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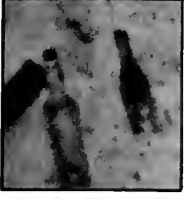
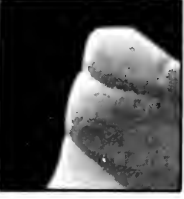
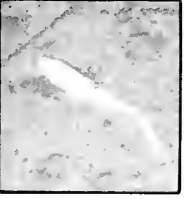

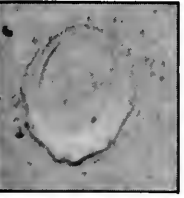
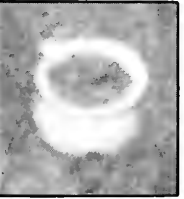
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Preface:

An Ocean of Revelations

by Edward S. Kamuda

It had been more than 73 years since man cast his eyes on the Royal Mail Steamer *Titanic*, once the pride of the White Star Line. The very last impression of the ship in the minds of the 705 survivors on that cold April night in 1912 was of the liner's stern, lifted out of the water and pointing to the star-strewn heavens. Internal lights grew pale, flickered out for a brief few seconds, and came on again. Then blackness ensued, followed by a horrendous rumble as machinery, cargo, furniture, and people still on board tumbled down into the sea. The stern sank back slightly, and the great ship slid gracefully into the ice-strewn ocean, leaving only a wisp of grey smoke, and a calm sea littered with debris, lifeboats, and more than 1,500 drowning souls.

With the completion in 1912 of the U.S. Senate and British inquiries into the cause of the disaster, the story of the *Titanic* was over for most people, except for those sizable numbers who would relive the tragedy in films and books over the years, and of course, for those who had lost loved ones. However, the story was also not over for those with an engineering bent.

An new argument began about what became of the ship once she slid below the surface. There were few answers, as little information was available about the ocean at such depths. Engineers expressed greatly different theories. Some thought the liner leveled off at "approximately 1,000 feet below the surface" and then turned on her side "as a leaf falls" and hit the ocean floor at a moderate speed of "15 feet per second," "probably damaging her superstructure," with masts and funnels snapping off in the process.

Others surmised that the liner broke in two, and slammed into the seabed at a speed of 100 miles per hour, causing enormous damage. Still others believed that the ship nose-dived into the thick mud of the North Atlantic seafloor, burying a third of the ship, with the rest of the liner standing up at a nearly perfect 90-degree angle. Only a few guessed that the ship landed on the seabed on an even keel, gently, and would be found in pristine condition.

Now, 73 years later, thanks to the scientific expedition mounted by Dr. Robert Ballard of the

Woods Hole Oceanographic Institution, and the French Government, the complex details of the *Titanic's* final moments as well as her present condition, can be answered with more than an "educated guess."

One of the first photographs to be released revealed a ship's boiler resting in the gravel-like seabed. It immediately answered one question involving the destruction of the *Titanic*. Those who argued that the ship's boilers rumbled through the ship, possibly exiting from the liner's hull had been scoffed at over the years. "The ship's hull and interior were too well built to allow that to happen," was the argument. That sobering photograph gives us a different answer.

But there were more surprises as each new photograph was released—silent testimony to the splendor of the *Titanic*: a silver serving tray beside the ship; bottles of fine wine unbroken—labels still affixed; luggage seen through a hole in the side of the liner; and two funnels still standing on the ship's boat deck.

Even more surprises emerged from the discovery—the stern lies more than 200 feet from the liner, twisted and bent, the deck cranes smashed and strewn about. Further examination should reveal how and why this occurred. The forward mast, containing the crow's nest where lookouts Frederick Fleet and Reginald Lee spotted the deadly iceberg, now rests against the liner's bridge (see back cover).

Each new photograph produced, each new fact revealed, gives one more of an appreciation not only of the *Titanic* herself and the building technology of the time, but also of the inventions of this modern day—robot cameras and equipment created for the exploration of the great oceans of the world.

The *Titanic* died in 1912 as an instrument of transportation, but today she continues to expand man's knowledge of the ocean. Let us give thanks to all who took part in this great scientific drama for sharing with us this ocean of revelations.

Edward S. Kamuda is Secretary and Co-Founder of the Titanic Historical Society.

Introduction

by Robert D. Ballard

My desire to search for the *Titanic* goes back many years, to about 1973, when the decision was made at Woods Hole to replace *Alvin's* original steel hull with a new one made of a titanium alloy. Such a conversion would increase its diving range from 6,000 feet to its present operational range of more than 13,000 feet, making it possible to reach the *Titanic's* estimated depth.

Preparing for the search took many years of hard work and involved several false starts. As time went on, my interests turned away from manned submersibles towards unmanned vehicles. Ultimately those interests began to focus on the *Argo* vehicle system, which I became more and more convinced was a necessary next step in exploration technology for our continued research in the deep sea and, more specifically, on the Mid-Ocean Ridge. Initially, I had hoped the *Titanic* program might help our laboratory to raise the funds to build *Argo*. That proved unsuccessful, and, after several attempts, the *Titanic* faded into the background while all our energies went into developing *Argo*.

By 1980, we had convinced the U.S. Navy to provide funds to develop *Argo*, not to search for the *Titanic*, but to assist them in their own search programs and to develop a fundamentally new approach to scientific exploration in the deep sea. The *Argo* program stresses visual imaging instead of more conventional acoustic imaging techniques.

From 1980 to 1983, it was difficult to sit on the sidelines and watch as other attempts were mounted to search for the *Titanic*. The failure of those efforts clearly illustrated that finding the *Titanic* was a more difficult undertaking than anyone had suspected. Distinguished researchers from the Scripps Institution of Oceanography and the Lamont-Doherty Geological Observatory had used excellent search equipment and had not succeeded. Watching their efforts convinced

me that the key to discovering the *Titanic* lay in having sufficient time on target to conduct a thorough search of an area of 100 to 150 square miles.

By 1985 we would have the technology necessary to search for the *Titanic* and approval from the Navy and the Woods Hole Oceanographic Institution to test *Argo* in the area where the *Titanic* sank. But that limited test period was not enough to insure success. For that reason, I turned in 1983 to an old friend, France, and more specifically Claude Riffaud, Jean Jarry, and Jean-Louis Michel—long time friends from the days of Project FAMOUS (French-American Mid-Ocean Undersea Study). These men I knew and deeply respected. We had worked together in 1973 and 1974 on man's first investigation of the Mid-Atlantic Ridge using manned submersibles. These were men of the deep who would find the *Titanic* an exciting technological challenge and at the same time, a human adventure. I went to Paris and arranged to have dinner at Claude Riffaud's apartment. Claude invited Jean Jarry and the new head of IFREMER (*Institut Français de Recherches pour l'Exploitation des Mers*), Yves Sillard who accepted the *Titanic* challenge. The rest is now history (see page 16).

Now that the *Titanic* has been found and photographed, my greatest desire is to take *Argo* back to sea off the coast of Mexico and conduct our first scientific program, looking at recent volcanic activity and hydrothermal vent fields on the East Pacific Rise. If all goes as planned, we should be at sea doing that work as this issue of *Oceanus* is being read.

Robert D. Ballard is a Senior Scientist in the Ocean Engineering Department at the Woods Hole Oceanographic Institution, and head of the Deep Submergence Laboratory in the same department. He and Jean-Louis Michel of IFREMER were co-chief scientists aboard the R/V Knorr's cruise that discovered the Titanic.

The *Titanic*: Lost & Found (1912–1985)

We have fed our sea for a thousand years
And she calls us, still united,
Though never a wave of all her waves
But marks our English dead;
We have strawed our best to the weeds unrest,
To the shark and the sheering gull.
If blood be the price of admiralty,
Lord God, we ha' paid in full.

—Rudyard Kipling

by Paul R. Ryan

The foundering of the “unsinkable” *Titanic* on her maiden voyage in 1912 served notice that man’s technology—then as now—is not invulnerable to the forces of nature, be they in the form of ice, wind, or fire. The steel-plated, four-stack vessel was enormous and extravagant, some would say too big and too lavish—four city blocks long and eleven stories high. Men standing beneath her giant propellers in the Belfast yard where she was built appeared hardly bigger than barnacles. And her appointments—a Gilded Age facade even down into steerage class.* Gourmet cheeses and vintage wines. She was a ship catering to those who could afford an Atlantic crossing in a ragtime, black-tie style—the Astors, Wideners, and Guggenheims of the world who in that highly social-conscious time substituted in the public’s consciousness for today’s glamorous movie stars.

Although a symbol of the limits of technology in her day, the discovery of the *Titanic* by a team of French and American scientists on September 1, 1985, paradoxically served to usher in a new era in marine science. The vehicle that discovered the largely intact hull of the doomed liner is called *Argo*. It is an unmanned sonar and TV-imaging system that will allow vast areas of the world’s seafloor to be observed for the first time. The French vehicle used in the search is called *SAR*. It is described on page 19.

* Steerage is a term left over from the 1860s when it had been legal to transport people to one shore and then carry cattle in the same quarters on the trip back. The term gave way eventually to third-class.

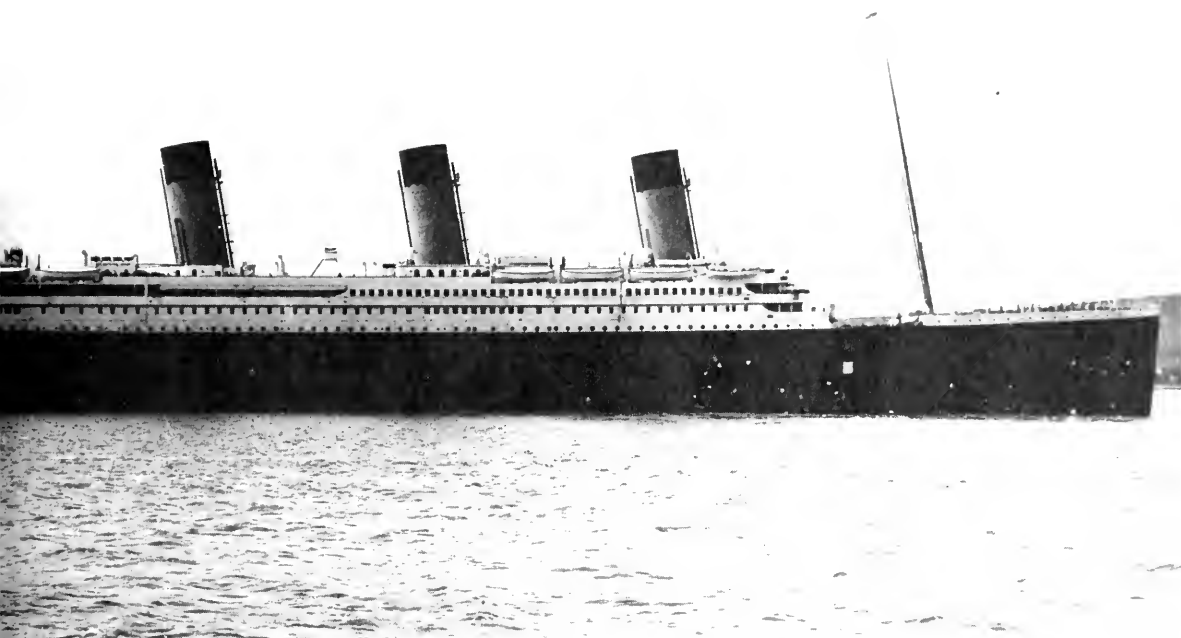


Argo, named after the mythical vessel that carried Jason on his quest for the Golden Fleece, was on its maiden voyage when it discovered the *Titanic*. Plans call for the *Argo* vehicle—which is about the size of a small airplane fuselage—to eventually house a smaller robot named *Jason*, which will be used for close-up viewing of features on the bottom. *Jason* will be a tethered vehicle with sophisticated TV cameras for eyes and manipulator arms capable of retrieving small objects.

