

ON THE
HUNT WITH
ALASKA WOLVES

NATIONALGEOGRAPHIC.COM/MAGAZINE

MAY 2004

NATIONAL GEOGRAPHIC

HEARTLAND

WHICH WAY FOR
THE GREAT PLAINS?



PLUS

EUROPE'S BIG GAMBLE

HANOI, THE SOUL OF VIETNAM

UNLOOTED GRAVE OF A MAYA KING

GOING DEEP WITH BOB BALLARD



Black Sea, 2003: explorer **Bob Ballard**



Mobbed by Turkish reporters, Ballard fields questions about his deep-sea expedition.

has never faced so many problems at once.

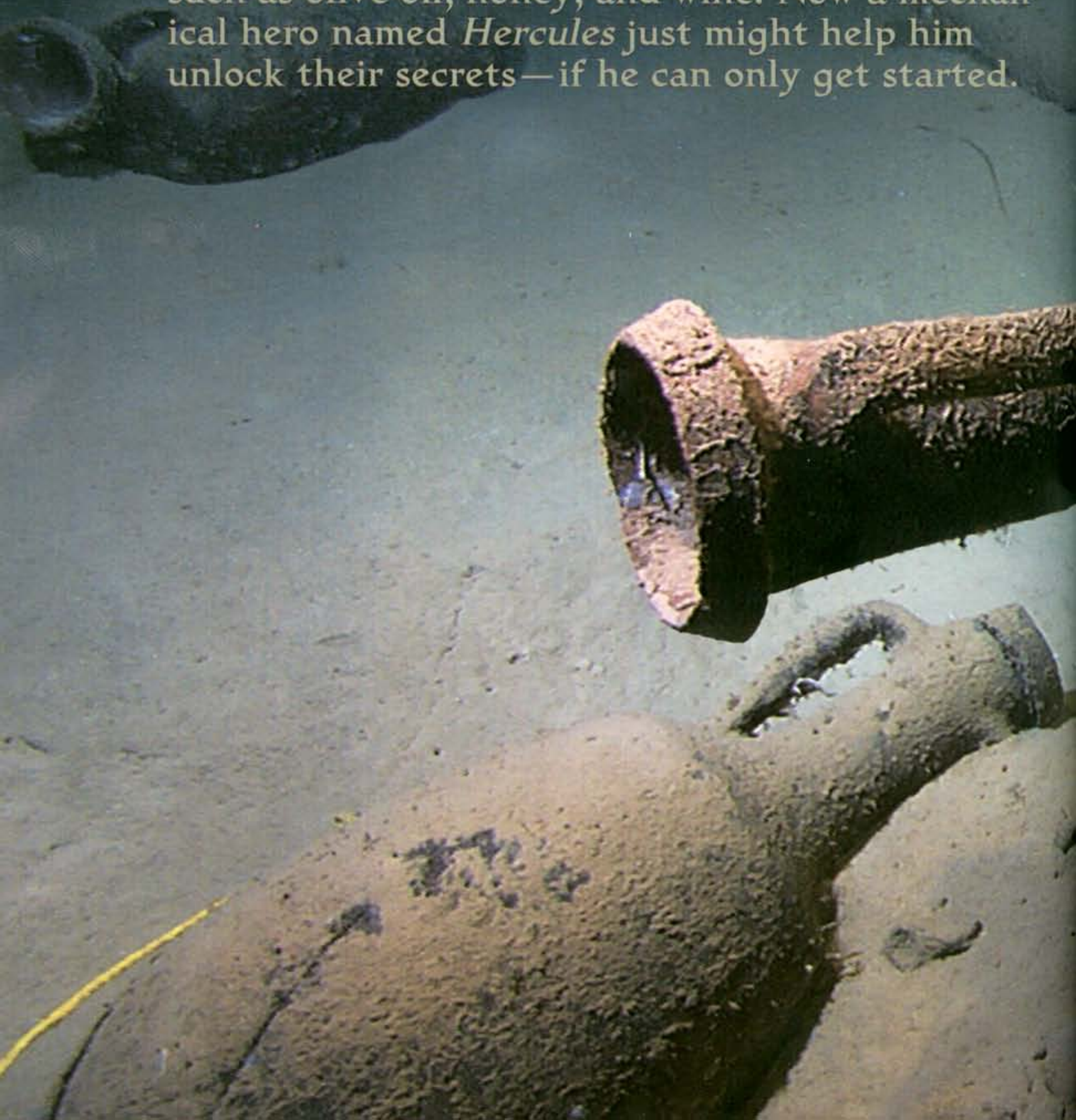


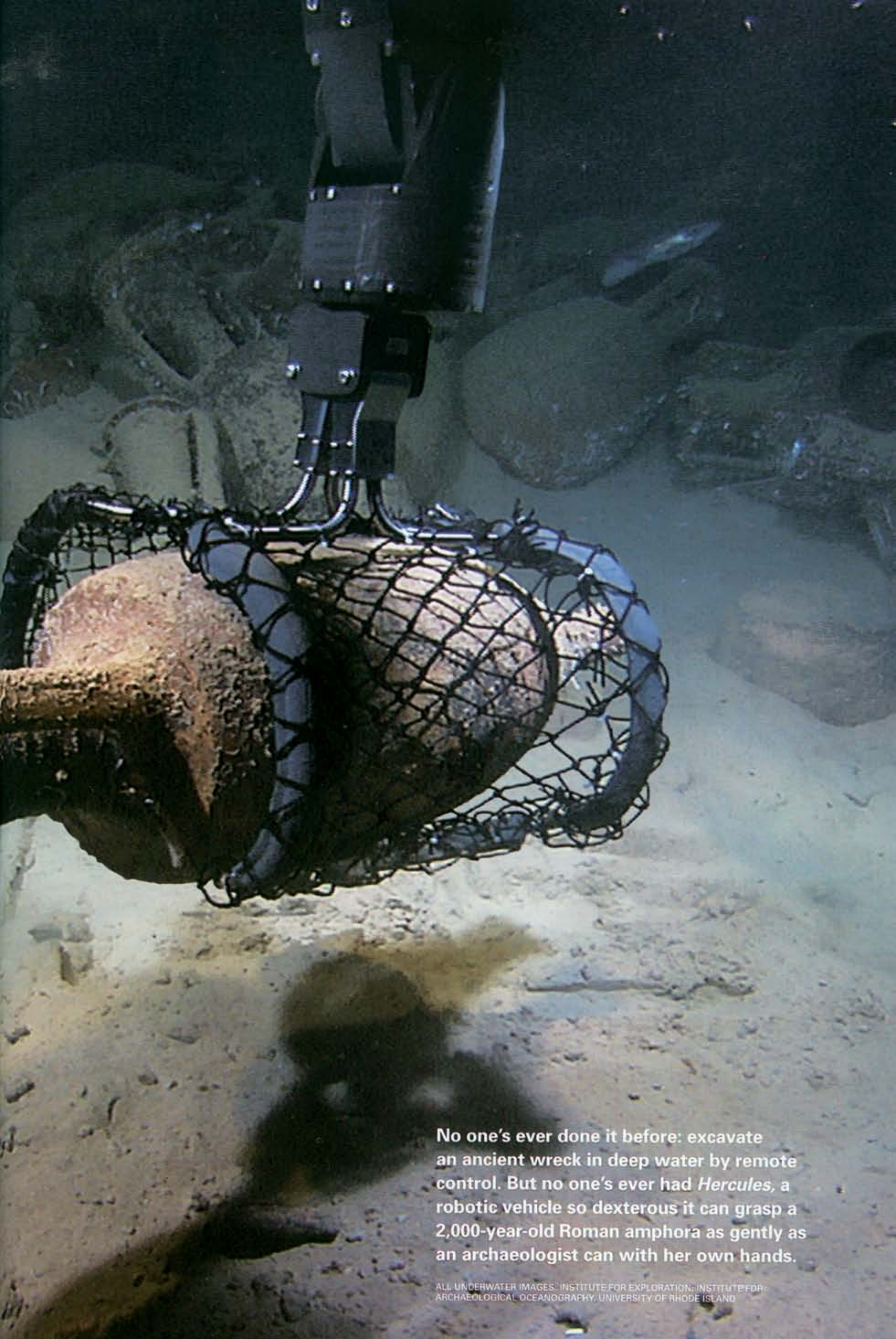
denied
permits
red
tape
dashed
hopes
media
circus
cash
crunch
ticking
clock

meanwhile, 1,000 feet below...

...ancient wrecks await

Ballard has known about these ships for years, vessels scattered across the Black Sea and the Mediterranean that once carried delicious riches such as olive oil, honey, and wine. Now a mechanical hero named *Hercules* just might help him unlock their secrets—if he can only get started.





No one's ever done it before: excavate an ancient wreck in deep water by remote control. But no one's ever had *Hercules*, a robotic vehicle so dexterous it can grasp a 2,000-year-old Roman amphora as gently as an archaeologist can with her own hands.

ALL UNDERWATER IMAGES: INSTITUTE FOR EXPLORATION; INSTITUTE FOR ARCHAEOLOGICAL OCEANOGRAPHY, UNIVERSITY OF RHODE ISLAND

BY PETER DE JONGE
PHOTOGRAPHS BY
DAVID MCLAIN

For the past 48 hours the 280-foot oceanographic research vessel *Knorr*, temporary if not harmonious home to some 30 engineers, scientists, and academics, as well as a rotating roster of friends and financial supporters, has been lashed to a pier in the northern Turkish city of Sinop, kept from its appointed mission by the lack of research visas. The American ship and crew have come to the Black Sea to investigate ancient shipwrecks, but the local media are skeptical. During the day packs of journalists scramble up and down the stone dock, aiming their cameras and questions at anyone on the deck within earshot.

“Why are you really here? Are you searching for oil? Are you on a secret mission for the U.S. military? Are you looking for Noah’s ark?”

Hundreds of residents, curious to see for themselves, stroll arm in arm to the waterfront in the lovely late July evenings to marvel at the great ship stuffed with high-tech wizardry bobbing in the bay of their historic walled city.

But for expedition leader Robert D. Ballard, who is spending \$40,000 a day on the project and is losing priceless research time—having invested millions in a state-of-the-art remotely controlled submersible, deep-sea high-definition cameras, and a futuristic high-bandwidth satellite communications system—there’s nothing magical about the nightly carnival on the dock.

“We’re bleeding to death,” he says. “We’re hemorrhaging money.”

