

LEGACY FROM THE DEEP

Henry VIII's



Lost Warship

THE YOUNGEST on board was 14. The oldest about 44. They were seamen and officers, archers and gunners, cooks, shipwrights, a surgeon, and soldiers in armor. Seven hundred men in all, they were the crew and fighting men of the Tudor warship *Mary Rose*, one of England's first modern battleships.

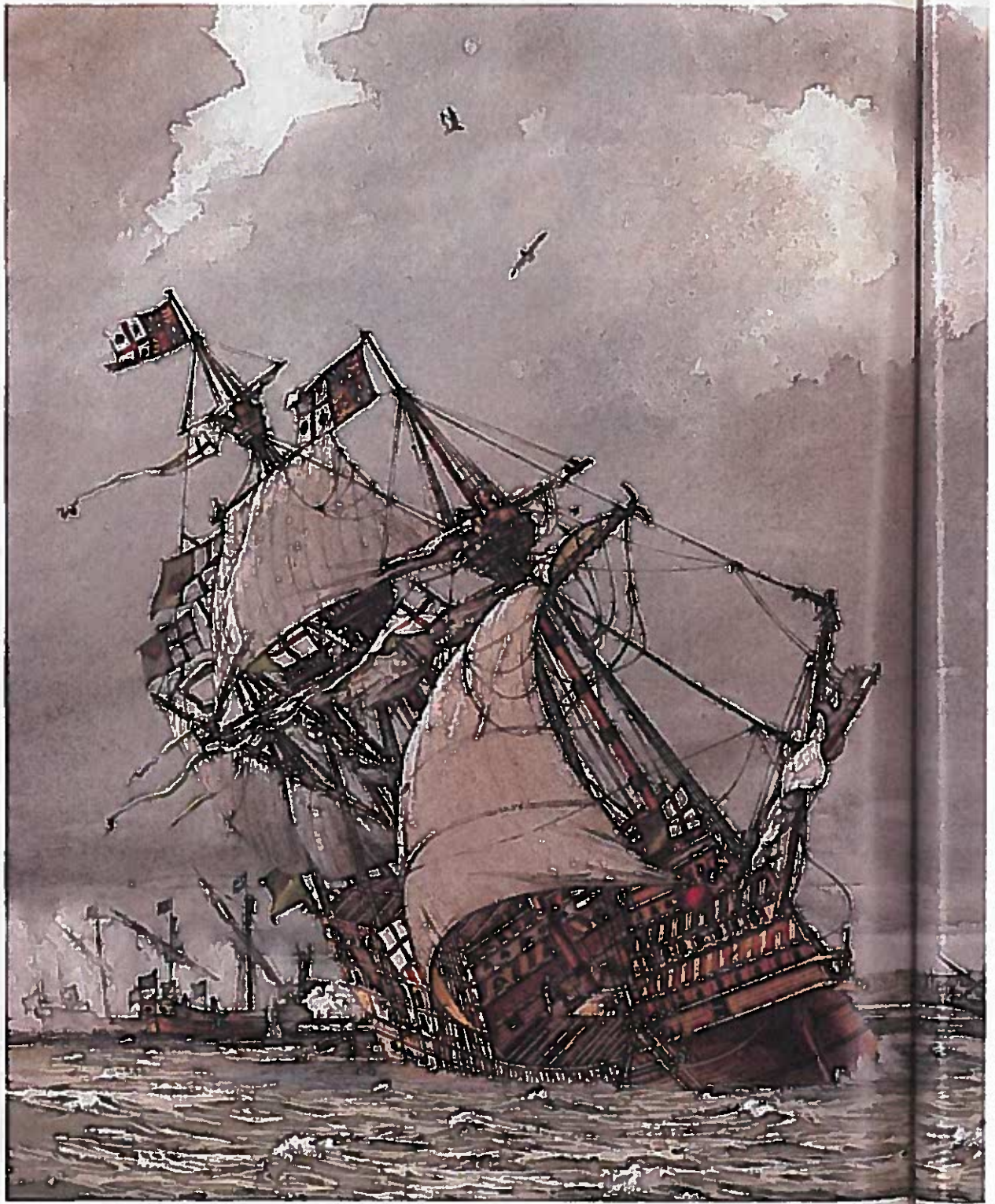
They gambled at backgammon and threw dice when they got the chance. They liked the lively music of tabor and pipes, ate heartily, and enjoyed reasonably good health. They knew what their job was. They were a powerful force of destruction.

It was Henry VIII's idea, one that he borrowed from Mediterranean navies, to mount heavy artillery on *Mary Rose*'s lower decks. Thus he helped change the course of English naval strategy, for her elegant cast-bronze cannon could cripple an enemy ship with deadly broadsides at long range, rendering obsolete medieval methods of ramming and boarding.

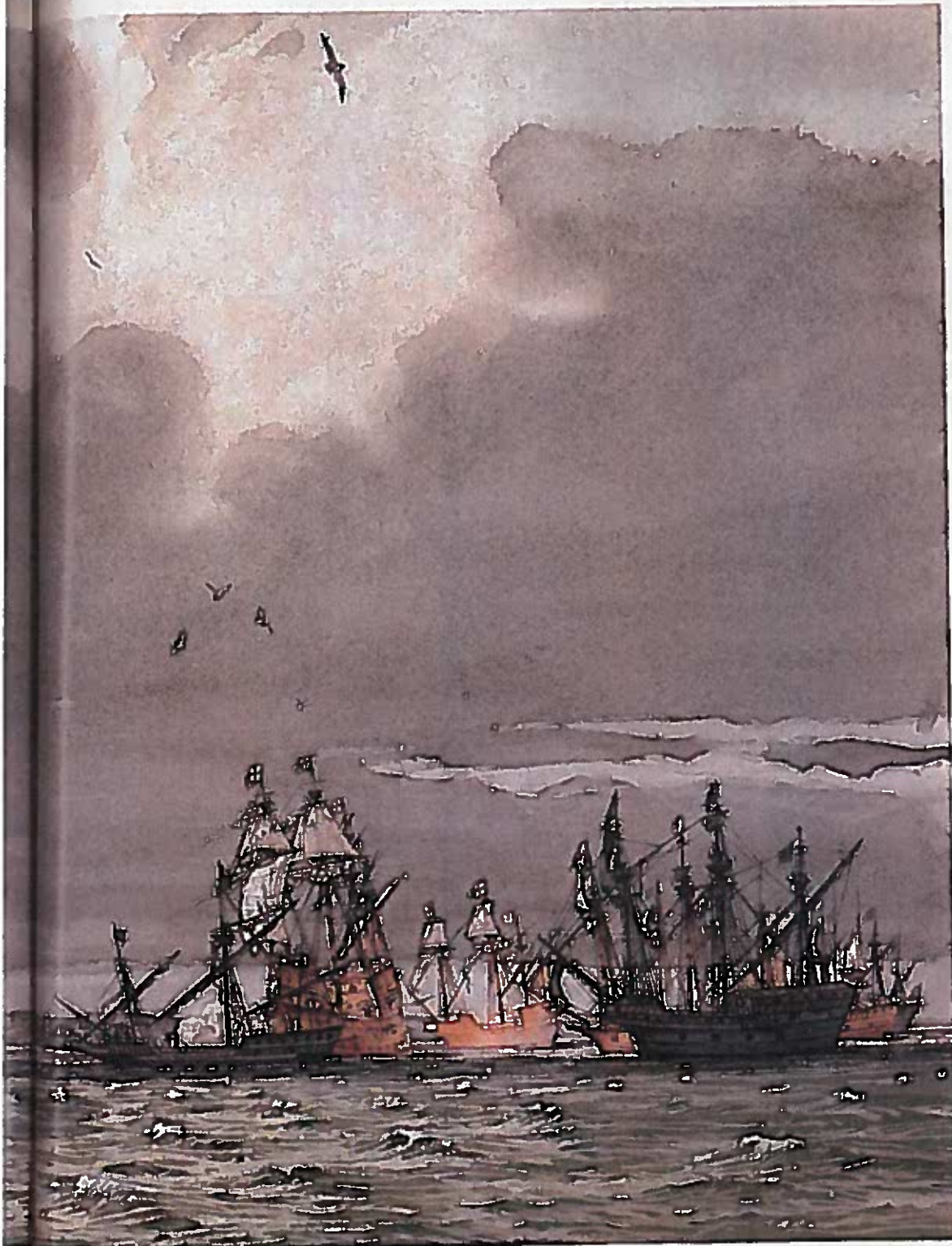
She was serving the king in battle on July 19, 1545. Just two years before Henry's death, the aging monarch was facing one of the gravest perils of his reign. A French invasion force—larger than the armada that Spain would send four decades later—had been deployed by Francis I to attack the English fleet at Portsmouth. For the first time Henry stood alone without allies among the powers of Europe, his alliance with Charles V of Spain finally exhausted. But *Mary Rose* was not destined to prove her prowess that day. A bizarre accident before the king's unbelieving eyes would cheat her crew of battle glory. And their remarkable bronze cannon would join their bones in the deep.



BOTH BY WILLIAM G. CURTIS



IT HAPPENED so fast. A shore breeze came up and Mary Rose hoisted sail to engage the enemy. Then suddenly she swung away from the battle, heeling dangerously on her



side. Water began flooding into her lower gunports, cannon crashing headlong across her slanting decks. In less than a minute she sank to the bottom like a stone.



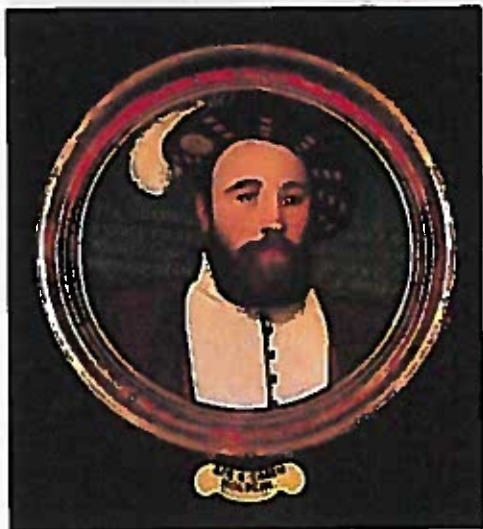
BY THE TIME rescue boats reached Mary Rose, only the tops of two masts remained above the water (above, right). Henry VIII heard the dreadful cries of her drowning crew as he looked on helplessly from Southsea Castle.