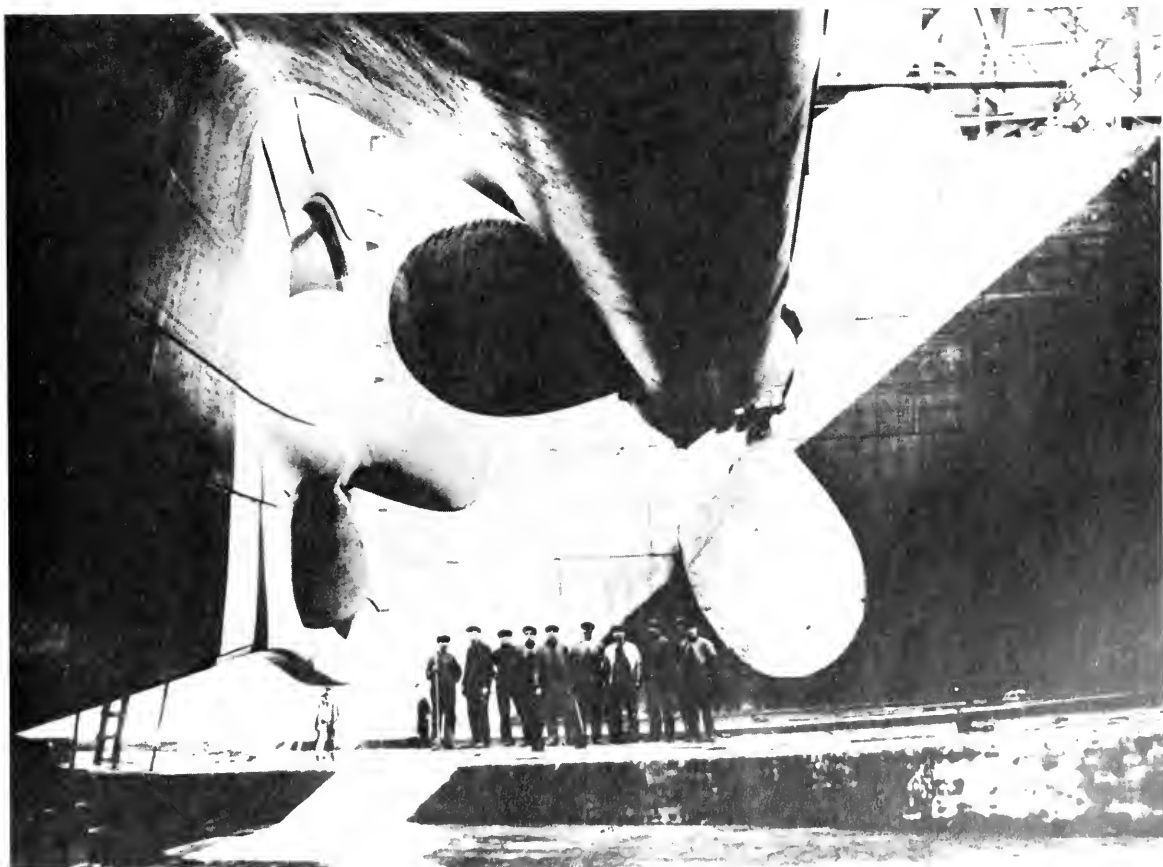
Argo and *Jason* are financed by the U.S. Navy and are being developed by the Woods Hole Oceanographic Institution’s (WHOI’s) Deep Submergence Laboratory, which is headed by Senior Scientist Robert D. Ballard (see page 103). The Navy’s interest in the vehicles is prompted by the fact that the more they know about the deep seabed, the better their antisubmarine warfare program will be. Although Ballard’s interest in finding the *Titanic* goes back at least 10 years, his motivation in developing *Argo* and *Jason* derives from more recent scientific goals.

Both an engineer and a geologist, Ballard has probably spent more time on the bottom of the deep ocean than anyone alive. In 1977, he was in *Alvin*—a three-person submersible operated by WHOI for the Navy and the National Science Foundation—when it verified the existence of hot springs in the Galápagos Rift and came upon unusual life forms for the first time—such as giant tube worms with no mouth or gut.

As this issue of *Oceanus* comes off the press in December, Ballard and other marine scientists are scheduled to use *Argo* on the East Pacific Rise. They



The Titanic at Queenstown, Ireland, 1912, before her departure for New York. (Photo courtesy The Cork Examiner) Below, workmen are dwarfed beneath propellers on the sister ship Olympic, which were exactly like those on the Titanic. (Photo courtesy Harland and Wolff, Ltd.)



expect in just 20 days to examine as much of the seafloor as has been covered in 12 years using manned submersibles. While manned submersibles are limited to a few hours on the bottom before they must surface for air, *Argo* can stay on the seafloor for long periods of time.

Documenting A Disaster

The intent of this issue of *Oceanus* is to review the history of the *Titanic* disaster, and also to document the discovery of the wreck. In selecting information on the history of the great ship, we have been guided by two members of the *Titanic Historical Society*: Edward S. Kamuda, co-founder of the organization and Editor-in-Chief of *The Titanic Commutator*, the official journal of the society; and John Hollis, society spokesman, who opened his extensive files to us and served as a consultant on the issue, as he did for the film version of Clive Cussler's *Raise the Titanic*.

The story of the *Titanic*, dubbed "Empress of the Ocean," is riddled with conflicting eyewitness accounts. For example, did the band play the nondenominational hymn "Nearer My God to Thee" or the Episcopalian hymn "Autumn" in the last

moments before the ship turned her stern to the star-lit heavens and slowly, almost apologetically disappeared below the surface. Does it really matter? Actually they sound a little alike. Hollis believes it was probably "Autumn" because she was a British ship and the band would have been more familiar with that hymn. Other conflicting testimony deals with such diverse topics as the fate of the officers and whether the ship broke in half.

After all these years, there is no agreement even on the number of dead, or, for that matter, on the number of people on board before the sinking. A cautious writer fudges a bit, "more than 1,500" people died; the truth probably lies between 1,517 and 1,521. Such discrepancies make the work of historians of the *Titanic* difficult.

There were two official inquiries into the disaster, one in the United States and the other in Great Britain. The one in the United States was led by Senator William Alden Smith of Michigan and concluded about a month after the disaster; the British inquiry lasted until July 30th of that year and took into account the material gathered by the Senate investigation. We have leaned heavily on these reports for our account of the tragedy.

The *Titanic* Tale

In 1898, fourteen years before the *Titanic's* voyage, a popular novel written by Morgan Robertson and called *Futility* appeared in the United States. It was a yarn about a great "unsinkable" luxury liner named the *Titan* that sank in the North Atlantic after hitting an iceberg at top speed. Almost all of the passengers lost their lives because there were not enough lifeboats aboard. The similarities between the fictional *Titan* and the real *Titanic* are uncanny:

	<i>Titan</i>	<i>Titanic</i>
Ship length	800 ft.	882.5 ft.
Tonnage displacement	75,000	66,000
Propellers	3	3
Speed at impact	25 knots	22 knots
Number of passengers	3,000	2,340
Number of lifeboats	24	20
Month of sinking	April	April

The *Titanic's* keel had been laid in the summer of 1909 at the Belfast, Ireland, shipyards of Harland & Wolff. William J. Pirrie, the head of the shipyard, had risen from boilermaker to baronet. His yard held the reputation of being one of the best in the world. Lord Pirrie's nephew, Thomas Andrews, who accompanied the *Titanic* on her maiden voyage and went down with the ship, served as one of the principal designers of the liner. Then, as managing director of the yard, he supervised the details of her construction.

J. Bruce Ismay was chairman of the White Star Line of Liverpool, England, operators of the *Titanic*.

Reportedly having a personal fortune worth \$40 million, he too sailed on the maiden voyage, but survived. In 1902, the International Mercantile Marine (IMM), a braintrust of J. Pierpont Morgan who sought to add the North Atlantic steamship trade to his other enormous financial interests—such as railroads, coal, and steel—struck a deal with the White Star Line. The line would be principally American-owned, but would remain under British management. The agreement allowed the line to stem a rate war with Cunard and other lines.

Ismay and Lord Pirrie put their heads together in 1907 and, with Morgan's blessing, decided they would build two twin ships to compete with the speed of the new Cunard liners, the *Lusitania* and *Mauretania*. The White Star ships would be the last word in comfort and elegance. They would be able to guarantee a week's crossing on a regular schedule. The two vessels would be built side by side in twin slips.

The first of the twin sisters, the *Olympic*, sailed on her maiden voyage to New York on May 31, 1911. On the same day, the *Titanic* was launched from Slip 3 in Belfast. Although the *Olympic* had many of the same appointments as the *Titanic*, the younger sister benefitted from correction of design flaws found in her older sister. Modifications were extensive; 100 more first-class cabins than the *Olympic*, and a Parisian boulevard on B-deck to create the illusion of a sidewalk café. Ultimately, the *Titanic* outweighed her sister by more than a thousand tons. The cumulative effect was such that the two ships could no longer be

regarded as twins. The two ships would eventually be joined by a larger third sister, the *Brittanic*, which was converted to a hospital ship at the outset of World War I and never saw service as a passenger liner.

Morgan came down from London for the *Titanic* launching and inspected his own private suite aboard. He planned to make the maiden voyage, but would later cancel because of poor health.

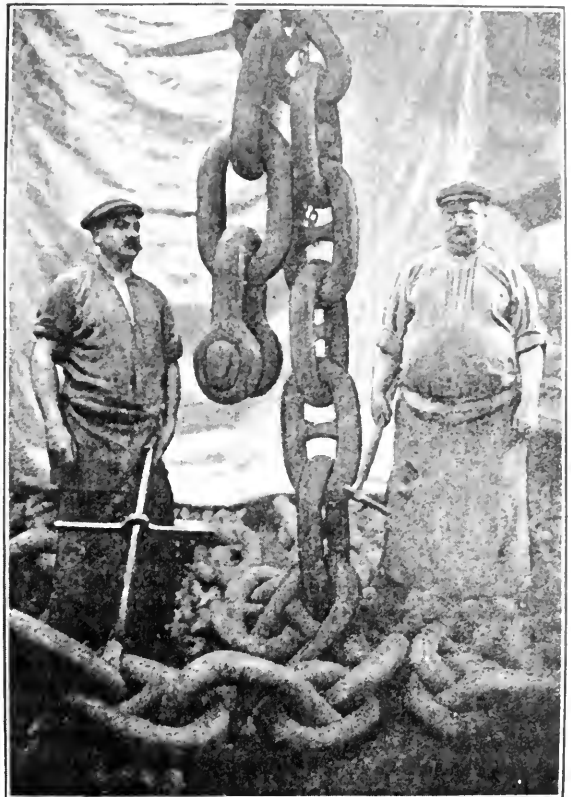
The *Titanic* was built throughout of steel and had a cellular double bottom. For about half the length of the vessel the double bottom extended up the ship's side to a height of 7 feet above the keel. All decks were steel plated throughout—three million rivets weighing 1,200 tons held her together. Each link in her anchor chains weighed 175 pounds. The huge power plant, comprising 29 enormous boilers under heat from 159 furnaces, produced a registered horse power of 50,000 and an average speed of 21 knots. At full speed she could produce 55,000 horsepower and a speed of 25 knots.