Nor has this latest delay been the only setback of the summer. Ballard’s original itinerary called for testing his machines on a series of Greek and Byzantine wrecks off Bulgaria and Turkey before moving on to a pair of 2,700-year-old Phoenician wrecks off Egypt. But weeks earlier, just before the *Knorr* left its home port at Woods Hole, Massachusetts, complications in his negotiations with the Bulgarian Academy of Sciences forced Ballard to scuttle that leg of the cruise for now. Later, after the expedition was under way, Ballard would also get word that



Egyptian security had denied him permission to explore the Phoenician ships.

“Five years of wrecks have been taken off the table in weeks,” he says with a sweep of his arm.

For Ballard, a restless, 61-year-old oceanographer whose role models skew toward explorers and mountain climbers—“I believe in the Hillary approach,” he says, “climb the mountain, plant the flag”—the only thing worse than the wasted money is the diminishing prospect of realizing a personal dream. This is the summer Ballard intended to plant the flag for a new multidisciplinary approach in which the worlds of maritime archaeology and oceanography would merge. Ballard’s plan calls for remotely controlled vehicles to

■ SOCIETY GRANT

This Expeditions Council project was supported by your Society membership.



carry out the careful excavation of deep-sea wrecks, and for their activities to be broadcast live via satellite to scholars and students back on the beach over Internet2, the next-generation network not yet available to the public. Once the kinks are worked out, research vessels laden with ROVs would begin systematically searching the deep for wrecks of antiquity.

If Ballard were a patient man, he would never have accomplished half of what he has. But this is especially exasperating. After raising the necessary funds and recruiting brilliant engineers to design and build his advanced hardware, here he is, twisting in the wind on a Turkish dock, thwarted by the lack of an official seal on some paperwork.

Then again, Ballard, whose detective grandfather was killed in a gunfight in Wichita,

held at bay

The research vessel *Knorr* idles in Sinop, Turkey, awaiting permissions while expedition members visit a café (above). Ballard stays aboard to avoid local reporters (below). When he finally holds a press conference, they ask, "Is it true you're here for oil?" "Yes," Ballard says, "1,500-year-old olive oil!"



Kansas, has always relished the pressure of working on a new frontier. On this same ship in the North Atlantic in 1985 he was down to the last days of a search when a tethered imaging sled called *Argo*, dangling on a cable 12,000 feet down, passed over debris from *Titanic*. He was fighting against time again when he found the German battleship *Bismarck* in 1989, the U.S. aircraft carrier *Yorktown* in 1998, and JFK's *PT 109* in 2002. And during a dive in a bathyscaph 9,200 feet below the surface in 1973—in which he and two others survived an electrical fire—he became only the second scientist to observe the mysterious Mid-Atlantic Ridge, helping to prove the theory of plate tectonics.

Through a combination of imagination, persuasion, and nerve, with support from the military, Ballard has pulled off the enviable feat of

doing pretty much exactly what he's wanted to for 40 years. As an officer in the Navy he convinced the chief of naval operations that the same technology he was developing for exploration and science could be applied to deepwater military operations. As a result, the Office of Naval Research helped fund the development of his early ROV systems. The Navy also assigned him to conduct classified missions such as mapping and videotaping the lost U.S. nuclear submarines *Thresher* in 1984 and *Scorpion* in 1985—allowing him to piggyback his search for *Titanic* on the *Scorpion* mission.

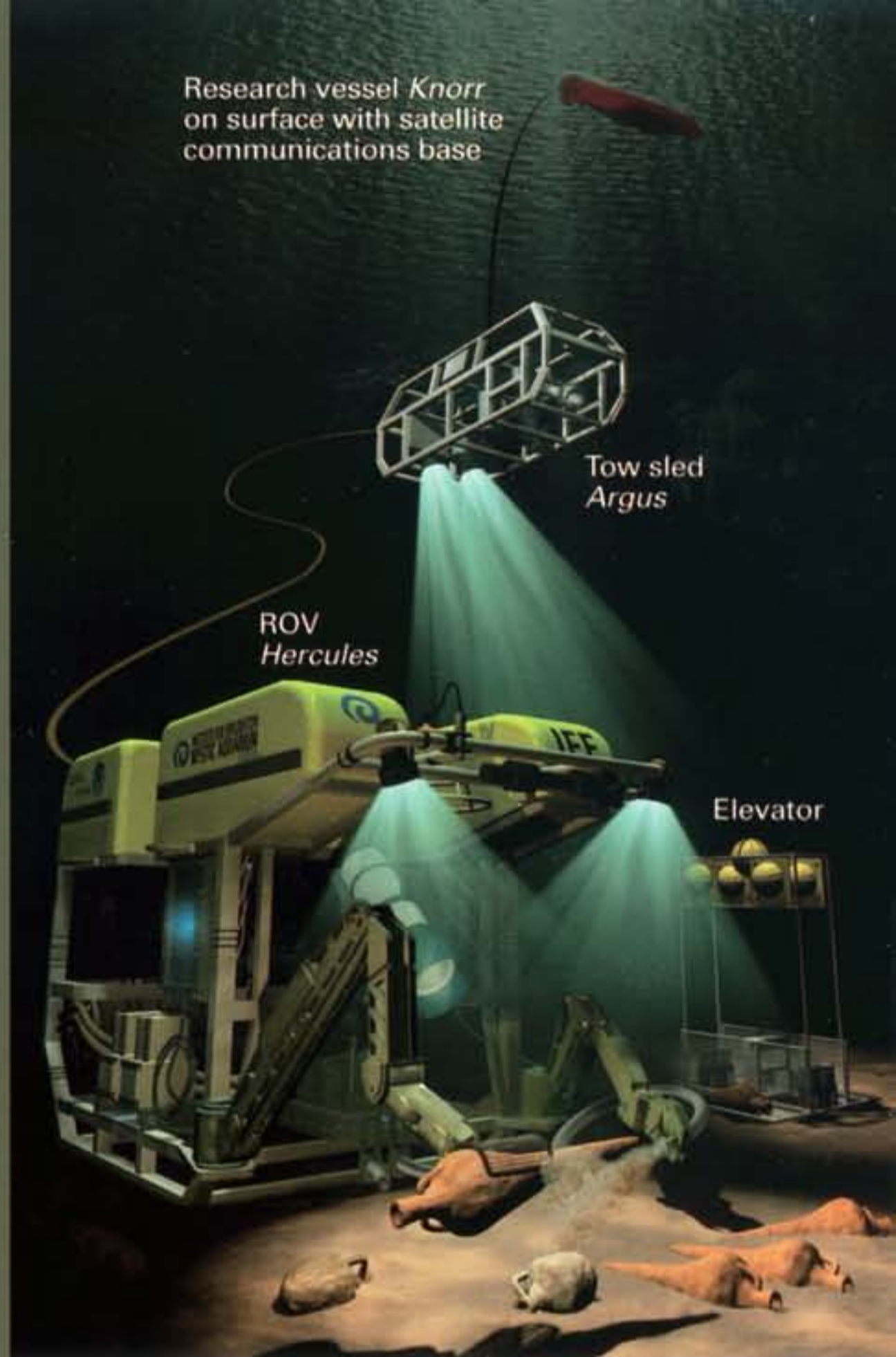
Now that those secret military operations are a matter of public record, you can hardly blame the media in places like Turkey and Egypt for wondering what Ballard might be up to when he sails into their waters in a vessel bristling with