Among those lost were Capt. Roger Grenville and Vice Adm. Sir George Carew (right), whose wife, also witnessing the tragedy from the castle, fainted dead away. The king, stricken with sorrow, tried to comfort the lady.

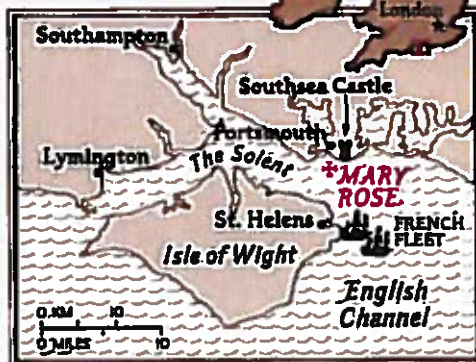
But the sinking of Mary Rose was not decisive to the battle. The French armada, depicted at left in this engraving from a contemporary painting, could not approach Portsmouth Harbour without bombardment from Henry's fortifications. The battle ended in a stalemate after fierce combat on the Isle of Wight, where a French detachment burned several villages before being driven back by English militiamen.



PORTSMOUTH CITY MUSEUM (ABOVE); THE RIGHT HONOURABLE THE EARL OF BRADFORD AT WESTON PARK



FOUNDERING as she prepared to meet the French fleet, Mary Rose disappeared into the murky waters of The Solent.



NATIONAL GEOGRAPHIC CARTOGRAPHIC DIVISION

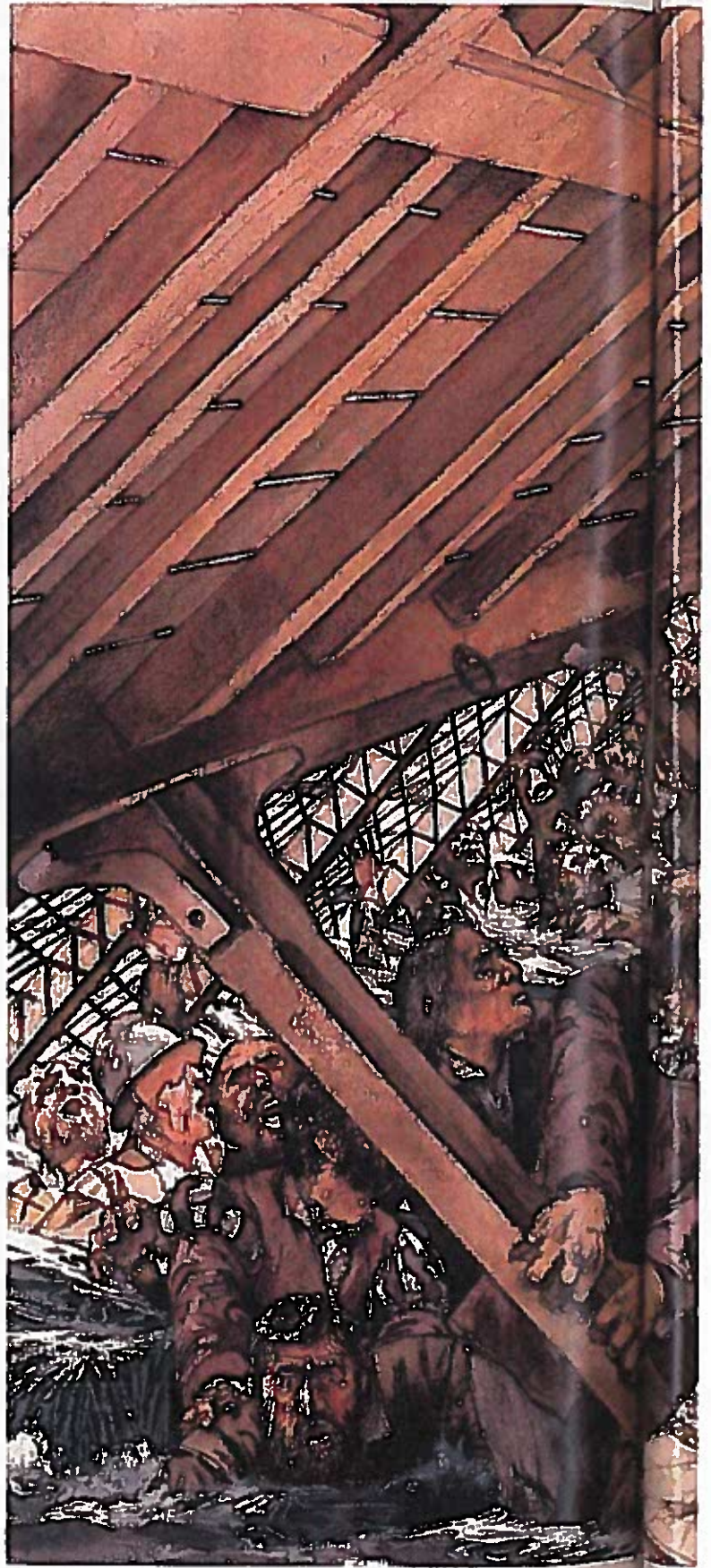
PANIC swept the weather deck of Mary Rose as the sea rushed in through a heavy rope antiboarding net strung overhead. Fewer than three dozen souls survived the tragedy, which occurred so swiftly that not even the ship's rats had time to escape.

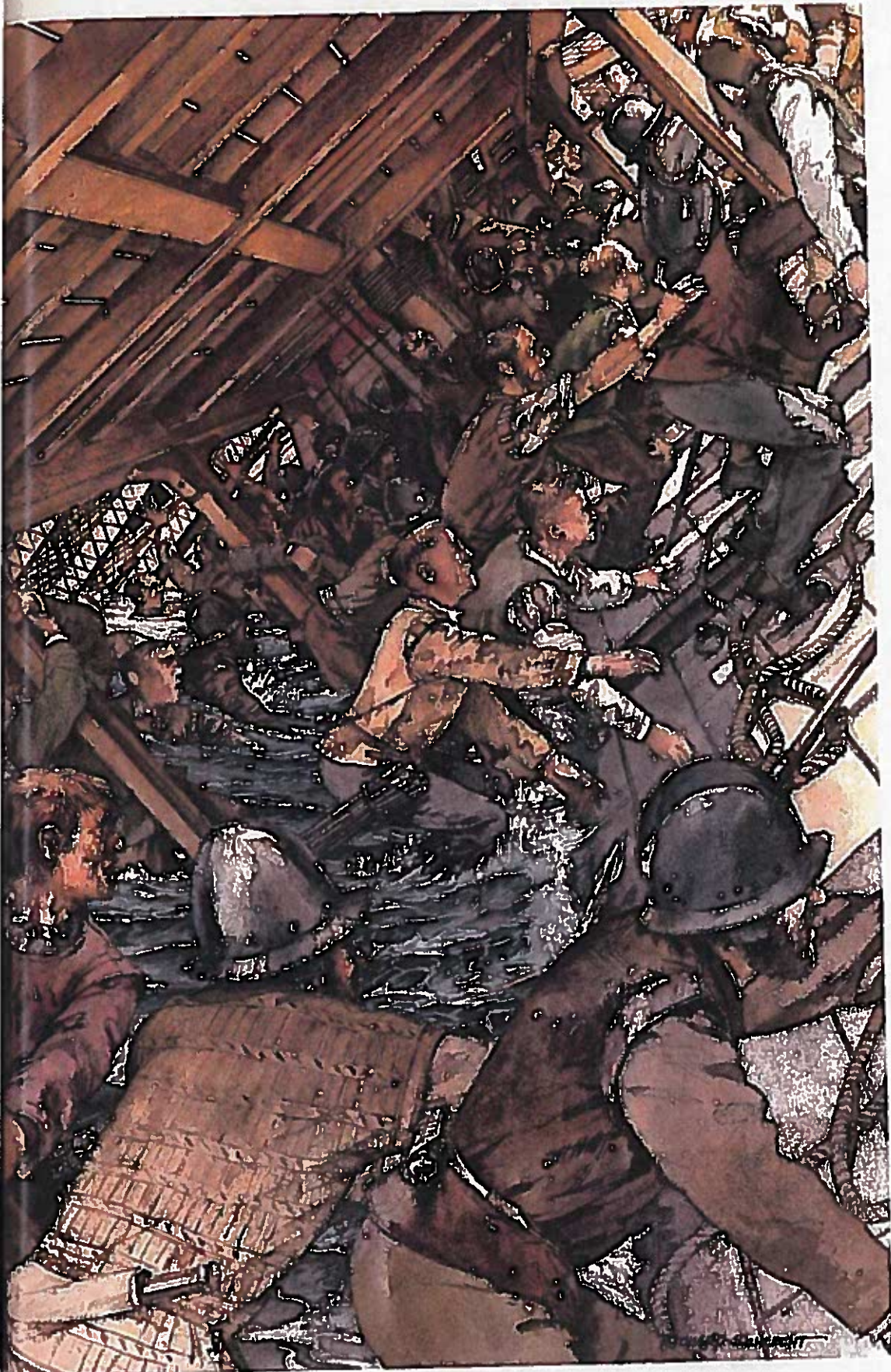
Plunging into the soft mud a mile outside Portsmouth, Mary Rose and her crew lay trapped for centuries in their frozen moment of time. Now they live again in our imaginations as a team of archaeologists, scientists, conservators, and historians describes the priceless artifacts recovered from the ship's watery grave.

In the pages that follow, Margaret Rule, archaeological director of the Mary Rose Trust, reports some of the most exciting discoveries yet made about this great warship and why she went down. * * *

Introduction and
picture text by
PETER MILLER
NATIONAL GEOGRAPHIC STAFF

Paintings by
RICHARD SCHLECHT





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LIKE GREAT blackened molars the ship's timbers jutted above the sea-floor, massive and partially eroded. As I drifted slowly down on them through water clouded with silt and plankton, I could envision the great vessel that lay buried underneath.