The one thing the *Titanic* did not have was ample lifeboats for the approximately 2,340 people on board, although she exceeded the number required under British regulations by four. She carried fourteen 30-foot wooden boats, two 25-foot wooden boats, and four canvas collapsible craft (see page 37).

One-way passage in the most luxurious first-class suites, those with private promenades, went for \$4,350, equivalent to about \$50,000 today. At the other extreme, the steerage bunks, the lowest in the ship and closest to the bow, went for considerably less than first-class dog kennel passage. The ship—in addition to her splendid suites, cabins, dining saloons, ballrooms, and lounges—housed a swimming pool, squash and tennis courts, sun parlors, a Turkish bath, a gymnasium, and several libraries.

The *Titanic's* crew numbered 860. Sixty-five of these were officers, mates, and deckhands; 320 were listed as engineers; and 475 stewards, cooks, and helpers rounded out the crew. Although the ship had accommodations for about 2,500 passengers, only about 1,480 booked for the maiden voyage, roughly a fourth traveling first-class, a fourth second-class, and half steerage or third-class.

Several of the first-class passengers on board had fortunes exceeding many millions of dollars. Among them were John Jacob Astor (estimated worth \$150 million), who was returning from Egypt with his 19-year-old bride; Benjamin Guggenheim (\$95 million), the mining and smelting king; Isidor Straus (\$50 million), a partner in R.H. Macy & Co.; and George D. Widener (\$50 million), Philadelphia financier and tractor baron. All perished when the *Titanic* went down. Other prominent passengers included William T. Stead, a leading British evangelist, editor, and publicist; Jacques Futrelle, a noted American journalist whose wife would survive and whom this writer would visit often in her Scituate, Massachusetts, nursing home; Henry B. Harris, a Broadway producer; Major Archibald Butt, military aide to President Taft who was traveling to the White House with a message from the Pope; Frank D. Millet, American painter; John B. Thayer, a vice president of the Pennsylvania Railroad; Arthur Ryerson, steel executive; and Col. Archibald Gracie of the U.S. Army (Ret.). Only Gracie would survive from this group to



Anchor chains of the type used on the *Titanic*. Each link weighed 175 pounds. (Photo courtesy Ken Marshall collection: from *The Largest Ships of the World*, 1914)

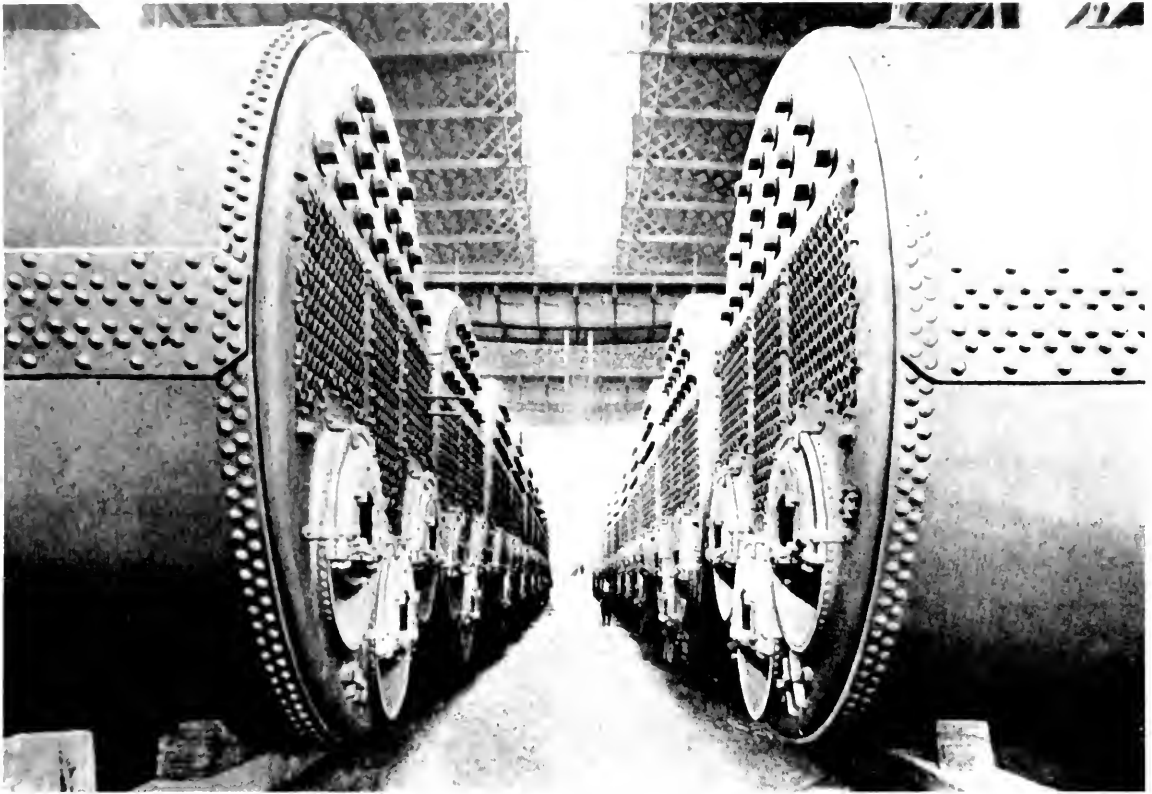
write a book about his experiences, *The Truth About the Titanic*, published in 1913. He died less than 8 months after the loss of the *Titanic*.

The Voyage and the Iceberg

The *Titanic* left Southampton, England, on Wednesday, April 10, and, after calling at Cherbourg, France, proceeded to Queenstown, Ireland. She sailed from the Irish port on Thursday, April 11, shortly after noon, following what was at that time the accepted outward-bound route for mail steamers from the Fastnet Light, off the southwest coast of Ireland, to the Nantucket shoal light vessel off the East Coast of the United States.

Just before the *Titanic* sailed from Southampton, a second-class passenger, Mrs. Albert F. Caldwell, called to a deckhand loading luggage: "Is this ship really unsinkable?" "Yes, indeed, lady," the deckhand replied, "God himself could not sink this ship."

There were two omens on the day of departure from Southampton. A coal strike in Britain had left a number of vessels short of coal. The *Titanic* needed 650 tons of coal per day to run her 159 furnaces. The White Star Line, operators of the *Titanic*, were forced to cancel the trips of their ships *Oceanic* and *Adriatic*, transferring the passengers and



Boilers of the type installed on the *Titanic*. Note size of man in relation to the boilers. (From *Shipbuilder* magazine, 1911)

coal to the *Titanic*. On the day she sailed, the *Titanic* had a fire in a coal bunker, which continued until the ship sank. A fireman, J. Dilley, would later testify: "... my sole duty, together with 11 other men, had been to fight that fire. We had made no headway against it . . . The fire started in Bunker No. 6. There were hundreds of tons of coal stored there . . . The wet coal on top kept the flames from coming through, but down in the bottom of the bunkers the flames were raging . . . The stokers were alarmed over it, but the officers told us to keep our mouths shut—they didn't want to alarm the passengers."

The second omen occurred as the *Titanic* left the dock. The tremendous force of the ship's suction snapped the steel hawsers of the steamer *New York*, which was moored close by, causing her to drift toward the *Titanic*. The Captain, Edward J. Smith, ordered ahead on the port engine, the wash from this action gently pushing the *New York* back. He then cut his engines and tugs drew alongside to aid the *New York*. This is but one of many ifs in the *Titanic* tale. If the ship had collided with the smaller steamer it might have delayed the maiden voyage long enough for the *Titanic* to have missed her fate.

After leaving Queenstown, the huge vessel moved sleekly through the North Atlantic in almost perfect weather (experiencing only a brief period of fog). Passengers commented that there was a minimum of pitching, rolling, and vibration. The first day, the *Titanic* made 484 miles, the second 519,

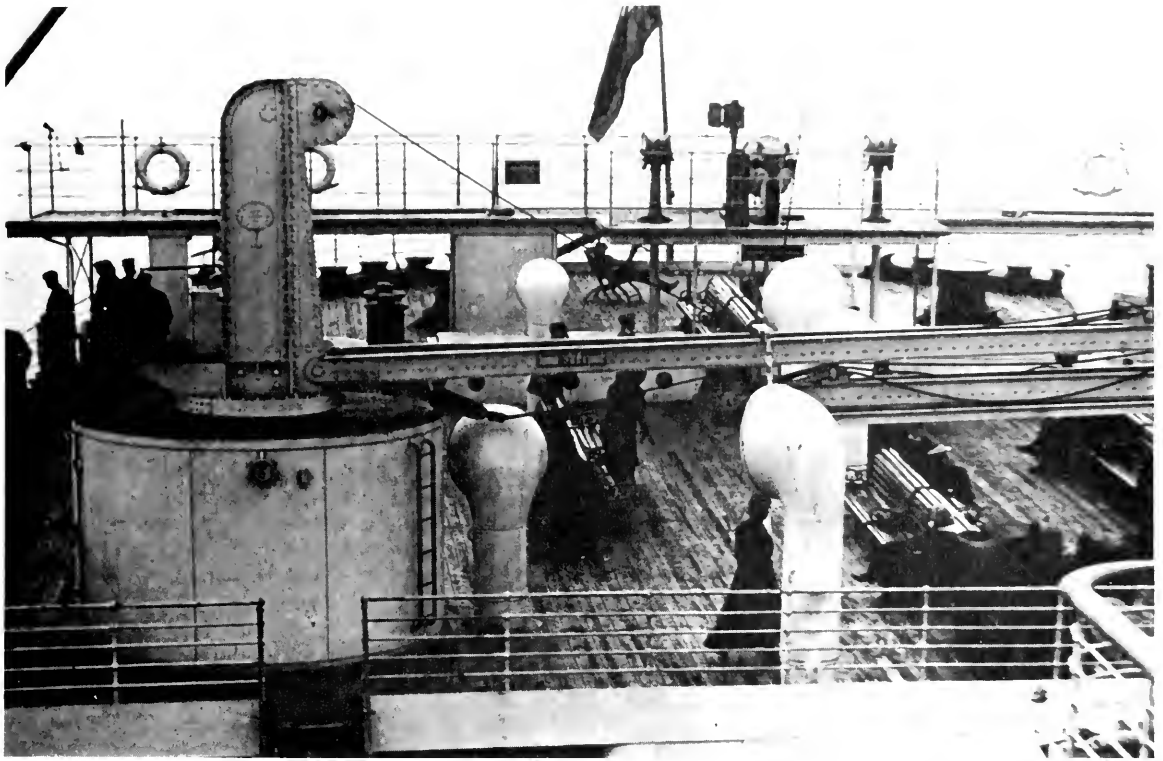
and the third 549. Some of the passengers participated in betting pools on the daily runs. Ismay had set the ship's New York arrival time at Wednesday morning. Junior officers told passengers that the hours of Tuesday night seemed a better bet.

