, a two weeks' extension was granted. Another coffer-dam was driven adjacent to the first and a new pit was excavated. One of the ends of the boat was uncovered, which was as well-preserved as the midship section, and has since been successfully salvaged using the same methods as with the midships section.

Whether the new section is the bow or the stern may never be known, but it reveals superbly-crafted details about an entirely unknown method of boatbuilding. A complex angled structure was carved at the end of each of the bottom planks,

in two mirrored halves and fastened into the gap with a combination of lashings and wedges. A scow-like bow would have been simpler to produce, but seems less in keeping with the concept of the boat.

The wedges in the yoke bear clear signs of having been cut through with a bronze axe. Several lashings were also intentionally cut. Even before uncovering the end, Fenwick observed that the planks appeared to be worn, while the lashings were new and fresh. She believes the boat was designed to be dismantled and taken ashore in pieces for the winter, and then reassembled the following spring.

Fenwick also commented on the location of the find: adjacent to a contemporary settlement and on the former bank of a stream, but beyond the limit of navigation.

tainly heavy and sluggish and probably leaked copiously. But its size, and the location of its discovery, seem to confirm that it was used for substantial voyages, so it must have been fairly seaworthy.

Why the Dover boat was never reassembled by its builders is a puzzle we may never solve. The task now facing Fenwick, Bennett and others is to develop plausible ideas of what the missing parts looked like, and to test those hypotheses with working models. One thing is certain: a proper reconstruction will challenge the skills of our finest woodworkers. ✎

As the boat is still in the earliest stages of investigation, preliminary observations may need to be reconsidered. All dimensions above are based on the author's eyeball estimates.