advanced electronics. This time not even the U.S. State Department can help him.

Luckily for Ballard, however, the local security chief and provincial governor in Sinop are also creative problem solvers, persuading the Foreign Ministry in Ankara to issue a waiver for the research visas. At the same time, customs officials declare everyone on board a temporary resident of Sinop—for a modest fee of \$150 a head. After Ballard gives the governor a courtesy tour of the ship, the *Knorr* finally escapes the pier and steams out of the bay.

Within hours the ship is on station off the Turkish coast and the crew prepares to lower *Hercules*, Ballard's bright yellow refrigerator-shaped ROV, over the side to check out a target called site 82. Three



high-res research

Ballard found the wreck-rich areas in the Black Sea and Mediterranean on previous expeditions. Now he had the technology (above) to do them justice, including tow sled *Argus*, which carries lights and cameras, and an elevator platform that ferries finds up to the research vessel *Knorr* to free *Hercules* for more important work.

Most exciting: the project's "telepresence," providing real-time transmission of high-resolution seafloor video to both the *Knorr*'s control console (left) and—via satellite and ultra-high-bandwidth

Internet2 connection—to U.S. scientists some 6,000 miles away. Ballard first envisioned such remote imaging in 1981. "It's 'you are there' technology," he says, "without you being there at all."