Other passengers passed the time by dancing in the main ballroom. The *Titanic's* eight-member band was billed as the best on the Atlantic. It included Wallace Hartley, bandmaster, Theodore Brailey, pianist, and Jock Hume, cello and first violinist. To a man, the entire band played to the very end in an extraordinary demonstration of courage.

It was Sunday afternoon on April 14th, the fateful day, when passengers exercising on deck first noticed patches of drifting ice. This did not alarm seasoned travelers who explained to others that ships on the northern express route often encountered ice in April. What they did not know—indeed no one on the *Titanic* knew—was that the ice conditions were worse than normal and would prove to be the worst in 50 years for that month. A mild winter had caused glaciers on the west coast of Greenland to give birth to large numbers of icebergs.

The *Titanic* received six wireless messages that Sunday warning of the danger of ice. The first came from the steamship *Caronia* at 9 a.m. It said:

CAPTAIN, *Titanic*:
West-bound steamers report bergs, growlers,



The poop deck of the Titanic (see also stern photo on pullout). Picture was taken while at Queenstown, Ireland. The baggage/freight handling cranes could each lift a maximum of 2½ tons. Note the two docking telegraphs on aft bridge and the one spotted in the debris field on page 28 (lower photo). (Photo courtesy The Cork Examiner)

and field ice in 42° N., from 49° to 51° W., April 12.
Compliments.

BARR.

Captain Smith acknowledged receipt of the message.

The second message came from the steamship *Baltic*, arriving at 1:42 p.m. It stated:

Capt. SMITH, *Titanic*:

Have had moderate, variable winds and clear, fine weather since leaving. Greek steamer *Athenia* reports passing icebergs and large quantities of field ice to-day in latitude 41° 51' N., longitude 49° 52' W. Last night we spoke German oiltank steamer *Deutschland*, Stettin to Philadelphia, not under control, short of coal, latitude 40° 42' N., longitude 55° 11' W. Wishes to be reported to New York and other steamers. Wish you and *Titanic* all success.

COMMANDER.

Captain Smith acknowledged receipt of this message, too, passing it along to Ismay, who showed it to two ladies who in turn may have communicated its contents to other passengers. It remained in Ismay's possession until 7:15 p.m. at which point Captain Smith asked him to return it so that it could be posted in the chart room.

The third message was perhaps the most crucial. It was sent from the German steamer *Amerika* to the Hydrographic Office in Washington

Ice Terms

An iceberg may be defined as a detached portion of a polar glacier carried out to sea. The ice of an iceberg formed from a glacier is of quite fresh water. Only about an eighth of its mass floats above the surface of sea water.

A "growler" is a colloquial term applied to icebergs of small mass, which therefore only show a small portion above the surface. It is not infrequently a berg which has turned over, and is therefore showing what has been termed "black ice" or, more correctly, dark-blue ice.

Pack ice is the floating ice which covers wide areas of the polar seas, broken into large pieces, which are driven ("packed") together by wind and current, so as to form a practically continuous sheet. Such ice is generally frozen from sea water, and not derived from glaciers.

Field ice is a term usually applied to frozen sea water floating in much looser form than pack ice.

An icefloe is the term generally applied to the same ice (i. e., field ice) in a smaller quantity.

A floe berg is a stratified mass of floe ice (i. e., sea-water ice).

—From the British Inquiry, 1912

Sailing Directions

One of the chief dangers in crossing the Atlantic lies in the probability of encountering masses of ice, both in the form of bergs and of extensive fields of solid compact ice, released at the breaking up of winter in the Arctic regions, and drifted down by the Labrador current across their direct route. Ice is more likely to be encountered in this route between April and August, both months inclusive, than at other times, although icebergs have been seen at all seasons northward of the parallel of 43° N., but not often so far south after August.

These icebergs are sometimes over 200 feet in height and of considerable extent. They have been seen as far south as latitude 39° N., to obtain which position they must have crossed the Gulf Stream impelled by the cold Arctic current underrunning the warm waters of the Gulf Stream. That this should happen is not to be wondered at when it is considered that the specific gravity of fresh-water ice, of which these bergs are composed, is about seven-eighths that of sea water; so that, however vast the berg may appear to the eye of the observer, he can in reality see one-eighth of its bulk, the remaining seven-eighths being submerged and subject to the deep-water currents of the ocean. The track of an iceberg is indeed directed mainly by current, so small a portion of its surface being exposed to the action of the winds that its course is but slightly retarded or deflected by moderate breezes. On the Great Bank of Newfoundland bergs are often observed to be moving south or southeast; those that drift westward of Cape Race usually pass between Green and St. Pierre Banks.

The route chart of the North Atlantic, No. 2058, shows the limits within which both field ice and icebergs may be met with, and where it should be carefully looked out for at all times, but especially during the spring and summer seasons. From this chart it would appear that whilst the southern and eastern limits of field ice are about latitude 42° N., and longitude 45° W., icebergs may be met with much farther from Newfoundland; in April, May, and June they have been seen as far South as latitude 39° N. and as far east as longitude 38° 30' W.

—From United States Pilot (East Coast), 1909, second edition, published by the British Admiralty and supplied to the master of the *Titanic* together with other necessary charts and books.

through the *Titanic* at 1:45 p.m. because she was the nearest vessel to Cape Race, Newfoundland, the relay point to Washington. It said:

Amerika passed two large icebergs in 41° 27' N., 50° 8' W., on April 14.

The message never reached the bridge of the *Titanic*. The position given was south of the point of the disaster and recorded on the same day. In all likelihood had an officer on the bridge seen the message, he would have slowed the ship down and taken other precautions. It has been theorized that Phillips, the senior wireless operator in the *Titanic's* Marconi room, shoved the warning aside when his set suddenly went dead. After an afternoon of troubleshooting with his colleague Bride (see page 48), the crucial message lay under a pile of messages to be sent that passengers had dropped off during the afternoon.

At 7:30 p.m. a fourth message was intercepted. It was from the steamship *Californian* to the steamship *Antillian*. It read:

TO CAPTAIN, *Antillian*:

Six-thirty p.m., apparent ship's time; latitude 42° 3' N., longitude 49° 9' W. Three large bergs 5 miles to southward of us. Regards.

LORD.

Bride later testified that he delivered this message to

an officer on duty, but could not recall which one.

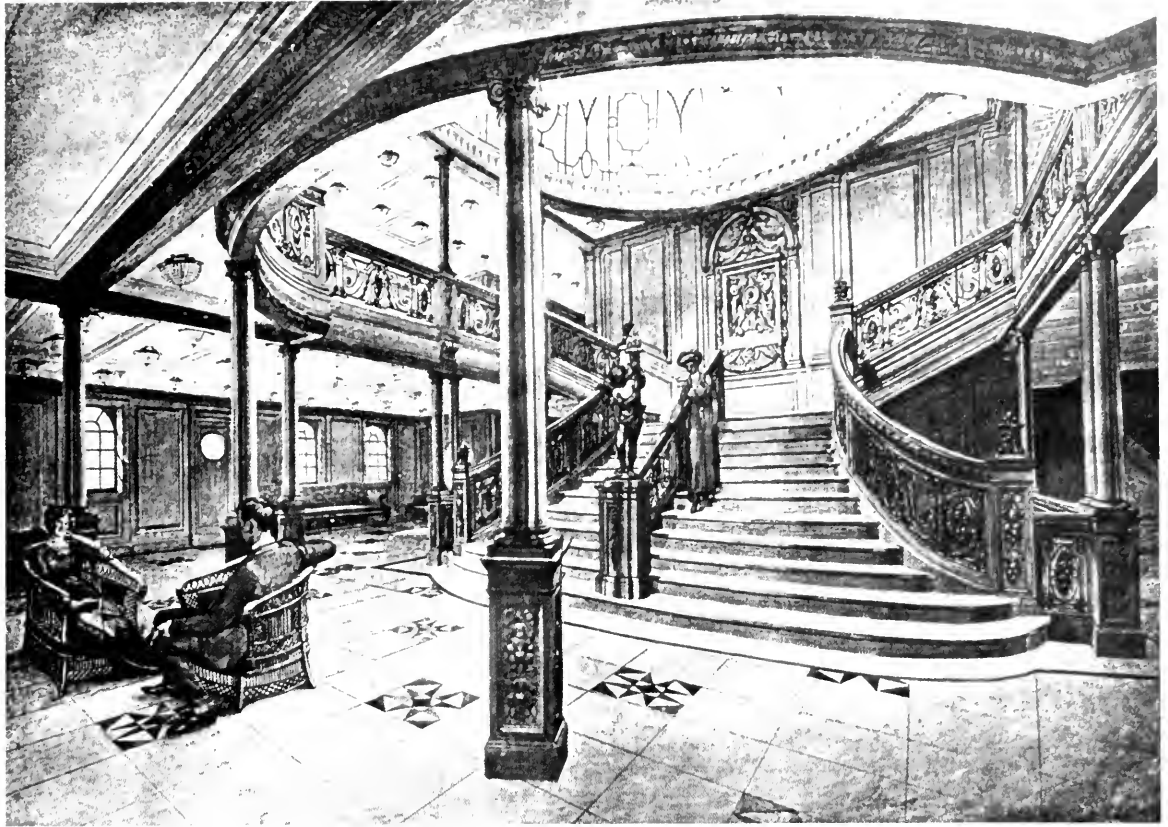
The fifth message arrived in the Marconi room at 9:40 p.m. from the steamer *Mesaba*. It read:

From "Mesaba" to "Titanic" and all east-bound ships:
Ice report in latitude 42° N. to 41° 25' N., longitude 49° to longitude 50° 30' W. Saw much heavy pack ice and great number large icebergs. Also field ice. Weather good, clear.

The British inquiry found: "This message clearly indicated the presence of ice in the immediate vicinity of the *Titanic* and if it had reached the bridge would perhaps have affected the navigation of the vessel. Unfortunately, it does not appear to have been delivered to the master or to any of the officers. The Marconi operator was very busy from 8 o'clock onward transmitting messages via Cape Race for passengers on board the *Titanic*, and the probability is that he failed to grasp the significance of the message . . ."

The air temperature that Sunday morning had been about 45 degrees Celsius, but by 10 p.m. had dropped to 32 degrees. The sea temperature was 31 degrees at 10:30 p.m. and still dropping. There was no moon, but the sky was cloudless, and full of stars. Captain Smith and Second Officer Lightoller, standing on the bridge at 8:55 p.m., remarked that they had never seen a more brilliant night. The *Titanic* was making about 22 knots.