I knew the ship well, though I had never set eyes on her: a vessel, in the measurement of her time, of some 700 tons burden that carried a crew of 415, mounted a total of 91 guns, and bore the name of a Tudor princess. She was the pride of England in her day, once described as "the flower, I trow, of all ships that ever sailed." Few ever met a more terrible end.

Hovering just off the bottom, I examined the huge timbers, each more than a foot square at the face. As I fanned silt away with my hand, the seabed fumed and smoked around me. I was delighted, for the silt that now obscured the wreck had entombed and preserved it for more than four centuries.

Beneath me lay the remains of one of the most fascinating ships in British naval history, *Mary Rose*. Others had found her, but it was to be my task to explore and recover her if it could be done. In a sense the job meant bringing her home, for she had barely left port on the dreadful day she died.

Sunday, the 19th of July, 1545, in the 36th year of Our Sovereign Lord, Henry VIII of England, dawned bright and clear—a perfect summer day. That morning the king stood beside Southsea Castle at his main naval base of Portsmouth on England's south coast. He gazed across the deepwater channel leading to the harbor entrance and waited to repel a French invasion.

Henry faced heavy odds. The French fleet then approaching Portsmouth numbered 235 ships and carried 30,000 troops. By contrast Henry had only 60 ships available. The

latter included *Mary Rose*, an aging vessel built 35 years earlier and named for the king's sister Mary Tudor, whose family symbol was a rose.

Although badly outnumbered, the English ships were well prepared. To wage war against his arch rival, France, Henry VIII had gathered some of the finest gun founders and smiths in all Europe to produce bronze and iron cannon for England's coastal defenses and for the royal fleet. In 1536 *Mary Rose* herself had been rebuilt, and her armament increased. At some point heavy bronze guns from the foundry at Houndsditch were added—guns that she had never been designed to carry.

Now on this bright, almost windless July day, *Mary Rose* slowly emerged from Portsmouth with the English fleet to engage the enemy. In addition to her normal crew of 415 the ship carried 285 heavily armed soldiers, many of them longbowmen whose job was to blanket the French ships under a steady hail of arrows. Together with their armor and equipment, these soldiers added another 24 or 25 tons to *Mary Rose's* weight high above the waterline.

As part of her defense, the ship carried an antiboarding net of woven rope stretched eight or ten feet above the open deck in the waist of the ship. All was in readiness for battle: bowmen stationed atop the sterncastle and in the fighting tops, cannon loaded, manned, and run forward through the gunports. All *Mary Rose* needed was a breath of wind to carry her into action. The first gust carried her to her grave.

As Henry watched from Southsea Castle, a breeze sprang up from land and the English ships surged forward. Suddenly *Mary Rose* veered sharply, her open gunports on the starboard side dipping dangerously close to the water. As another English ship passed

The Search for *Mary Rose*

By MARGARET RULE

ARCHAEOLOGICAL DIRECTOR
MARY ROSE TRUST

More than 17,000 artifacts, large and small, were recovered from Mary Rose, the first well-preserved Tudor warship ever discovered. One of 500 divers who helped excavate the wreck, Bob Stewart (right) records the precise location of a cannon jutting up through the weather deck. WILLIAM R. CURTIS/INER



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within hailing distance, her captain inquired what the trouble was. Vice Adm. Sir George Carew, in command aboard *Mary Rose*, replied: "I have the sort of knaves I cannot rule!"

It was to be the last message from *Mary Rose*. As Henry watched in horror from a mile away, the stricken ship heeled farther and farther to starboard, the sea rushing in through her gunports amid the screams of men trapped beneath the antiboarding net. The king and his followers could hear the screams plainly. Sir George Carew's wife, who stood beside Henry, fainted at the dreadful sound.

Within less than a minute, according to one account, *Mary Rose* vanished with "one long wailing cry." Out of 700 men aboard,

about 30—most of them fortunate enough to have been stationed in the fighting tops—survived one of the greatest naval disasters in English history. By contrast the loss, in a similar manner, of the Swedish warship *Vasa* nearly a century later claimed only about 50 lives.*

THE CAUSE of *Mary Rose's* death remained in doubt over the next four centuries. French naval authorities of the time claimed that the ship had been sunk by French gunfire, but there was no evidence to support the claim. Sir George Carew's remark about knaves he could not rule suggests mishandling as the tragedy's cause.

*See "Ghost From the Depths: the Warship *Vasa*," by Anders Franzén in the January 1962 *GEOGRAPHIC*.



Rescuing history with science, conservator Simon Aked (left) applies polyester resin to the barrel of a wrought-iron cannon to strengthen and seal the metal. The barrel was first cleaned of marine deposits, then flushed with nitrogen and hydrogen and baked at 400°F in this furnace to stabilize the iron.

The first wrought-iron gun recovered from *Mary Rose* in 1970 revealed an unexpected innovation—a new kind of barrel. Unlike others made from several long iron bars forge-welded into a cylinder, this barrel was formed from a single wrapped sheet of iron. Reinforced with heat-shrunk hoops and rings (right, inset), this strong barrel, more gas-tight than earlier models, was probably part of a high-velocity gun used to hit the superstructure of enemy ships from a distance. Other wrought-iron cannons, by contrast, were normally short-range weapons. All were breech-loaded with removable powder chambers (right), firing cast-iron or lead shot or stone shot that shattered on impact, hurling shrapnel-like pieces across a deck.

Mary Rose's wrought-iron guns were also the earliest found aboard ship on wheeled carriages. These allowed the guns to be run back from the lidded gunports when they had to be closed.

LOWE PSMOTOS

Indeed, Sir George's younger brother, Peter Carew, later described *Mary Rose's* crew as among the finest mariners in all England. But, Carew added, there was such dissension among them that "contending in envy, [they] perished in frowardness."

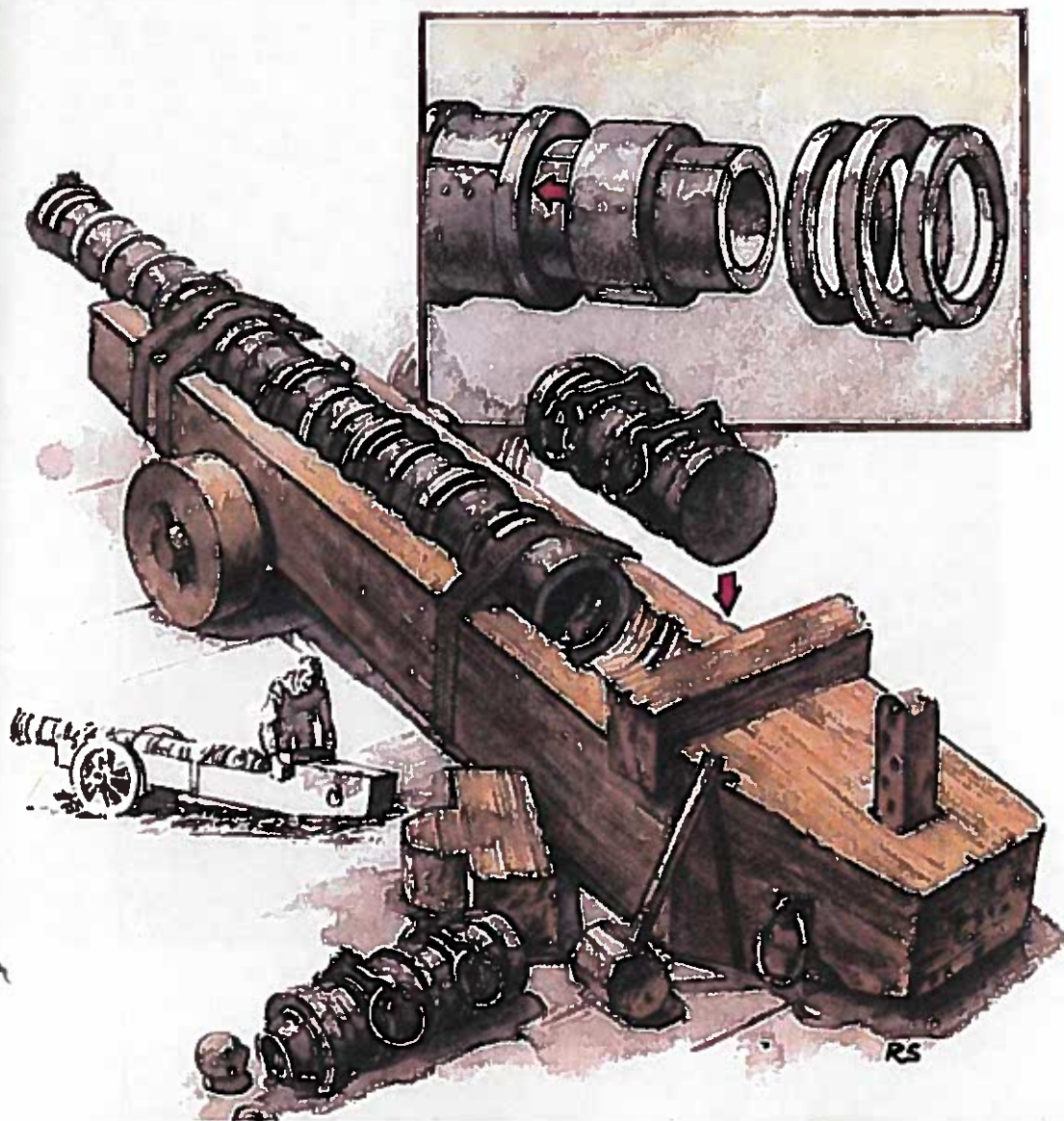
Finally, the extra weight of armored soldiers and heavy ordnance above deck had rendered *Mary Rose* dangerously top-heavy. Even a disciplined crew might have failed to avoid the tragedy that befell her.