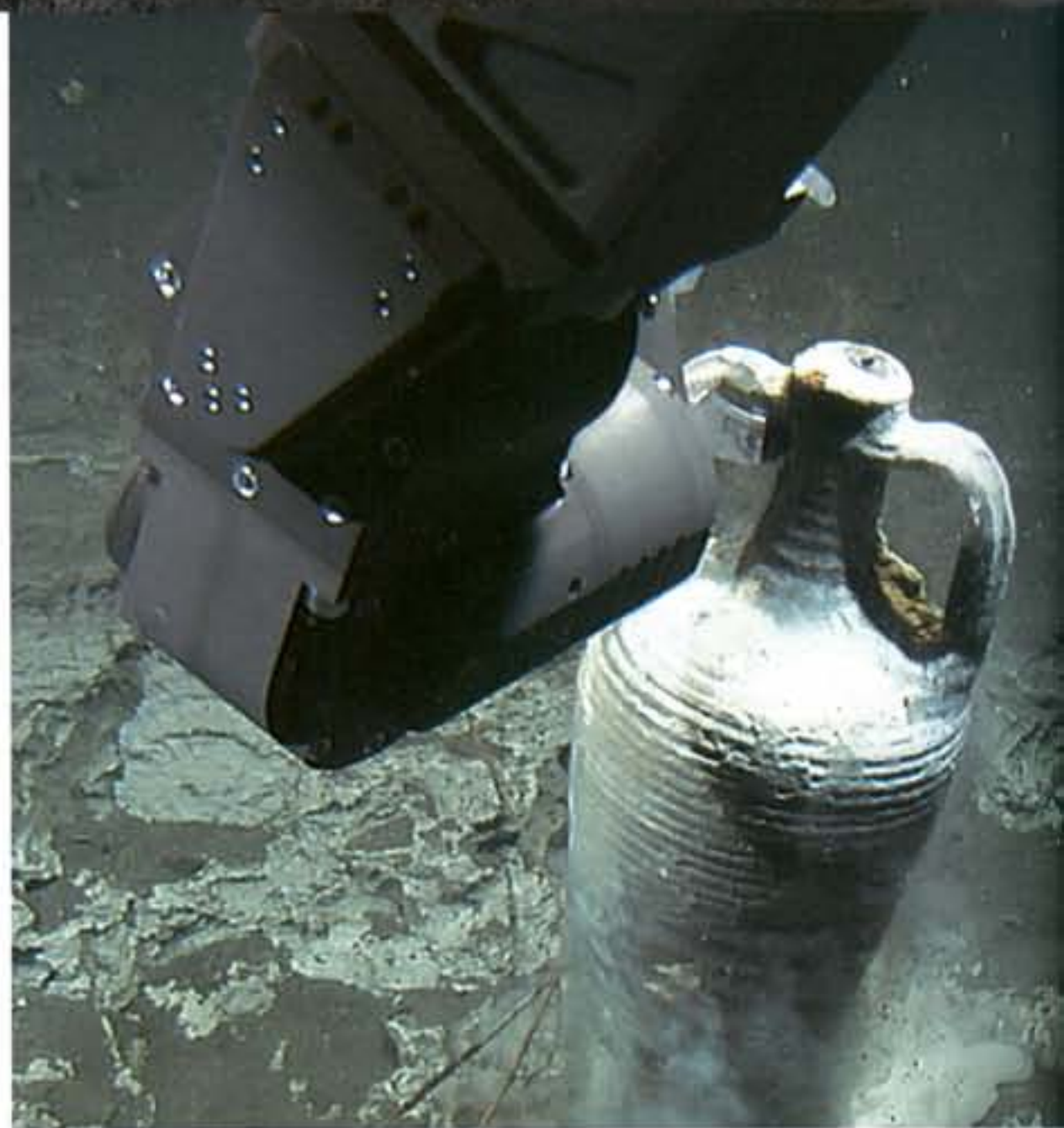


summers before, Ballard and archaeologist Fredrik Hiebert of the University of Pennsylvania Museum had discovered stones in a rectangular pattern here, speculating that they might belong to a dwelling dating back 7,000 years. That was the era when some scientists believe the Mediterranean breached the Bosphorus and, in a flood of biblical proportions, turned what had been a freshwater lake into the Black Sea. Now they are looking for further proof.

On the aft deck, mechanical engineers Todd Gregory and Sarah Webster, both blond and twentysomething, buzz around the decal-festooned *Hercules* like a NASCAR pit crew. Webster makes last minute adjustments on the clear Lexan tubes that will be used to take samples of the bottom, and Gregory, who is also a pilot of the ROV, does a quick check of the vehicle's \$150,000 manipulator arm.

Twenty feet away behind the closed doors of the deck lab, the expedition's computer brain-trust, an unnerving percentage of whom have Ph.D.'s from MIT, hunch cheek by jowl over their laptops, testing and tweaking the ever evolving software that will help navigate the ROV, spit out maps, and organize reams of data. Dana Yoerger, head of the Deep Submergence Lab at Woods Hole Oceanographic Institution, which helped develop *Hercules*, and David Mindell, a 37-year-old MIT professor and inventor of a narrow-beam sub-bottom profiler that can survey wrecks buried a few feet deep below the seafloor, are sitting back to back.

"Everybody here in almost every billet is about as good as you can find," says Yoerger, a veteran



of 14 Ballard expeditions. "If they're not the best in the world at what they do, they're number two or three." At the other end of the room, Hiebert and his research assistant, Julie Hanlon, ready the makeshift lab where the core samples will be processed and analyzed.