At about 11 p.m., the *Titanic* received a sixth



Artist's rendition of the Titanic's forward grand staircase to promenade deck. Note photo of glass dome area on page 26.
 (© Mary Evans Picture Library/Photo Researchers, Inc.)

warning message—this time from the *Californian* which had stopped in the ice at 10:30 p.m. relatively nearby and ahead of the *Titanic*, but Phillips cut it off, telling the other operator “Shut up! Shut up! I’m working Cape Race.” The operator on the *Californian* did just that until 11:30 p.m., when, being the only Marconi operator aboard, he closed down his set and went to bed.

The watch on the *Titanic* had changed at 10 p.m., First Officer William Murdoch taking over from Second Officer Lightoller. Both men were old hands at crossing the Atlantic in “greyhounds,” as liners of the *Titanic*-class were called. Some of their crossings had been made in dense fog. The two friends talked about the falling temperature and the possible presence of icebergs. Lightoller then advised Murdoch that a message had been sent to the crow’s nest telling the lookouts to keep a sharp watch. With that, he went below, leaving the bridge to Murdoch.

In the crow’s nest, seamen Fleet and Lee, shivering in the freezing air, peered forward—they had no binoculars—into the night. Usually icebergs could be spotted by the outline of waves breaking at their base, but this night the sea was so calm that this aid was not available. Down below, most passengers had gone to bed, although a few were still playing cards. In the main dining hall, stewards were setting the tables for breakfast with highly polished silver and china cups.

At a little before 11:40 p.m., Fleet, acting almost instinctively on sighting a large, irregular shaped object ahead, rang the crow’s nest warning bell three times, and, in almost the same motion, telephoned the bridge, shouting “Iceberg right ahead.”

Almost simultaneously with the three-bell warning, Murdoch gave the order to “Hard-a-starboard,” and immediately pushed the telegraph levers to “Stop. Full speed astern.” The helm was “hard over,” and the ship’s bow had fallen off 2 points when she hit the iceberg well forward on her starboard side.

History’s Worst Ship Disaster

The worst single ship disaster in history occurred on January 30, 1945. The Wilhelm Gustloff, a German tourist ship carrying wartime refugees, was sunk by the Soviet submarine S-13 off Gdansk (then Danzig), Poland. Approximately 7,700 of the 8,700 men, women, and children on board the 25,484-ton vessel were killed either by explosions caused by torpedoes or by drowning.



Captain Edward J. Smith at Queenstown, Ireland. (Photo courtesy The Cork Examiner)

Murdock, who would not survive the sinking, immediately closed the water-tight doors in the engine and boiler rooms. The ship had been constructed to stay afloat with any two compartments completely flooded.

Captain Smith then rushed onto the bridge and asked what the ship had struck. Murdock replied:

An iceberg, sir. I hard-a-starboarded and reversed the engines, and I was going to hard-a-port round it, but she was too close. I could not do any more. I have closed the water-tight doors.

Then Captain Smith summoned Andrews, the ship's designer, and both went below and surveyed the damage. It did not take Andrews long to figure out that there was no hope for his "unsinkable" ship. The ice had sliced the vessel open about 10 feet above the level of the keel for a distance of about 300 feet. Water was pouring in the forepeak, Number 1, 2, and 3 holds, and Number 5 and 6 boiler rooms. A scant 10 minutes after the collision water was 14 feet above the keel in all compartments except Number 5 boiler room.

When Andrews confirmed his own assessment of the damage, Captain Smith assembled those of his officers then awake and told them the worst. There was to be no panic; priority in lifeboats was to be given to women and children.

The Captain then hurried to the wireless room and ordered Phillips and Bride to send out distress signals. About 12:15 a.m., Phillips began tapping out "CQD"—at that time the usual international distress call—followed by "MGY," the *Titanic's* call letters, and her position, 41 degrees, 46 minutes North, 50 degrees, 14 minutes West. About 12:45 a.m. Phillips switched to "SOS," the new international distress signal. It marked the second time* the new signal had been used since an international convention had approved it.

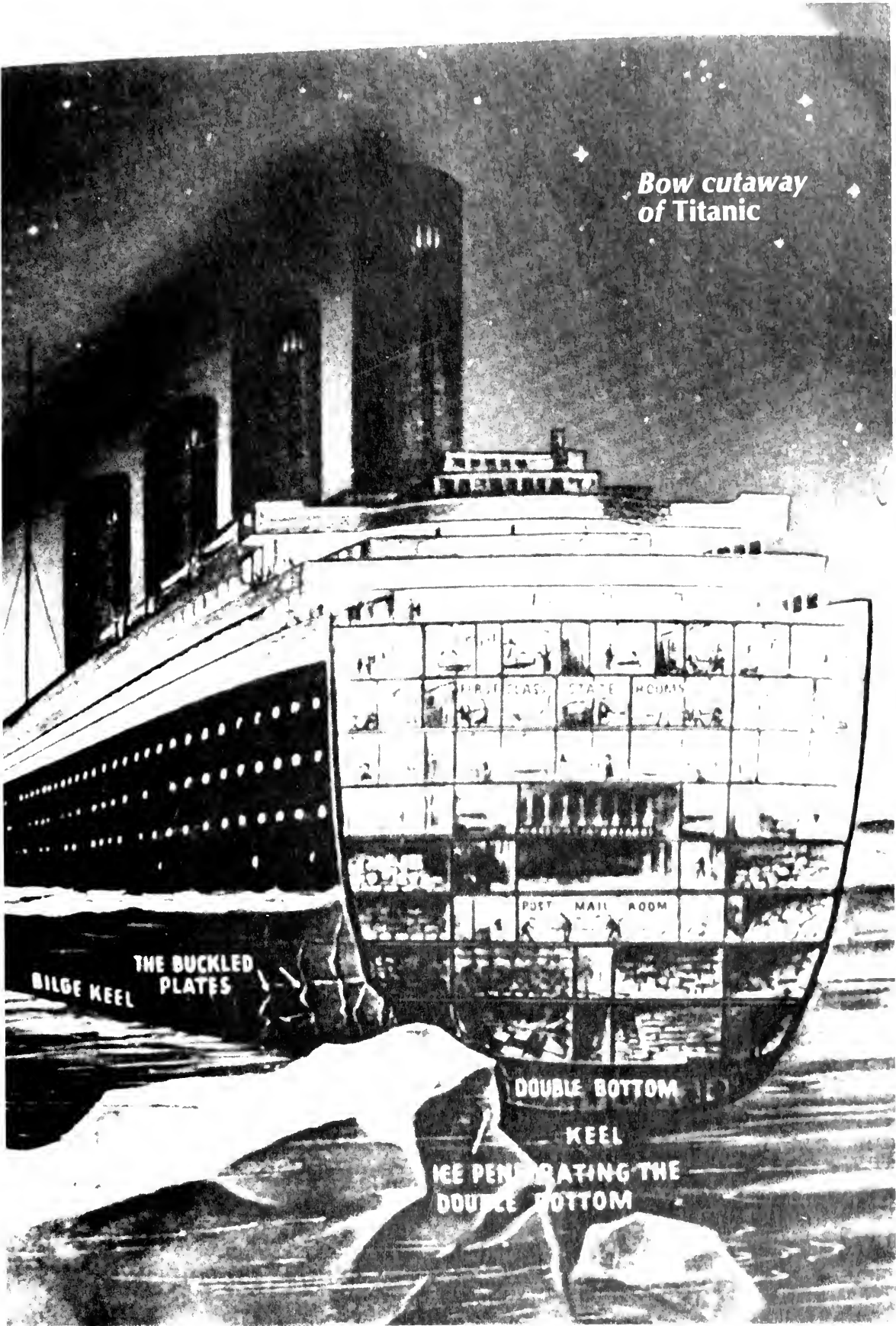
Captain Smith then ordered the lifeboats uncovered and instructed stewards and crew members to go through the ship and get all passengers on deck with life jackets on. There had been no emergency drill undertaken since leaving Southampton. The ship began to list as the bow settled deeper and deeper into the water.

At about 12:45 a.m., the Fourth Officer, Joseph G. Boxhall, began sending up distress rockets, which exploded in the air at regular intervals and gave off white stars. He continued to do this until he left the ship at 1:45 a.m.

At approximately 12:25 a.m., the *Titanic* wireless operator raised the Cunard liner *Carpathia*, which was bound from New York to Liverpool and only 58 miles away. The *Carpathia's* Captain, Arthur H. Rostron, immediately wired back that he was coming to the rescue. The Cunard liner, which

* The first ship to send an SOS was the American steamer *Arapahoe* in August 1909. The first lives saved by a wireless distress call (CQD) were on the White Star liner *Republic* in January 1909. The call, sent by Jack Binns, an English radio operator, came after the *Republic* collided with the liner *Florida* off Nantucket.