Fortunately for Henry, the loss of *Mary Rose* had no apparent effect on the Battle of Portsmouth. After an inconclusive exchange the French fleet landed troops on the neighboring Isle of Wight, where they wreaked havoc for several days. They then briefly attacked the English coast to the

east before sailing back across the Channel.

The English made several attempts to salvage *Mary Rose*, the first one immediately after the sinking. Guns were salvaged as late as the 19th century. From the outset, salvage was hampered by the nature of The Solent, as the channel off Portsmouth is called. The bottom of The Solent consists of banks of sand, fine mud, and silt constantly stirred by tidal action. Hitting the soft seabed with tremendous momentum, *Mary Rose* began to dig her own grave, much as a pebble slowly buries itself on a wave-swept beach.

After the recovery of several cannon in the 1830s, attempts to salvage *Mary Rose* were abandoned. The silt that engulfed the remains of her hull was left undisturbed, and she lay entombed (Continued on page 662)





TOASTING THE SKILL of royal gun founders John and Robert Owen, "Bluff King Hal" lifts a mug at the Houndsditch Foundry, just beyond London's wall. In 1537, at the king's command, the brothers fashioned a cast-bronze gun later found on Mary Rose. It was a nearly 11-foot-long "bastard," so-called for its nonstandard caliber. Showing pride in their work, they patriotically identified themselves as "sonnes of an English" in an inscription (above right). Henry's name appears in Latin on another inscription, and a crowned emblem of the Tudor rose, symbol of his family, has also been cast on the weapon. Lion heads on either side of the barrel (far right) formed rings for ropes to lift the gun, one of the first of its kind made in England.

ROBERT AND JOHN OWYN BRETHERYNGERNE
IN THE CYTE OF LONDON THE SONNES OF AN
WELSHMADE THYS BASTARD ANNO DNI 1570



NES PHOTOGRAPHER VICTOR R. BOWELL, JR.




Treasures of Tudor life

AFTER CENTURIES at sea bottom, personal items reveal much about Tudor man. The wearer of a wooden pomander (right) preferred spices to the smell of ship life. A punctual officer may have carried the wooden pocket sundial (below), its compass needle now lost.




THIS STURDY LEATHER SHOE was probably worn by a crewman. Officers preferred dainty slippers, popular among the upper class.

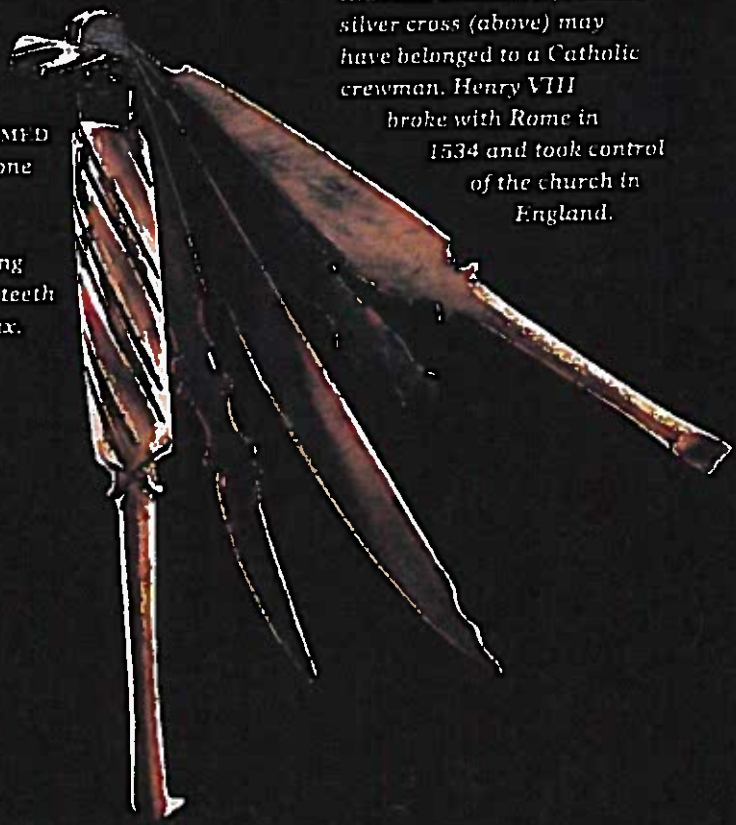
PHOTOGRAPHS BY VICTOR H. B. SWELL, JR.
SHOE PHOTOGRAPH FROM MARY WISE TRUST



A SINGLE GOLD COIN worth 40 pence was roughly a day's wages for the vice admiral, or more than a month's pay for an ordinary seaman. These of varying denominations (left) were among only two dozen gold coins recovered.



HEAVILY OXIDIZED, a small silver cross (above) may have belonged to a Catholic crewman. Henry VIII broke with Rome in 1534 and took control of the church in England.



FOR THE WELL-GROOMED Tudor gentleman, a bone manicure set (right) served many useful purposes, from cleaning fingernails to picking teeth or scooping out earwax.

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at 40-foot depth in The Solent. There she might lie to this day, but for the vision and energy of a man named Alexander McKee.

He is a journalist, a scuba diver, and a military historian with a lifelong interest in historic ships. In 1965 McKee organized a search for underwater wrecks called Project Solent Ships, focusing on the coastal area off Portsmouth. Although I was strictly a land archaeologist at the time, I gladly accepted Alex McKee's invitation to join the group.

Over the next six years we spent every available summer weekend exploring the bottom of The Solent for historic wrecks, using scuba divers and underwater detection gear such as magnetometers. Perhaps the greatest help in pinpointing the location of wrecks was use of Dr. Harold Edgerton's sub-bottom and side-scan sonar to survey wide areas of the seafloor.

Although the search initially was aimed at wrecks of all kinds, the project gradually narrowed to finding *Mary Rose*. For one thing, she represented a key stage in evolution of the warship in northern Europe, being one of the earliest vessels built there to

carry heavy ordnance and to be equipped with gunports so that her main batteries could be housed belowdecks.

Moreover, Alex and I both believed that the massive buildup of silt around and within *Mary Rose* would have preserved her to a remarkable degree. If we could excavate the ship, along with her ordnance, stores, tools, and the personal possessions of her crew, we would shed valuable new light on the Tudor period of England, an era that has left far too few tangible remains of everyday life.

We had a series of winter storms to thank for our first actual glimpse of *Mary Rose*. In the fall of 1970 a team led by Alex McKee dredged up a 16th-century iron cannon near the point where our underwater detection instruments told us the wreck must lie.

The following spring our divers went down and discovered that winter storms had laid bare the ends of several massive ship's timbers, which resembled a row of great blackened teeth. In all my years of archaeological exploration I can recall no more beautiful sight. The long search for *Mary Rose* was over.



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DURING THE YEARS that followed, we came to sympathize with those who had tried to salvage *Mary Rose* before us. In terms of water quality The Solent is a diver's nightmare, ranging at best from a milky haze to something on the order of lentil soup. What can be accomplished within a week or two in the crystal waters of the Caribbean often took us an entire diving season of several months.

To safeguard the wreck from looters, we had formed a *Mary Rose* Committee and leased the site from the crown for the munificent sum of one pound sterling a year. On that makeshift basis we enlisted a team of volunteer divers and technicians and began a careful survey of *Mary Rose* in her final resting-place.

In time we discovered that almost half of the hull remained intact. The ship had come to rest at a 60-degree angle on her starboard side, which had quickly settled into the mud and been preserved. Most of the superstructure and the hull's port side had remained exposed, and they eventually collapsed or were scoured away by tidal currents.

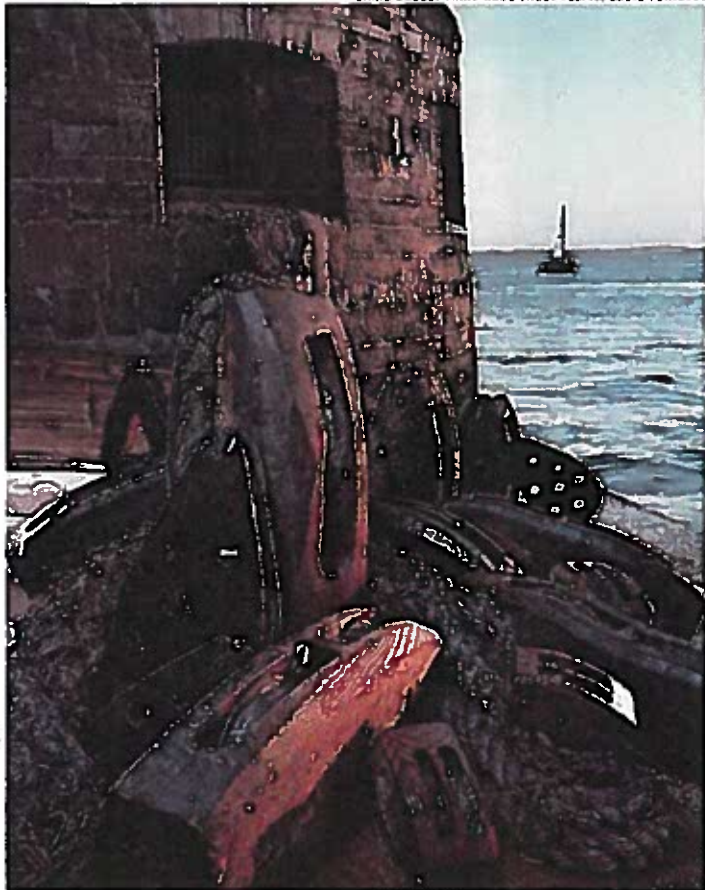
The hull itself contained an infinite variety of treasures. With each ebb and flow of the tide, fine silt had penetrated every corner of the remaining structure, gradually filling it and sealing everything inside from the corrosive effects of salt water and oxidation and destruction by microorganisms. Virtually everything that had gone down with the ship—weapons, tools, clothes, and even normally perishable stores—remained in a remarkable state of preservation.