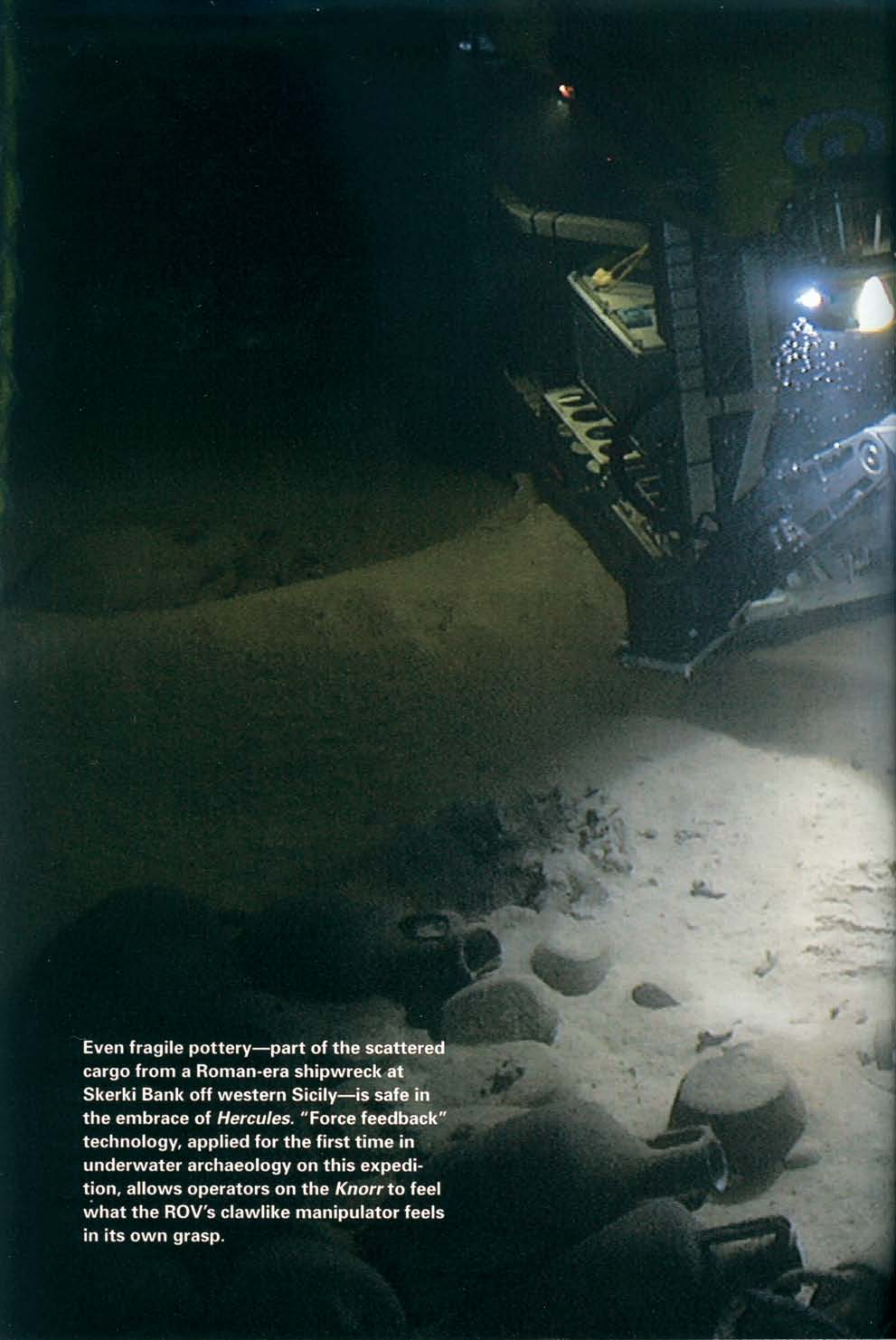
While the engineers and academics scurry on the deck like cerebral galley slaves, Ballard sits directly above them in his million-dollar control room, a headset resting rakishly atop his brown expedition cap. Now that the work is finally under way, he evinces a manic glee, alternately belting out Sinatra's version of "On the Road to Mandalay" and Allan Sherman's "Hello Muddah, Hello Faddah."



labors of *Hercules*

A thousand feet beneath the Black Sea in a zone starved of oxygen, a thick frosting of silt covers a 1,500-year-old shipwreck, barely hinting at what lies beneath. Transmitting continuous images to scientists on the *Knorr* as it explores the early Byzantine wreck, *Hercules* vacuums away centuries of sediment (top left) to reveal a shipwright's rough adze marks (above). The ROV's mechanical "hands" apply the precise amount of pressure needed, from gently lifting an amphora (left) to spinning a paintbrush car wash style (below) against a jutting beam. Says nautical archaeologist Cheryl Ward on board the *Knorr*: "This is the best preserved shipwreck from the ancient world."





Even fragile pottery—part of the scattered cargo from a Roman-era shipwreck at Skerki Bank off western Sicily—is safe in the embrace of *Hercules*. “Force feedback” technology, applied for the first time in underwater archaeology on this expedition, allows operators on the *Knorr* to feel what the ROV’s clawlike manipulator feels in its own grasp.



Flanking him at the cherry-finish console, facing a wall of 50-inch flat-screen plasma monitors, are two of Ballard's personal guests: Jack Orben, an investment adviser from New York, and Garry Weber, a counterpart from Dallas who starred on the gridiron at SMU before making a killing in stocks. As they follow the action on the monitors, *Hercules* makes a gentle landing on the rocky bottom about 300 feet down at site 82. Reaching around its side with the manipulator arm, *Hercules* plucks one of the tube cores from a holster made from a milk crate and attempts to push the tube into the sea-floor. As the tube bumps against the bottom, the pilot operating *Hercules*, seated on the other side of the control room, can actually feel the resistance through the joystick in a technological advance called "force feedback."

The goal is to collect a sample from about seven inches down, where researchers hope to find signs of ancient habitation. But the rocks and shell hash on the ocean floor prove too tough for the cylindrical cores to penetrate cleanly, and so the team switches to a different instrument to sample sediment lying on top of the bedrock. Before leaving the site, they also collect a log and a stone block for later analysis.

Next the expedition drops in on two early Byzantine shipwrecks, where the team retrieves sample amphorae and maps the sites using the high-definition cameras. Then it's on to the deep-water prize, a sixth-century Byzantine cargo vessel, dubbed wreck D, which has lain waiting in the soft mud for 1,500 years, its mast still standing as if the ship has just gone down. Excavating a deep ancient wreck by remote control has



never been attempted, and on the evening when Gregory, flanked by Webster and Cheryl Ward, a nautical archaeologist from Florida State University, tilts his joystick forward and sends *Hercules* on its descent, space in the darkened theater of the control room is standing room only.

“If I knock over the mast,” Gregory tells the hushed throng following the action on the monitors like sci-fi pay-per-view, “I apologize in advance.” This amuses his colleagues, but not Huseyin Vural, the anxious 28-year-old from the Turkish Ministry of Culture charged with safeguarding his country’s heritage.