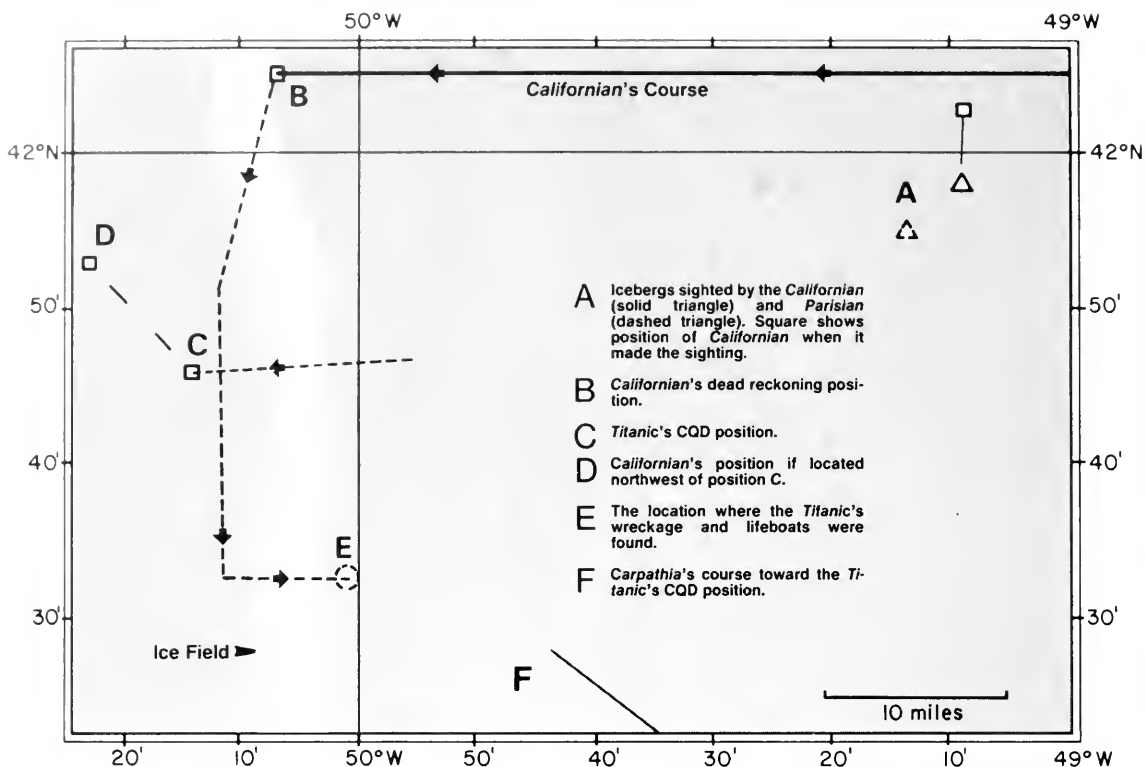
*Bow cutaway
of Titanic*



BILGE KEEL
THE BUCKLED
PLATES

DOUBLE BOTTOM
KEEL

ICE PENETRATING THE
DOUBLE BOTTOM



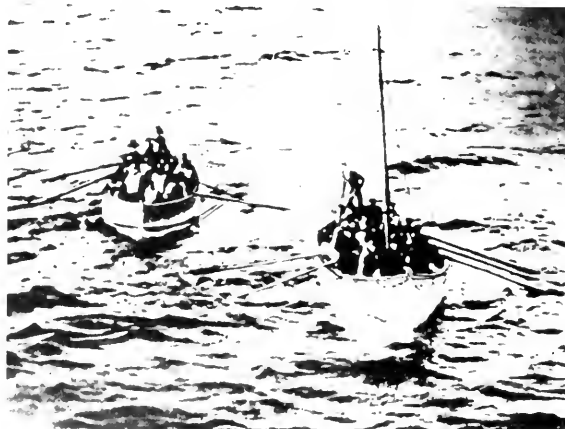
would sink after a torpedo attack in World War I, carried 740 passengers and 325 crew. At approximately 12:20 a.m. out on the *Titanic's* deck, the order had been given to begin lowering the boats. Second Officer Lightoller, one of those directing the lifeboat operations, testified later that the noise of steam escaping from the 8 exhaust vents on the stacks was so great that he had to give directions with his hands. There were few passengers on deck to climb aboard the first boats.

The story of the passengers' fate and the loading and events in the lifeboats is described elsewhere in this issue (see page 81). Suffice to say that tales of bravery seem to substantially outnumber those of cowardice on that night. The *Titanic* disappeared at 2:20 a.m. The night was left to the piercing cries and wailing moans of the drowning. In the lifeboats, rowing was the best defense against the bitter cold. It would be 73 years before the *Titanic* would be located at approximately 1:05 a.m. on September 1, 1985, by scientists aboard the research vessel *Knorr*, operated for the U.S Navy by the Woods Hole Oceanographic Institution.

Paul R. Ryan is Editor of Oceanus.

The QE II

The Queen Elizabeth II of the Cunard Line is the largest luxury liner in service today. She weighs more than 67,000 tons, stands 13 stories high, and measures 963 feet.



Titanic lifeboats on way to Carpathia. Photograph taken by passenger aboard the rescue vessel, April 15, 1912. (The Bettmann Archive)

The Rubaiyat

*The Worldly Hope men set
their Hearts upon
Turns Ashes—or it prospers;
and anon,
Like Snow upon the
Desert's dusty Face
Lighting a little Hour or
two—is gone.*

Of the jewels that sank to the bottom of the Atlantic when the *Titanic* plunged to her ocean grave none possessed more general interest than those used in the bound copy of the Rubaiyat of Omar Khayyam, which was being brought to America. There were 1,050 precious stones studding the binding.

The book, which later became known as the *Titanic Omar*, was to be exhibited by Henry Sotheran & Co of 45 Piccadilly West in London, along with a number of other books in honor of the coronation of King George V. Sotheran & Co. described themselves as "booksellers to the King." The bookbinding took three months to produce and took two years to complete. It was considered to be the most elaborate specimen of bookbinding at that time, representing more time and thought than had ever been expended on the cover of a book before. The *New York Times* of April 7, 1912, described the designs as follows:

Sunk panels of ornamental shapes are introduced into both covers and doublures, to break up the monotony of a flat surface, and also to avoid excessive projection of the jewels that are inset. The 1,050 stones comprise rubies, turquoises, amethysts, topazes, olivines, garnets, and an emerald. They are introduced into the decoration and each stone is in a gold setting, which is firmly fixed underneath the leather, thus making it almost an impossibility for it to come out. Close gold tooling, producing in appearance the richness and splendor of solid chased gold panels, is strongly in evidence on the whole work, and affords a fitting background for the jewels.

On the front cover, in a sunk panel of a shape suggestive of Persian architecture, appears, as a central figure, a heart shape, richly jeweled with rubies, olivines, and garnets, and closely gold tooled. This is surrounded by a conventional arrangement of three peacocks, elaborately inlaid in their many natural lines, and filling, with the graceful radiating lines of their tails, the remainder of the panel.

The eyes of the feathers are jeweled with 97 topazes, all of which are specially cut to the correct shape of the eye. The crests of the birds are suggested by 18 turquoises, and rubies are inset to form the eyes. The slight background thus left is tightly filled with gold dots.

Surrounding this panel is a border and corner piece, suggestive both in color and design of

characteristic Oriental decoration, and set with 289 garnets, turquoises, and olivines. The design is completed with a border suggesting a conventional treatment of the vine inlaid in brown and green and set with 250 amethysts arranged so as to form the bunches of grapes.

*Come, fill the Cup, and in the
Fire of Spring
The Winter Garment of Re-
pentance fling:
The Bird of Time has but
a little way
To fly—and lo! the Bird is
on the Wing.*

The Convergence of the Twain

In a solitude of the sea
Deep from human vanity,
And the pride of life that planned her,
 stilly couches she.

Steel chambers, late the pyres
Of her salamandrine fires,
Cold currents thrid, and turn to rhythmic tidal lyres.

Over the mirrors meant
To glass the opulent
The sea worm crawls—grotesque, slimed, dumb,
 indifferent.

Jewels in joy designed
To ravish the sensuous mind
Lie lightless, all their sparkles bleared and black and
 blind.

Dim moon-eyed fishes near
Gaze at the gilded gear
And query: "What does this vaingloriousness down
 here?"

Well: while was fashioning
This creature of cleaving wing,
The immanent will that stirs and urges everything

Prepared a sinister mate
For her—so gaily great—
A shape of ice, for the time far and dissociate.

And as the smart ship grew,
In stature, grace and hue,
In shadowy silent distance grew the iceberg too.

Alien they seemed to be
No mortal eye could see
The intimate welding of their later history.

Or sign that they were bent
On paths coincident
On being anon twin halves of one august event.

Till the spinner of the years
Said "now" and each one hears,
And consummation comes, and jars two
 hemispheres.

—Thomas Hardy

The Discovery



The discovery team poses on the R. V. Knorr. (Photo courtesy National Geographic Society/Woods Hole Oceanographic Institution)

of the *Titanic*



by the U.S. and French Expedition

by Paul R. Ryan
and Anne Rabushka

The Titanic lies in 13,000 feet of water on a gently sloping alpine-like countryside overlooking a small canyon below. [Her] bow faces north and the ship sits upright on the bottom, [two of her] mighty stacks still pointing upward. There is no light at this great depth. It is quiet and peaceful, a fitting place for the remains of this greatest of [peacetime] sea tragedies to rest. May it forever remain that way.

—Robert D. Ballard, 9 September 1985

The discovery of the *Titanic* on 1 September 1985 is a tale of two research centers—Woods Hole, Massachusetts, and Toulon, France—of two ships—the *Knorr* and *Le Suroit*—and of two new extremely sophisticated underwater vehicles called *Argo* and *SAR*. At this point in the telling, the tale is not unlike the iceberg that sank the *Titanic*—an eighth above the surface and the rest below.*

The finding of the *Titanic* was the culmination of 10 years of off-and-on planning and research on the part of Robert D. Ballard, a

* For a first-hand account of the search for the *Titanic* see the December issue of *National Geographic* in which an article by Ballard and John-Louis Michel appears.



The French SAR vehicle with its support ship *Le Suroit*. (Photo courtesy of IFREMER)

geologist/engineer and Senior Scientist at the Woods Hole Oceanographic Institution (WHOI). Others aided him in his efforts, including the *National Geographic* and the U.S. Navy's Office of Naval Research (ONR). He located the shipwreck during a campaign that began from Brest, France, with two cruises by a team of French engineers led by John-Louis Michel of the *Institut Français de Recherche pour l'Exploitation des Mers* (IFREMER) at Toulon. Ballard's close association with the French extends back to Project FAMOUS, a French-American expedition in 1973/74 that explored parts of the Mid-Atlantic Ridge by submersible. IFREMER was born in 1982 when the French government decided to merge the national fisheries ministry with the national center for exploration of the oceans (CENEXO).

For Ballard, the Navy, and the French, the *Titanic* was essentially a target—a large, newsworthy target—to test prototype underwater vehicles that will give man a “telepresence” on the ocean floor. Telepresence, a word coined by Ballard, means using video technology to project one's mind to the seafloor without physically descending to it. It will allow scientists to see vast areas of the seafloor—its mountains, canyons, and deserts—never before explored. It also means that scientists will not have to go down into the abyss in cramped three-man submersibles like *Alvin*, the workhorse of deep underwater research at the

moment. For the *National Geographic*, the *Titanic* represented an opportunity to support an expedition of historical interest and to develop new photographic techniques. The objective was to excite the imagination of the public with large, deep water images; the choice was to come back with pictures of acres of mud or, if lucky, the bones of the *Titanic* as a demonstration of this new technology.

Before the cruises began—two in the French ship (10 July to 19 July, and 26 July to 6 August) and one in the Woods Hole vessel (22 August to 9 September)—the scientists did a lot of homework on the historical and operational aspects of the wreck as well as the geological and physical processes at work in the general area where the *Titanic* went down, some 360 miles off the Grand Banks of Newfoundland.

Ballard and his associates had feared that benthic storms, strong bottom currents, mud slides, or a combination of these forces, could have buried the wreck in the course of 73 years. They also thought that turbidity (the suspension of sediments due to currents) might make it too murky to take photographs or do video work. This fear had been put aside a few years before by Emory Kristof and Al Chandler, both photography engineers at *National Geographic*. They had gone out on the International Ice Patrol's cutter *Evergreen* on one of that organization's annual April 15 voyages to lay a wreath at the approximate site of the *Titanic* sinking. A camera was lowered and began taking pictures of the bottom on contact. From this simple test, they determined that turbidity was not a problem.

The Navy's contribution to the search—besides millions of dollars to develop the *Argo* vehicle—was in providing Ballard with detailed topographic maps of the terrain in the search area.

The French-American campaign, of course, was not the first to seek to locate the *Titanic*. A Texas millionaire, Jack Grimm, an oilman and geologist, financed three expeditions to find the White Star liner in 1980, '81, and '83. Grimm used the *Sea Marc 1* (from the Lamont-Doherty Geological Observatory) and *Deep Tow* (see *Oceanus*, Vol 25, No. 1, p. 28) systems, the latter a towed underwater vehicle of the Scripps Institution of Oceanography.