The job of merely reaching those treasures took years, for at each stage we were determined to safeguard the hull. From my first view of those giant oak timbers projecting above the seabed, I had cherished the hope of one day bringing *Mary Rose* ashore to Portsmouth, where she had been built.

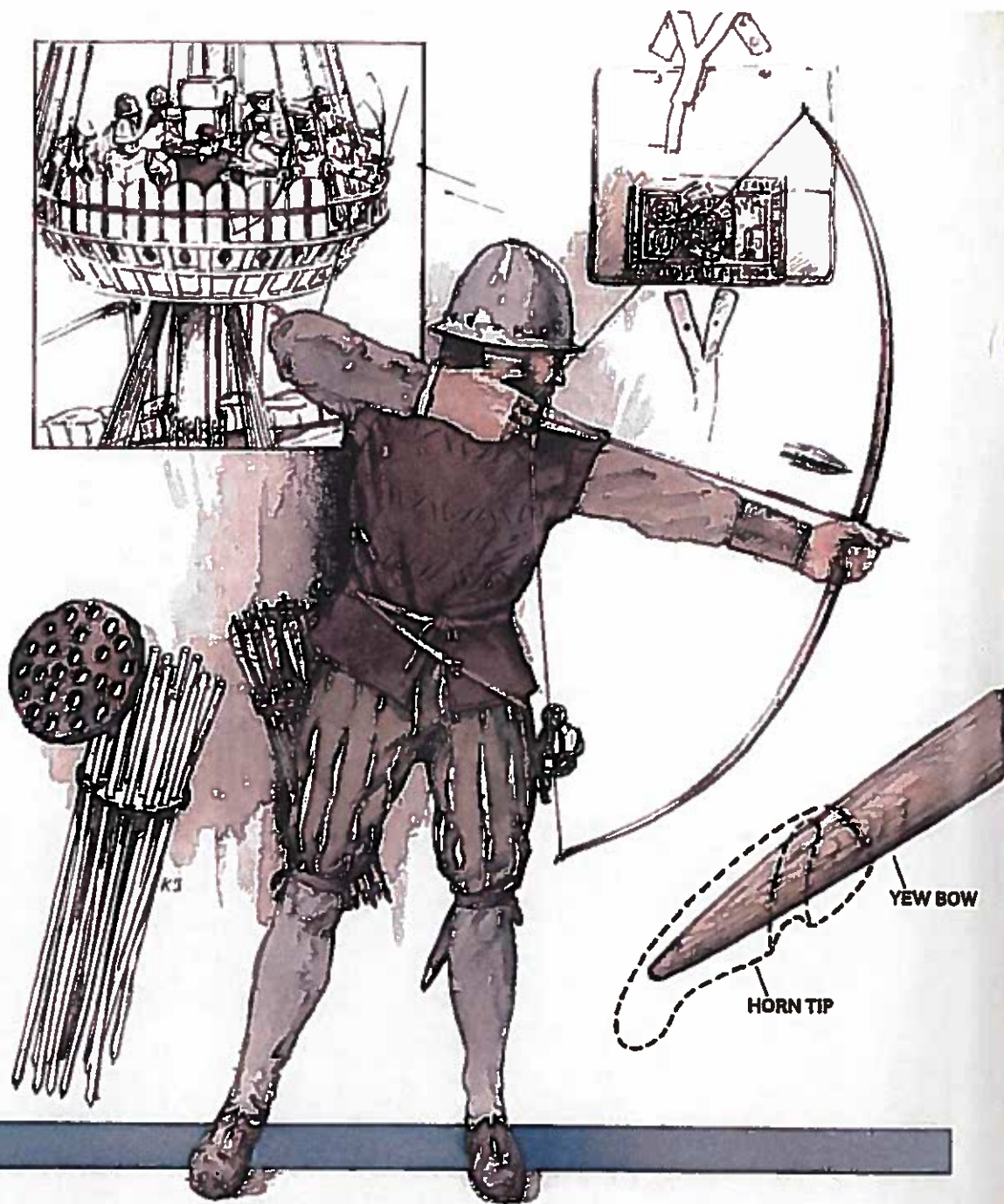
As a result, it was 1979 before we began to excavate inside the ship. By then *Mary Rose* was covered by the Protection of Wrecks Act of 1973, and our committee had been replaced by a nonprofit *Mary Rose* Trust, organized to direct operations and raise necessary funds.

His Royal Highness Prince Charles, who

CHRIS DOBBS, MARY ROSE TRUST (LEFT); LOUIE PSIHOTOS



More advanced than many historians expected, rigging tackle from Mary Rose has proved the sophisticated technology of ships in the age of discovery. Besides double blocks such as this masterfully carved one (far left) found amid the broken decks, divers recovered spare sets of ropes, lines, cables, parrels, and deadeyes from tightly sealed boxes deep in the ship's stores. Some of this rigging, still in nearly perfect condition, sits on a wall of Southsea Castle (left), from which the king saw his ship sink.



DEADLY ACCURATE within 300 yards, longbowmen on the ship's upper deck and in the fighting tops (above) could clear an enemy deck with a shower of arrows. Using leather spacers as "ammunition clips" for two dozen steel-tipped, armor-piercing arrows, an archer could shoot about 12 rounds a minute. His six-foot-long yew bow was probably fitted with horn tips on its ends, though none survived attack by marine organisms over the years. An embossed leather or horn bracer

protected his wrist from abrasion by the bowstring.

The 2,500 arrows and 139 longbows recovered from Mary Rose were found in remarkable condition. Many of the bows examined by the author (facing page, top) were so well preserved that they could be restrung and used today. Trying his hand at a Mary Rose bow, actor Robert Hardy (right), an authority on the longbow, shows the strength needed to draw one.

had first dived with us on *Mary Rose* in 1975 and who showed a keen interest in her recovery, agreed to become president of the trust. Sir Eric Drake, a former chairman of British Petroleum, became chairman, and I was appointed chief archaeologist. Now at last, with a professional staff as well as volunteers, we began emptying *Mary Rose* of her precious cargo.

NONE OF US, I think, will ever forget the archer. He had been a man in his mid-20s, sturdily built and of medium height, and he was obviously no newcomer to the longbow. His skeleton lay with that of a slightly younger man beside a ladder connecting the gun deck to the weather deck above. A bundle of arrows in a leather carrying device remained attached to the archer's spine by a leather thong, and the remnants of what appeared to be a leather jerkin lay scattered among his bones.

Clearly both men had sought to scramble to safety during *Mary Rose's* final moments. Probably the ship's extreme list to starboard had prevented them from climbing the ladder, and they were overwhelmed by inrushing water.

Careful analysis of the older man's skeleton confirmed that he was a professional archer. Two of his middle vertebrae had been pulled forward and twisted to the left, suggesting chronic pressure on his spine from that side. Also his lower left arm bone was noticeably enlarged and flattened, the result of prolonged strain. Obviously he had been right-handed and had spent long hours at the butts, as archery ranges are called.

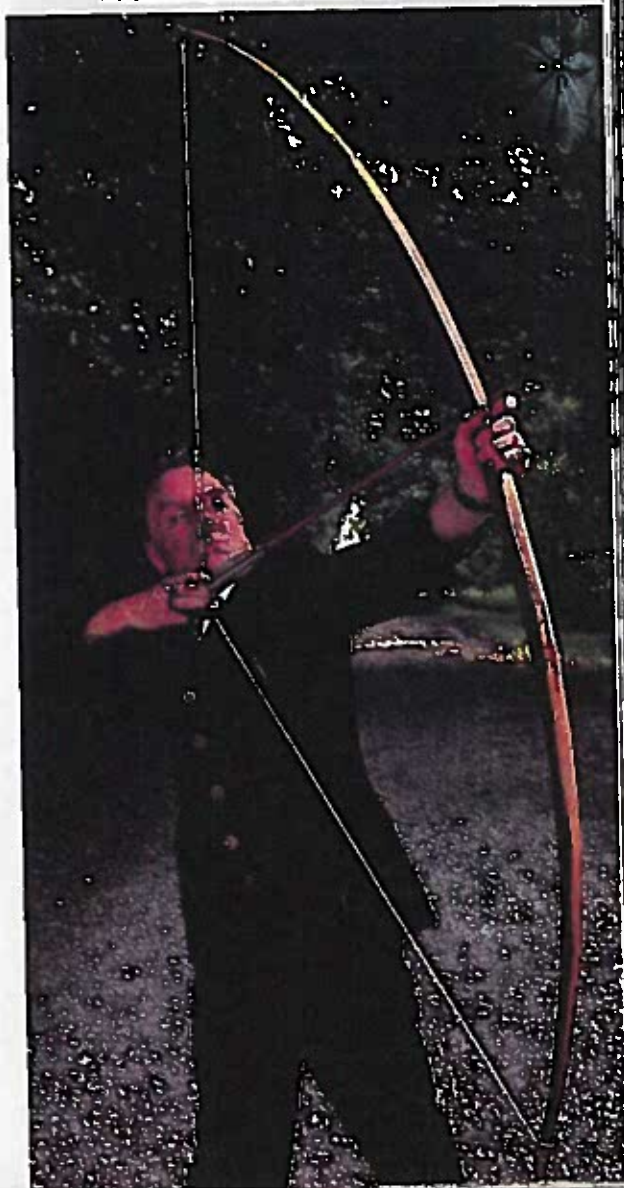
Such men were legendary in their time. Massed bowmen had given England the margin of victory over France in the great land battles of Crécy, Poitiers, and Agincourt. Expert longbowmen could shoot arrows a distance of 300 yards on an average of one shaft every five seconds—more than six times the maximum rate for the French crossbow. "The English are the flowers of the archers of the world," declared a 16th-century French chronicler.

What *Mary Rose* taught us was that Tudor bowmen fought at sea even after the addition of heavy guns. Many historians have assumed that archers were carried aboard King Henry's ships merely for shore raids.

The Search for Mary Rose



ANDREW FIELDING, MARY ROSE TRUST (ABOVE); LOUIE PSIMYOS





But the archer on the gun deck had obviously been prepared for action at the moment *Mary Rose* went down. Elsewhere in the hull we found longbows and arrows at what clearly were battle stations.