Gingerly sidling *Hercules* up to the 39-foot-long wreck, Gregory activates a sophisticated water jet and suction device on the ROV designed by Webster and named Snuffleupagus—after the woolly mammoth-like *Sesame Street*



by the time Ballard realizes one vision, he's already hatch- ing the next

A sailor with a farmer's tan, Ballard cools off (left) in a deck-top tank. Once the *Knorr* is on site, such relaxation is rare. To make the most of every minute on the seven-million-dollar expedition, six teams of operators worked four-hour watches round the clock to keep *Hercules* busy. On this, its Black Sea shakedown cruise, the ROV collected 3-D sonar data for each wreck and excavated a few amphorae for later analysis. Conservator Dennis Piechota (above) prepares the artifacts for transport to the Sinop Museum.

character—and *Hercules* begins snuffling the gelatinous muck off the amazingly well-preserved wood. If the ROV kicks up too much mud, obscuring Gregory's view, he can still operate acoustically, using three-dimensional ultrasound sensors on *Hercules* to peer through the dark. This time they aren't needed.

"Sarah designed her nozzle so well it sucks up the dirt as soon as it's dislodged," Ballard says. "It's absolutely elegant, like watching someone play a musical instrument."

Eventually a large stash of amphorae comes into view, 15 centuries falling away like magic. As Ballard has hoped, the level of preservation provided by the anoxic layer is such that you can still see the beeswax splatter formed when the jugs were sealed on an ancient dock. Indeed, every key facet of the operation, from the

surgical delicacy of *Hercules*' mechanical arm to the movie-set lighting provided by the trailing sled *Argus* to the dazzling clarity of the high-definition images broadcast live via satellite, has unfolded pretty much as Ballard envisioned 22 years before in the December 1981 issue of NATIONAL GEOGRAPHIC.

Watching the big plasma screen is like looking out the window of the *Nautilus* in Jules Verne's *Twenty Thousand Leagues Under the Sea*, the science fiction classic that inspired Ballard as a boy to dream of peering into the deep. And yet on this night Ballard is the least transfixed spectator in the room. Sitting in the back with Jack Orben, he fidgets and jokes like an unruly student disrupting his own class.



It's not just the glacial pace of the fieldwork that has him crawling the walls. For Ballard, a compulsively restless visionary, the present itself holds scant interest. By the time he realizes one vision, he is already hatching the next one or the one after that. Even as *Hercules* makes archaeological history, performing the first remote excavation of a deepwater ancient wreck, Ballard, at least in his head, has already moved on.

In any event, the clock has run out for the work at wreck D. Because of the days lost in Sinop, when the *Knorr* was tied up in red tape, Ballard now has no choice but to blow the whistle on his team just as they're hitting full stride. Over the objections of several researchers, who plead for additional time to keep excavating, Ballard orders the *Knorr* to leave the Black Sea on schedule and head for Istanbul, where a new



if Ballard were a patient man, he wouldn't have accomplished half of what he has

"Every twitch of my hand gets amplified by *Hercules*' arm down on the wreck," says ROV engineer and pilot Dave Wright, who steals a moment to stretch (left). Like many on board, Wright is a veteran of Ballard expeditions. "Bob's mellowed," he says—though perhaps not as much as a yoga pose on the galley floor suggests (above). "He throws out a million ideas a second for us to work on, then comes back later with brand new ideas."

group of researchers and a National Geographic film crew are waiting to come aboard.

Even now Ballard is still hoping for permission to work on the Phoenician wrecks. But when that doesn't come by the time the *Knorr* leaves Istanbul, he decides with National Geographic on a backup plan. Instead of sailing south toward Egypt, the expedition will head west toward Sicily, where six years earlier Ballard had discovered a string of Roman-era wrecks in deep water just north of a submerged reef called Skerki Bank. There the team can put *Hercules* through its paces on the harder clay of the Mediterranean, researchers can survey the area to determine why so many vessels wrecked there, and the film crew can document it all.

It's the kind of decision in the field only Ballard would make. Juggling the aspirations and abilities of his research team with the goals and demands of his sponsors, Ballard is constantly generating options, which is his way of ensuring that no setback will cost him too much. It's a pattern he's followed in his own career as well, never allowing any agency or institution to gain too much leverage over him, whether it's Mystic Aquarium in Connecticut, home of his Institute for Exploration, or the University of Rhode Island, where he recently established the Institute for Archaeological Oceanography, or the National Geographic Society, where he is an explorer-in-residence. If his latest proposal to one organization doesn't succeed, there's always another to back him up.