Grimm produced a film, directed by Michael Harris and narrated by the late Orson Wells, entitled “Search for the *Titanic*” from the 1980 and '81 search activity. He has plans to recover some *Titanic* artifacts (to be placed in museums such as the Smithsonian) in 1986 or '87, using the eight-man 52-foot recertified submersible *Aluminaut*. He also hopes to produce another film based on these activities as well as another book. (The first was *Beyond Reach* by William Hoffman and Jack Grimm, Beaufort Press, 1982.) Grimm has been aided in his searches by scientists from Scripps in California and Lamont-Doherty at Columbia University in New York. The 1983 expedition turned up an interesting anomaly (thought to be one of the ship's three propellers), but Ballard this year found the “propeller” to be nothing more than

a stone outcrop.

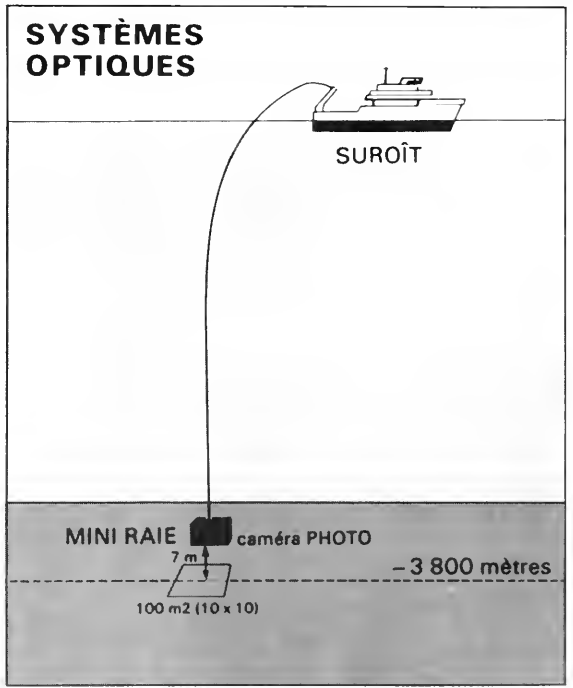
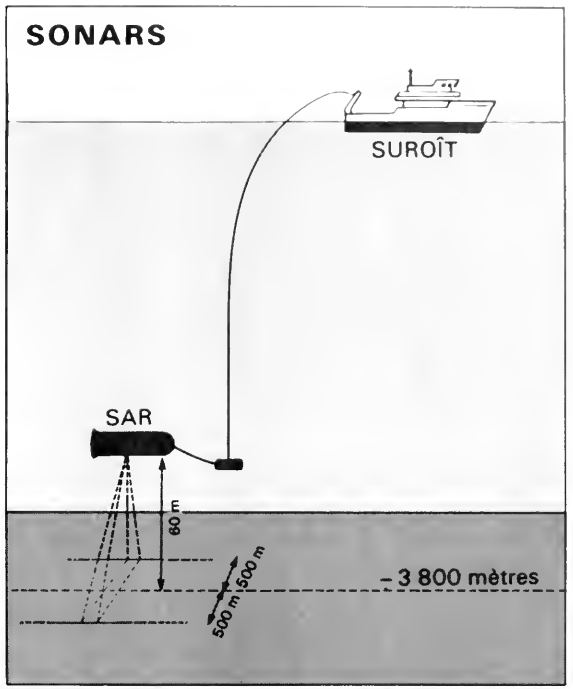
The French-American 1985 plan had called for the French to find the *Titanic* and for the *Knorr* to follow up and do the photographic work. But Murphy's Law works at sea as well as on land. Once on station, *Le Suroit* ran almost immediately into heavy weather—30 to 40 knot winds with higher gusts, seas of 12 to 13 feet, and surface currents of 2 knots. These conditions made it impossible for the French—who had been studying every detail of the ship and its history for more than a year—to complete their survey of the search area, which had been reduced to 150 square miles by the French and American calculations as to the *Titanic*'s true position. Nevertheless, operating in treacherous conditions that at one point threatened to part the cable to their underwater vehicle, the French eliminated 80 percent of the search area as the resting spot of the *Titanic*.

The SAR vehicle (5 meters long and 1 meter wide) towed by *Le Suroit* and nicknamed *Poisson* or "fish" by the French carried two lateral or side-scan sonar instruments and one vertical sonar unit capable of penetrating bottom sediments. It also trailed a magnetometer 50 meters behind, capable of telling whether any anomalies turned up in the 1 kilometer swath of the SAR were metal or not. SAR was towed at an altitude of 60 meters above the bottom and reportedly distinguished objects as small as 30 by 76 centimeters.

Ballard explains: "An acoustical search is very different than a visual search. With a side-scan sonar like SAR, you are searching for the main wreckage which will show up on the records like a large radar blip on the screen, with a high shadow behind it. At the same time, the magnetometer tells you if the object you are looking at is metallic or, like most images, is made of non-metallic rock or sedimentary material."

One problem *Le Suroit* encountered was that it could not come about in the heavy seas and strong currents. The French had hoped to survey the 150 square miles by "mowing the lawn" so to speak, going across the area and then turning about and going back again. The heavy weather forced the ship to retrieve the SAR after a crossing and run back down to the starting point before lowering the SAR again, a time-consuming process. Another time-consuming process (about 30 percent of the time at the site) was the establishment of transponder nets used to navigate the "fish." At one point, the SAR had to be retrieved while *Le Suroit* rode out a gale, even though the months of July and August had been picked as the best weather window for the search area. Still, Ballard was impressed by the French technology, later stating that the U.S. does not have a comparable system: "Mine complements their's and their's complements mine."

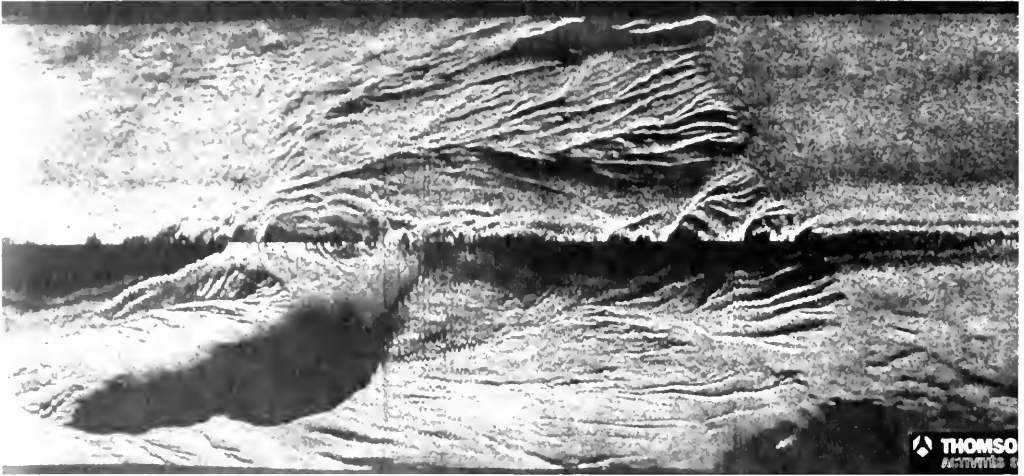
The second French cruise came to an end with a frustrated but not disheartened crew. Ballard later described the situation as "like trying to get across New York City in a cab with \$5 in your pocket." The American oceanographer and key members of the French crew, including Michel, were let off *Le Suroit* at St. Pierre, a French island



Sonar and camera used by the French researchers. (Diagram courtesy of IFREMER)

off Newfoundland, and immediately began a circuitous trip via Toronto to the Azores to join the *Knorr* on the last leg of the search.

When the *Knorr* arrived on station she initially had the benefit of 10 good days of good weather. Ballard's strategy to find the *Titanic* was



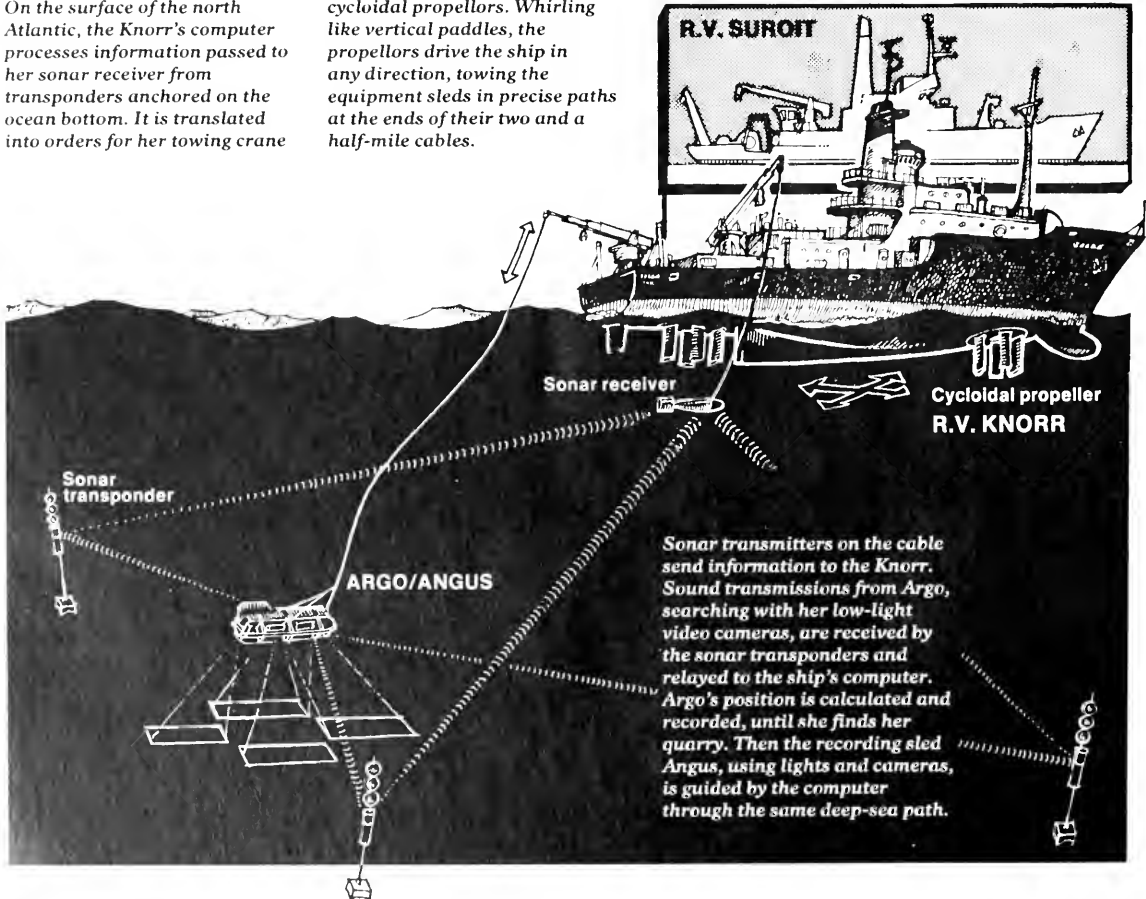
Bottom image created by the side-scan sonar on the SAR vehicle. The line in the middle is the ship's (Le Suroit's) track. (Image courtesy of HRIMIR)