The discovery of such weapons delighted experts in the field of archery, for *Mary Rose* has given us the only authentically dated Tudor bows and arrows. The total number we recovered was 2,500 arrows and 139 longbows, many of the latter in condition to be restrung and shot.

One specialized form of archery came to light with the discovery of two leather mittens packed in a wooden box among the longbows and arrows. The mittens were used by archers to protect their hands while shooting fire arrows. Only the hand holding the bow needed protection, as shown by the fact that both mittens were left-handed.

A MAJOR QUESTION regarding the loss of *Mary Rose* was whether she had actually engaged the enemy. The French long insisted they had sunk her by gunfire, while the English maintained that her loss was accidental. In a lower portion of the hull, below the level known as the orlop deck, we eventually found an answer.

As we excavated the hold carefully by hand and later with airlifts, we encountered skeletons on straw mattresses on the flint ballast. What were men doing stretched out in the lowest level of the ship while everyone else was at battle stations? One answer, of course, is that they had been wounded.

Might they have been merely ill? It's doubtful, for *Mary Rose* had just left port and would not have taken ailing crew members along. The men in the hold very likely had been wounded topside and had been hurried below so as not to demoralize their shipmates by their cries and appearance. The practice was common in navies of the period, when morale was considered more vital than treatment of the injured. Even the great Lord Nelson, when mortally wounded at Trafalgar two and a half centuries later, was unceremoniously rushed to the orlop, his face and medals covered, lest his crew recognize their fallen leader and lose heart.

Mary Rose, it seemed, had seen action and suffered casualties, though they were probably light and had little bearing on her loss. High above the orlop, in the raised sterncastle of the ship, we found a more likely cause of the sinking. There our divers came upon a large and handsome bronze



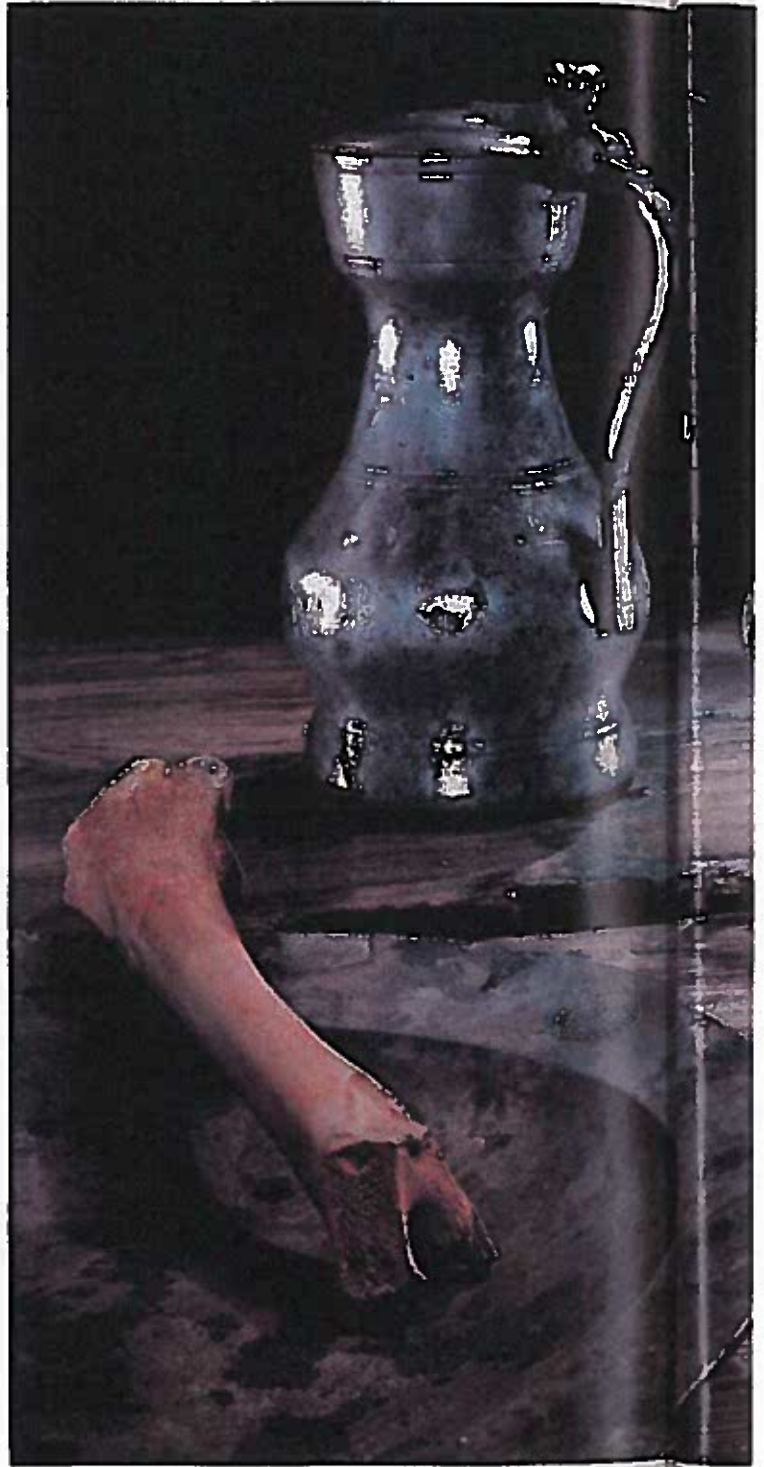
Clenching fire in their teeth, dragons and crocodiles carved onto the heads of linstocks (left) held slow matches for firing the ship's cannon, here simulated with colorful sparklers.

A fearsome antipersonnel weapon, the cast-iron "square murderer" (above) blasted boarders at close range with a lethal spray of hailshot (right). Small enough to be handled by one man, it was hooked over a rail for firing, a flange beneath the barrel absorbing the recoil. A wooden tiller fitted into the rear helped aim the small but deadly cannon.

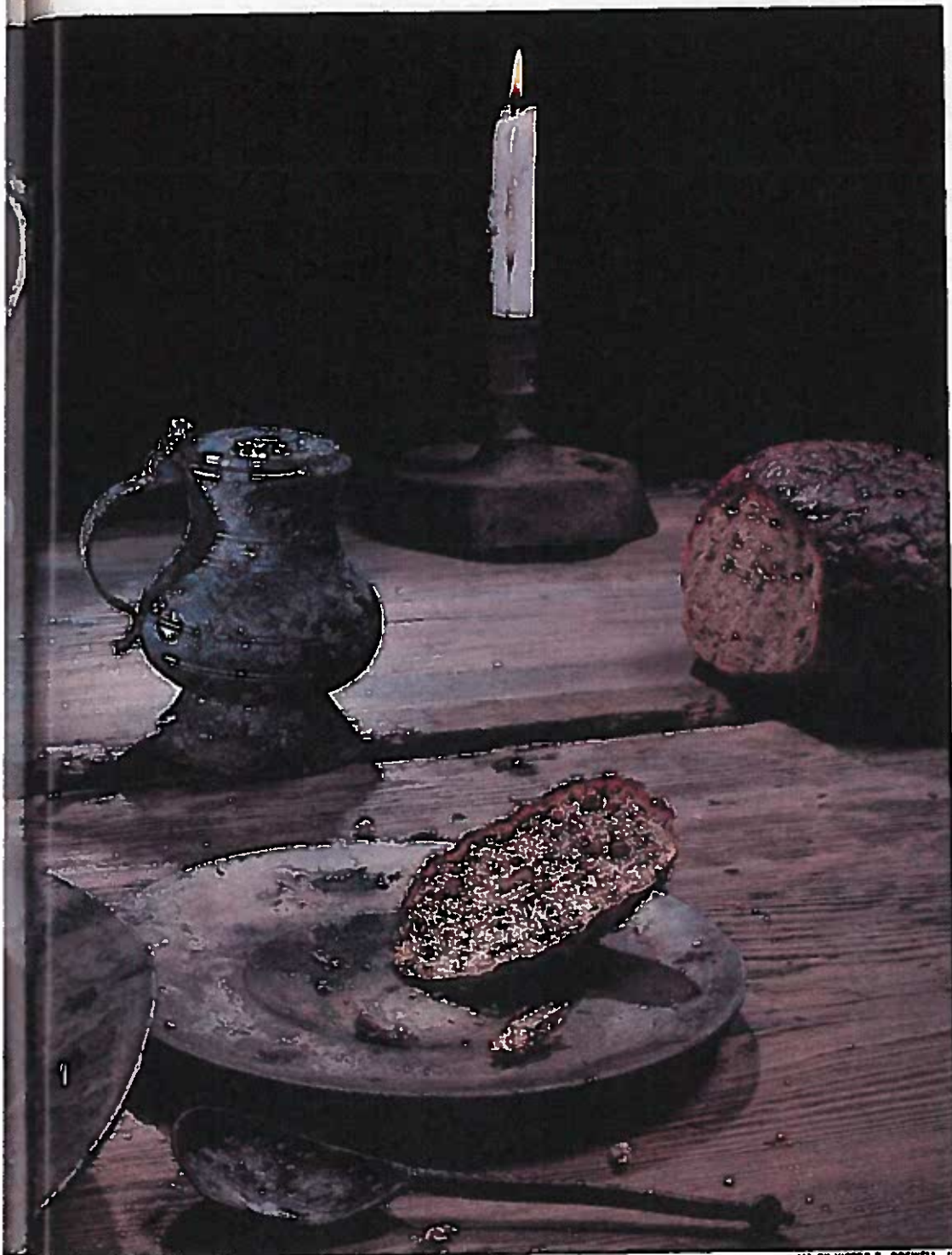


LOUIE PRIMOYS (LEFT);
VICTOR B. BUSHWELL, JR.