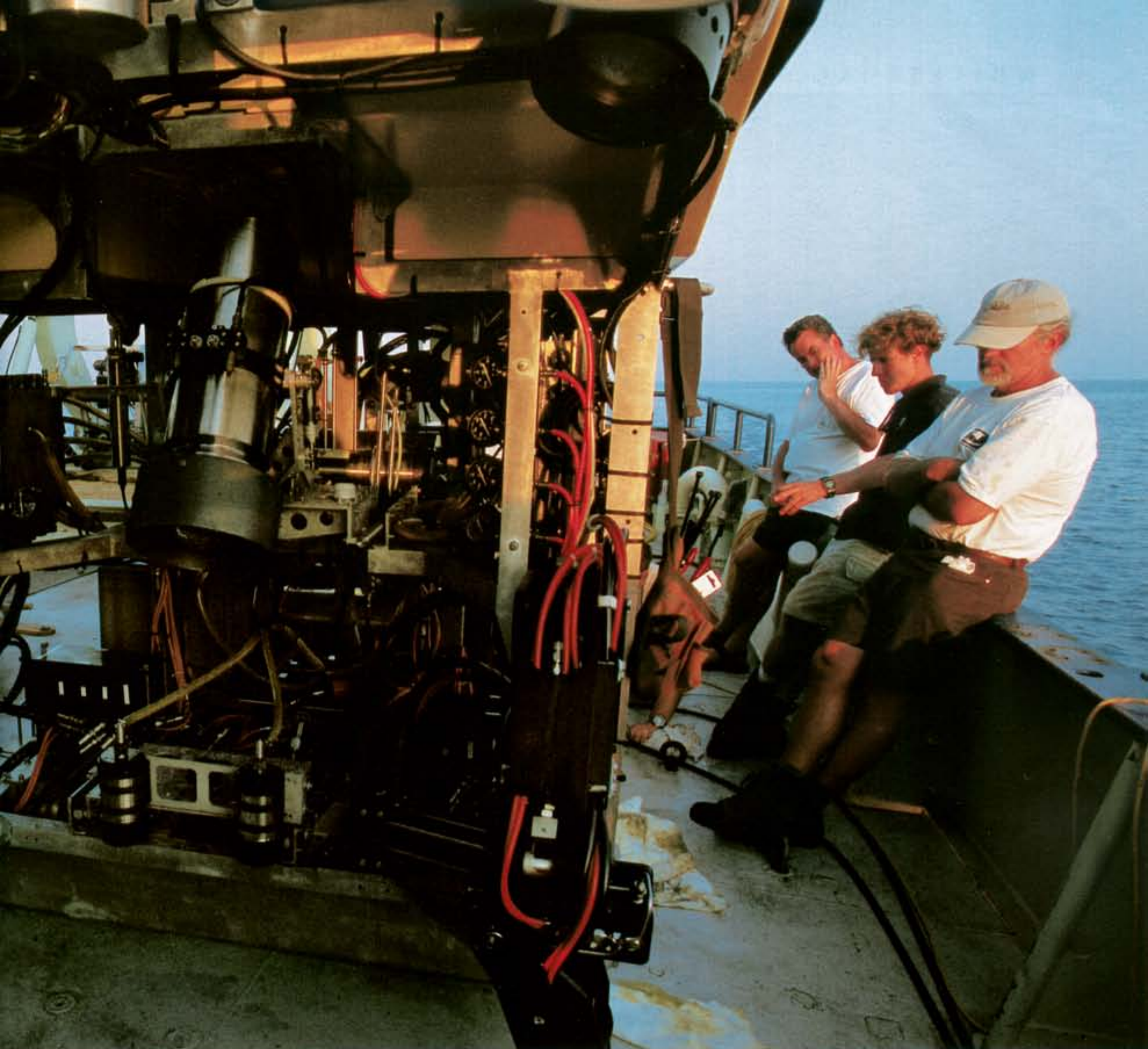
Exploring the Roman ships might have provided Ballard's team with yet another high-tech coup and even redeemed their high hopes for the summer, but they wouldn't get the chance. Soon after *Hercules* slips into the Mediterranean, its main hydraulic pump fails. A replacement pump is personally escorted from its manufacturer in Vancouver, but less than a day after *Hercules* is put back in the water, the ROV fails again. Using *Argus* and a smaller ROV, the team spends two days imaging a pair of wrecks, doing some filming for the TV crew, and surveying the Skerki Bank for new targets. But the momentum is gone, and Ballard announces the cruise is over. Some expedition members see the broken pump as another example of the bad luck that has dogged the *Knorr* all summer. Others feel it was lucky that the barely tested *Hercules* held up as well as it did.



In the end, the summer has turned out to be a sobering one for Ballard. For all the successes of his latest technology, his grand plan to excavate shipwrecks of antiquity in the deep sea has gotten off to a rocky start. In countries where he or his researchers have worked before, officials have suddenly thrown up barriers. Permission to work in Bulgaria: postponed. Permission to work in Turkey: delayed. Permission to work in Egypt: denied.

To some Ballard observers—especially more traditional academics who question his expensive, high-tech, media-savvy approach to archaeology—such problems are the result of an inevitable clash between Ballard's full-speed-ahead style and increasingly strict demands of governments on all marine archaeologists.

To Ballard, on the other hand, this summer's



difficulties reflect a broader shift in global political realities after the war in Iraq.

"As a result of the war there's a new landscape and it's going to affect my thinking about where we do future research," he says a couple months later. "Clearly the world has changed."

Then again Ballard, whose best ideas tend to be about 22 years ahead of their time, is accustomed to sailing upwind. He's already scheduling expeditions through 2005 and beyond, including plans to send *Hercules* and the other ROVs twice as deep as originally designed. For Bob Ballard the fun's just getting started. □

broken dreams

***Hercules'* hydraulic pump failed soon after arrival at Skerki Bank. One costly repair and a few precious days later, it failed again (above). The team's work done for now, Ballard (below) breaks the news: The expedition that started late would end early. "Some cruises," he says, "are more painful than others."**

WIRED TO THE HILT: That's how photographer David McLain describes the research ship *Knorr*. Get the behind-the-scenes scoop on high-tech triumphs and failures in a multimedia interview at nationalgeographic.com/magazine/0405.