Hearty fare filled dinner tables on Mary Rose. Fish, venison, beef, chicken, mutton, and pork were among the dishes served to the crew, along with fresh vegetables, fruits, and nuts. Peas still in the pod were found buried with the wreck, as were shells from hazelnuts and pits from wild cherries and plums. The men washed down their meals with beer, some drinking vessels bearing a personal mark etched into the lid (below). This stave-built wooden one (bottom) belonged to a common seaman. Like many of the wooden artifacts, it was treated with polyethylene glycol to replace moisture with wax, then freeze-dried for preservation.



A privilege of rank, the pewter dinnerware used by officers (above) was considerably more elegant than the wooden plates for the rest of the crew. A graceful flagon at their table might well have contained a fine



ALL BY VICTOR R. BOSWELL, JR.

wine. Even officers, however, were exposed to health hazards by the ship's uninvited rodent guests. The bones of rats—including the kind that carried fleas with bubonic plague—were found aboard ship, along with those of a small dog that may have chased them.



ALL BY LOUIE PSINOTOS

Chief admirer of the lady warship, Prince Charles (left) made many dives to inspect her in his role as president of the Mary Rose Trust.

On the day before the ship was raised, a protective ring of small craft formed around the recovery site (below), where the crane barge Tog Mor waited to reverse history. The moment came the next morning, October 11, 1982, when the starboard half of the lost ship's hull—the only part preserved by The Solent's thick sediments—rose dripping from its grave in a giant steel cradle and lifting frame. It was then taken to Portsmouth to rest at a dry dock only yards from where its keel was laid in 1509.



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muzzle-loading cannon that weighed about two tons. The cannon had been loaded and run forward on its heavy wooden carriage through an unlidded gunport.

When we removed the cannon, we found a socket cut in the sill of the gunport, which had obviously once been used for a small swivel gun. The suggestion is strong that those who refitted *Mary Rose*, either in 1536 or perhaps before the Battle of Portsmouth, had increased her firepower at the risk of rendering her dangerously top-heavy—a factor that plainly contributed to her loss.

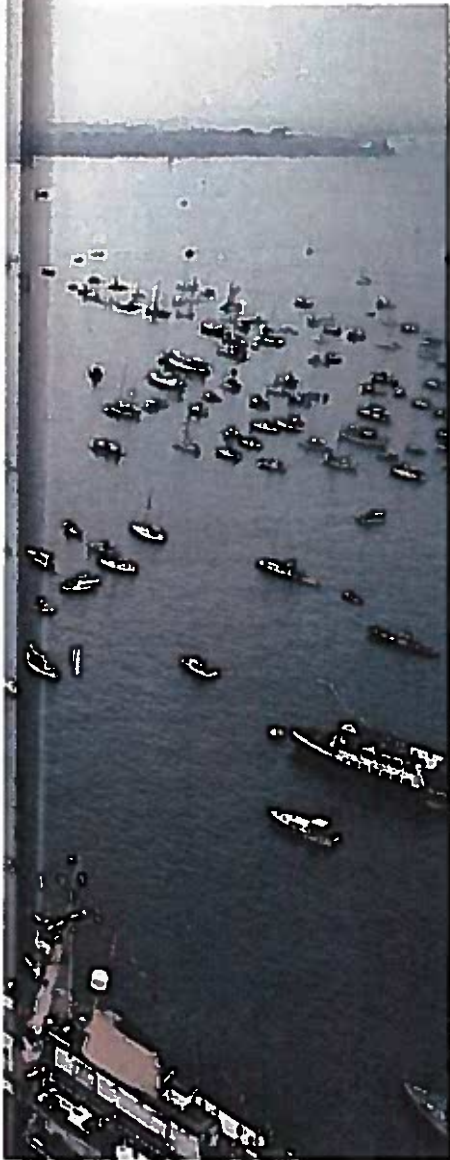
One of the richest finds aboard *Mary Rose* was a beautifully preserved barber-surgeon's chest. In the 16th century that title was used for one who practiced medicine,

surgery, and dentistry as well as barbering. The chest was a treasure trove of Tudor medical instruments and supplies. Its contents were so completely preserved that ointment in one of the small wooden jars still bore the surgeon's finger marks from his last application of the salve 437 years before.

In all, there were 64 items in the chest, including drug flasks, razors, a pewter bowl for bloodletting, a mortar and pestle, a chafing dish to hold lighted charcoal for cauterization, and the wooden handle of what probably was an amputation saw whose iron blade had rusted away.

Most of the instruments appeared simple but effective. A large brass syringe came complete with an eight-inch-long hollow

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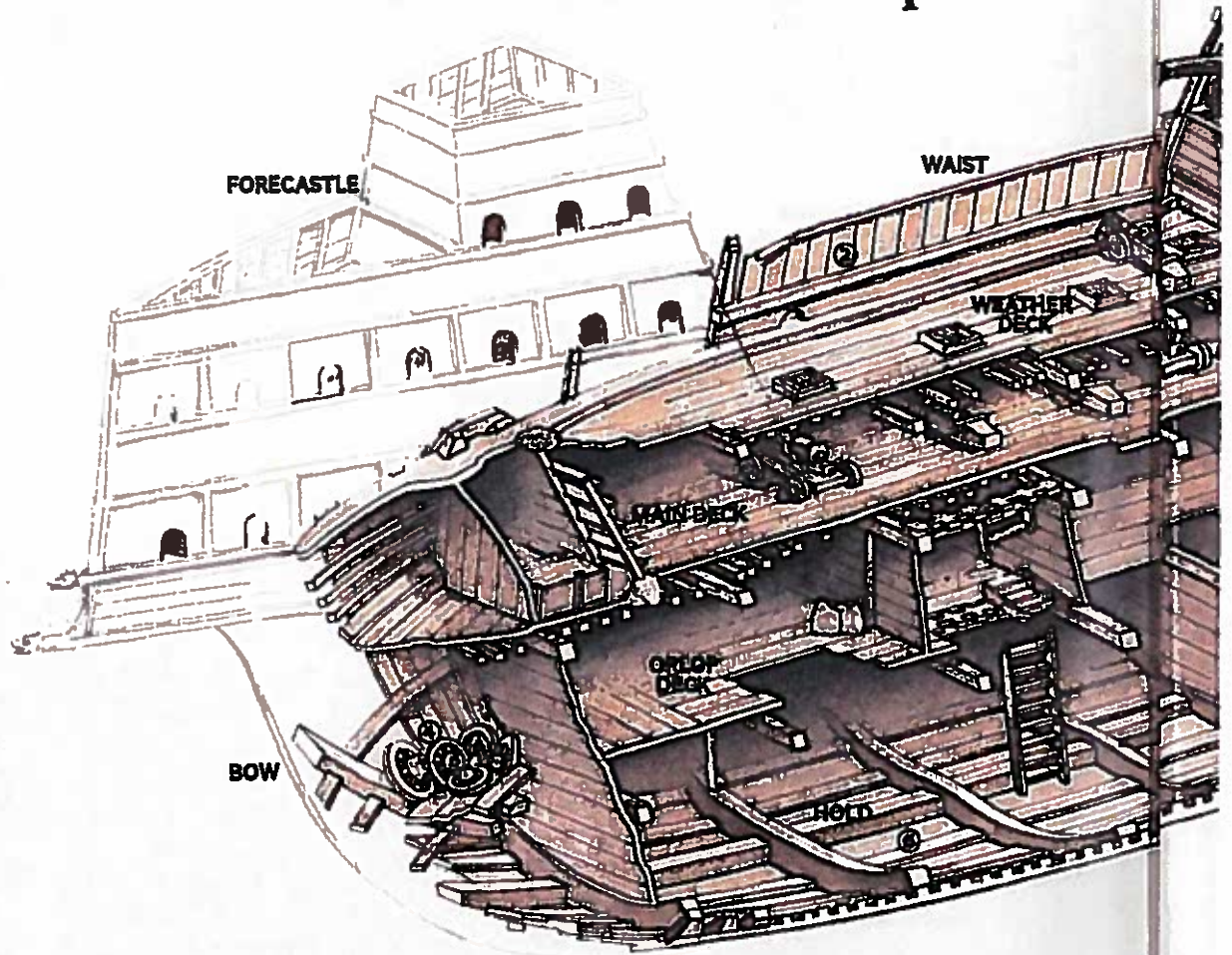


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Inside a Tudor warship



BUILT FOR FIGHTING, *Mary Rose* reveals her military design in an artistic reconstruction (above) of her sunken remains. Unlike earlier English ships sent into combat, she was more than a converted merchant vessel beefed up with a few cannon. From her lofty castles to her low-slung gun decks, she posed a variety of threats.

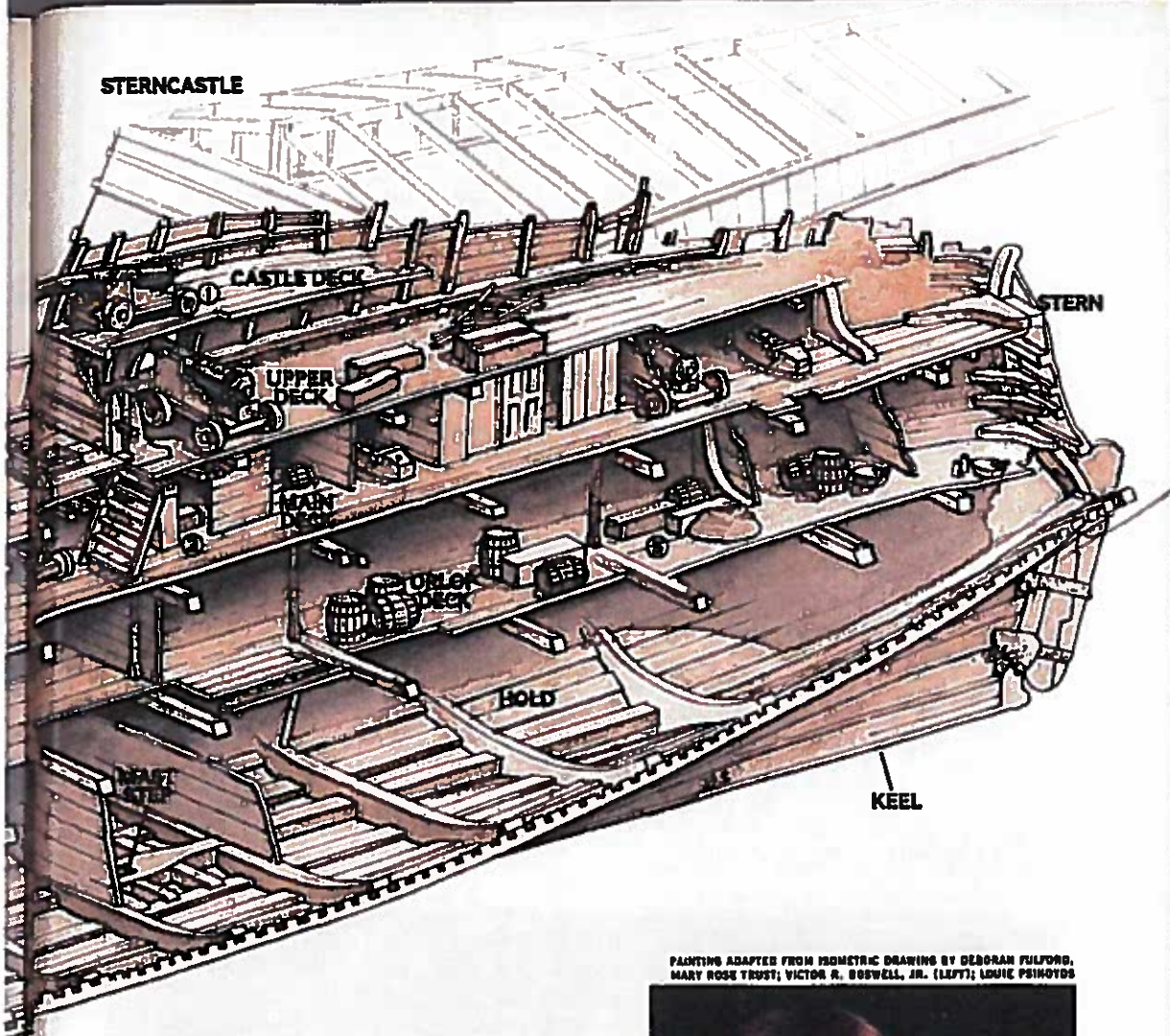
On the deck of her sterncastle, topmost of four decks that survived, a bronze gun (1) made by the Owen brothers stood prepared to bombard approaching ships. Soldiers armed with hailshot guns were stationed nearby to repel boarding parties.

Removable blinds (2) on the weather deck

protected the ship's archers, while wrought-iron cannon were run out through small semicircular gunports. A mix of bronze and iron guns—for long- and short-range protection—were lined up along the main deck, where a surgeon treated the sick and wounded in a small cabin (3).

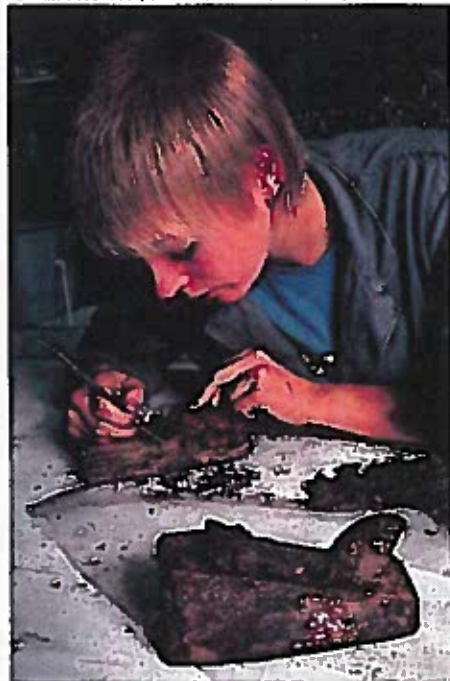
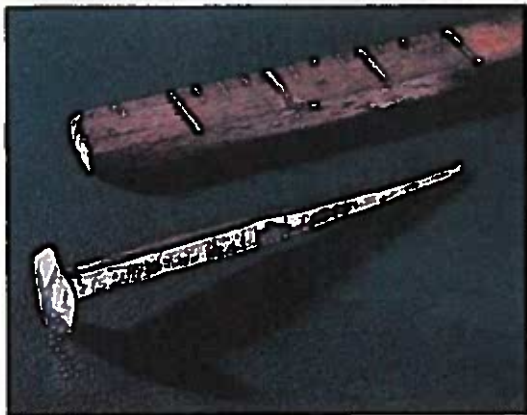
Great oak timbers stretched beneath the decks to support the extra weight of the large guns. Spare wheels for gun carriages (4) were stored in the forepeak and spare longbows in boxes (5) farther aft. Seriously wounded men were whisked below to mats in the hold (6), where their suffering would not demoralize the crew during the battle.

STERNCASTLE



PAINTING ADAPTED FROM ISOMETRIC DRAWING BY DEBORAH FULFORD, MARY ROSE TRUST; VICTOR R. BOSWELL, JR. (LEFT); LOUIE PSIMYOVS

Saved by accident from the effects of time, a Tudor nail (below) shines like new today because a workman dropped it into a caldron of tar four centuries ago. A ruler from the ship shows its size in inches. Wooden planes and other tools from the shipwright's cabin required more careful cleaning (right).



needle, to be inserted into the urethra for treatment of bladder stones or that age-old scourge of mariners, gonorrhea.

Other implements were more terrifying in appearance than in actual use. Prominent in the collection was a large wooden mallet employed in anesthetizing patients. The victim, however, was never struck directly on the skull. Instead he wore a protective metal helmet designed to absorb the blow and create a series of vibrations that were said to numb his brain. So far no one on our staff has volunteered to test the theory.

A seaman's chest contained one item that has altered our entire view of Tudor navigation. It was a beautiful magnetic steering compass, suspended on gimbals in a wooden case, the oldest so far found in northern Europe. The compass was no fluke, for we later recovered two similar ones from the ship.

Unlike the compass, many artifacts found aboard *Mary Rose* were known to have been in use on land during Tudor times. Their interest stems in part from the discovery that they were not only carried aboard ship, but in many instances were even commonplace at sea. We have found so many pocket

sundials, for example, that they appear to have been as popular in their day as our modern wristwatches (page 660).

One ingenious device rarely found ashore was apparently favored by Tudor naval officers. We recovered half a dozen so-called pistol shields, panels of laminated wood and leather, each pierced in the middle by a hole for a handgun. Above the hole was another aperture for use as a gunsight.

The pistol shields from *Mary Rose* were in excellent condition, though none was quite as elaborate as the shield I once saw among a collection ashore. In addition to the hole for the handgun the shield featured the Tudor version of a secret weapon—a candle stand on top for night combat.

Other items from the ship came as no surprise. Many seamen's chests contained a hand fishing line and bobber, doubtless for recreation as well as to augment the ship's fare. Yet the men aboard *Mary Rose* had eaten well by navy standards, judging from the samples of food we have recovered. There were remnants of fresh pork, bones of venison, beef, and mutton, and a variety of other bones yet to be analyzed, skeletons



BOHN BY VICTOR R. BOSWELL, JR.

of fish, fresh peas still in the pod, plum or prune pits, one of them with a dead mite still attached. Inevitably we found remains of those unwelcome diners aboard any ship, rats and insects.

Perhaps the most fascinating skeleton we recovered was a small one, that of a frog. It seems unlikely the creature was brought along for food—one frog hardly makes a meal—though it could have been a pet. My own guess, however, is that the frog was a backup for the ship's compass.

As late as the 19th century some sailors clung to the belief that if one dropped a frog in a barrel of water aboard a ship, the frog would automatically swim toward land, no matter how far away. Another superstition maintained that the frog was an instinctive barometer: If a storm was approaching, the frog swam at the bottom of the barrel; if good weather was on the way, the frog swam at the surface. Finally, there is the more likely but prosaic explanation: The frog was kept alive in a barrel of water on deck simply to ensure that the water was fit to drink.

In four years our recovery teams made a total of 30,000 dives on *Mary Rose* and

brought up more than 17,000 artifacts. The same teams gradually dismantled the interior structure of the hull, removing piece after carefully recorded piece and leaving only the massive 120-foot-long outer section to be raised intact.

THAT BREATHTAKING moment finally arrived at 9:03 a.m. on October 11, 1982, after months of the most meticulous planning and preparation. Early one morning before the raising, I made a final dive on the hull with my friend Christopher Dobbs. By then *Mary Rose* hung suspended by a network of cables attached to a giant lifting frame, ready to be transferred to a specially designed steel cradle.

In the near darkness Chris and I wriggled our way through the narrow space between the hull and the bottom, and I put my hands flat against the great planks. There was something immensely reassuring about the feel of them as the ship moved gently in the current, and I thought to myself, "*Mary Rose* can take it."

And so she did, with seemingly half of England and a good bit of the world on hand in Portsmouth to welcome her home (pages 670-71). Later she was transferred for study and reassembly to a dry dock within a hundred yards of where she had been built nearly five centuries ago.

We have only just begun to learn from her, and the process will go on for many years. My colleague Richard Harrison of the *Mary Rose* Trust plans a 70,000-square-foot museum in Portsmouth to house the hull and some 2,500 selected artifacts.

To me one of the greatest satisfactions is that, in the process of recovering *Mary Rose*, we trained literally hundreds of young volunteer divers, archaeologists, and conservators to be professionals of proven ability. Of their unique contribution Prince Charles recently wrote: "The only real way of understanding and coping with the present is, I believe, through an adequate knowledge and interpretation of the past. From that point of view we are able, for once, to transform a contemporary naval disaster into a victory in terms of human awareness."

I can think of no better epitaph for *Mary Rose*. □



*Held gently in the lap of the sea since the unlucky day the ship went down, an embossed leather book cover (far left) outlasted by several centuries the pages it once enclosed. Like others found in the wreck, it probably covered a prayer book. One may have been graced by a carving of angels (left) on its spine. Emblems of the crew's humanity, artifacts like these enrich our understanding of the men who perished so long ago on the king's warship *Mary Rose*.*