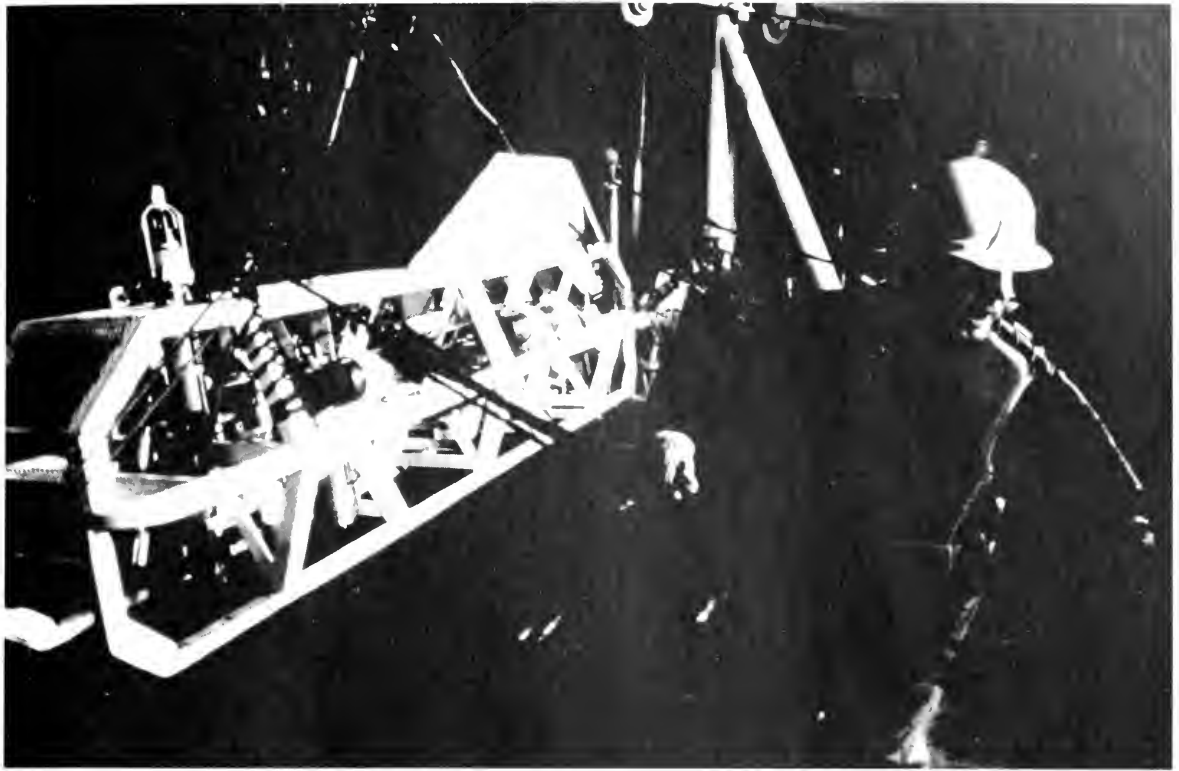
slightly different from the French's. The remaining search area contained three different types of terrain: 1) a canyon with many tributaries, 2) a sand dune area not unlike the Sahara desert, and 3) part of a large mudslide 12 to 15 miles long and 3 to 5

miles wide, the possible aftermath of an earthquake in 1928. The slide broke many transatlantic cables at the time, and the French SAR system was used to establish that the *Titanic* was not buried in most of that area.

On the surface of the north Atlantic, the Knorr's computer processes information passed to her sonar receiver from transponders anchored on the ocean bottom. It is translated into orders for her towing crane

cycloidal propellers. Whirling like vertical paddles, the propellers drive the ship in any direction, towing the equipment sleds in precise paths at the ends of their two and a half-mile cables.





Argo vehicle being launched off the Knorr during hunt for the Titanic. (Photo National Geographic/Woods Hole Oceanographic Institution)

The first order of business on the *Knorr* was to check the anomaly encountered in Grimm's 1983 expedition and craters found by the French that could possibly have been caused by the boilers from a disintegrating *Titanic*. The craters, however, turned out to be glacial erratics, a geologist's term for large boulders caught up in and released from melting icebergs. After eliminating these targets—instead of "mowing the lawn"—they concentrated on looking for a debris plume. In previous searches for other wrecks, it had been Ballard's and the Navy's experience that ships headed for watery graves left a debris plume of more than a mile behind impact. By establishing a spaced track pattern of searching for the debris rather than the wreck itself, more area could be covered.

"Our data suggested that at least a 1.1 knot southerly current was running the night the *Titanic* sank," Ballard recalled, "dispersing the debris in a north-south direction. Based on these factors we concluded our best plan was to run east-west lines starting in the south and working north in the area not already covered by the SAR. It was this strategy that was ultimately responsible for our discovery."

The *Knorr*, equipped with cycloidal propellers (see *Oceanus*, Vol. 25, No. 1, p. 48), can hold herself in position in heavy winds and seas, an advantage over *Le Suroit*. She also carried two underwater vehicles—*Argo*, named after the vessel that carried Jason in mythology on his quest for the Golden Fleece, and *ANGUS* (Acoustically

Navigated Geophysical Underwater Survey), an older 3-camera (35 mm) system often used in conjunction with *Alvin* on her dives to the hydrothermal vents in the Pacific.

The *Argo* system is described in detail elsewhere in this issue (see page 99). Suffice to say that *Argo*, which eventually will house a little tethered robot named *Jason* capable of sending back detailed closeup images of objects on the bottom, carries three video Silicon Intensified Target (SIT) cameras that can operate at a light level equivalent to a film speed of 200,000 ASA. Operating with either a continuous light source, or a strobe effect that "bangs out light for Charlie Chaplin-like snapshot images," the cameras can take pictures in excess of 100 feet (30 meters) off the bottom. Ballard described the system as basically "a lot of commercial equipment that can be bought off the shelf. Its unique nature comes from the software that has been developed by the Deep Submergence Lab from field tests." It was the *Argo* system that found the *Titanic*.

For several days after arriving in the search area, the drill was to eliminate potential targets and to explore individually the numerous tributaries running off the deep canyon in the search area not covered by the French. "The section we were headed for was about 1,000 meters across and 40 to 50 meters deep," Ballard explained. "The problem was not the depth of the canyon, but the complex series of secondary channels or tributaries that entered the canyon from both sides producing



The control room aboard the Knorr. Jean-Louis Michel (center standing), Jean Jarry (center sitting), and Robert Ballard (arms folded) watch television monitors as expedition members maneuver the Argo vehicle 13,000 feet below. (Photo by Emory K. Kristof. © National Geographic Society/WHOI)

a complex series of sonar shadows."

The initial excitement of being on station and looking for the *Titanic* soon wore off. Ballard's crew* from the Deep Submergence Laboratory (DSL) was not nearly as versed in the lore of the tragedy as the French, who had thoroughly researched it. Evenings the crew could see one of two movies aboard—*Raise the Titanic*, based on Clive Cussler's book, or *A Night to Remember*, based on Walter Lord's book. A seven-man round-the-clock 4-hour watch (each having a Frenchman) was set up in the small control center that had been especially erected on the starboard side of the aft deck. The center was basically a video studio with switching capabilities that permitted the scientific party to talk to the *Argo* cameras through microprocessors. The ship also could be navigated from the center.

As the days went by, hope for finding the wreck waned. Transponder nets were set and retrieved. A routine of keeping eyes glued to the video monitors settled in. Ears listened to rock and

country music, and mouths bulged with buttered popcorn.

On 31 August, Ballard left the control center with the rest of his 8 to 12 p.m. watch crew after turning over the watch to Michel. The weather was building after 10 days of pond-like conditions. Had something in his calculations been wrong? He had pinned his hopes of finding the *Titanic* on believing the course data given by the rescue ship *Carpathia*, discounting dead-reckoning fixes given by the *Californian* (for a complete discussion of this controversy, see pages 61, 64, and 74). After researching all the data, he was convinced that the *Titanic* had gone down somewhere on the east side of the iceflow (see map, page 14) and not on the west side as her official last sent position indicated.

But it was time to take a shower, relax, and read some of (General "Chuck") Yeager, the autobiography of a test pilot with "the right stuff" (the first to break the sound barrier) that he admired and related to. In Ballard, there is something of the astronaut, Jules Verne's Captain Nemo, and Lewis and Clark wrapped into one. He is the natural successor to Jacques Cousteau, who, faulted at times by some for his science, nevertheless made the world appreciate the wonders in shallow coastal waters and the necessity to protect them. Indeed, one of the French SAR instrument's prime purposes is to monitor pollution in deep areas of the world's oceans.

* The scientific party: Robert Ballard, chief scientist; Jean-Louis Michel, co-chief scientist; Jean Jarry, French project manager; Emile Bergeron; Martin Bowen; Sharon Callahan; Tom Crook; Tom Dettweiler; Steve Gegg; Stew Harris; Cathy Scheer; Bob Squires; Dana Yoerger; Earl Young; Billy Lange; James Saint; Georgina Baker; Lisa Schwartz; George Rev; Emory Kristof; Ralph White; Bernard Pillaud; and Terrence Snyder.

About an hour had elapsed since Ballard had left the control center, when a knock came at his door. It was the cook, John Bartolomei, who had visited the center for the first time some moments before. He stuck his head in the door, and excitedly exclaimed, "the guys in the van think you should come down."

Ballard pulled on his DSL jump suit over his pajamas and hurried to the control center, stepping into the soothing red light of the farm kitchen-sized room to see the first video image of the boilers on the monitors. "That's it," he blurted out, the excitement in him rising. His pilot's instincts

vehicle was retrieved. No spare part was available. The *Knorr's* Chief Engineer, Harold Oakes, and First Engineer, Richard Dudeck, fashioned a small miracle. They took an old bushing out of a spare cycloidal propeller and, working for nearly 14 straight hours on a lathe in the engine room, made a jerry-rig gear for the winch.

Meanwhile, an ancient fathometer at work on the *Knorr*, similar to a fishing boat's fish-finder or echo-sounder, returned the first clue as to the exact whereabouts of the *Titanic's* massive hull. From that point, it was relatively simple to lock in the *Titanic's* coordinates using a special



WHOI, IFREMER, Dr. Robert Ballard

"That's it"

immediately went to work. He called for *Argo* to be raised, realizing that the vehicle must be flying below the deck level of the *Titanic*. They would have to pinpoint the ship, bracket her with transponders, locate the stacks, find out what rigging remained.

But, at the moment, the control room was filling with excited crew members and scientists as word of the discovery spread throughout the ship. Some 30 people crowded into the center. Someone remarked that it was 1:40 a.m. The *Titanic* had gone down at 2:20. Ballard led the group out on the fantail, where they observed a brief, silent, memorial service for the more than 1,500 people who perished in the disaster. They also raised the flag of the *Titanic's* builders, Harland and Wolff.

Ballard's decision to raise *Argo*, while the right one, brought trouble on his head. The winch holding the *Argo* coaxial cable broke after the

transponder navigation system installed on the *Knorr* for the expedition. Next, a transponder net was deployed.

By then, it was time to lower *Argo* again and begin the photographic mission. The weather and the world were about to close in. Winds and seas in the next couple of days would build to 40 knots and 13 to 14 feet; the *London Observer* would run a tentative story based on rumors stating that the *Titanic* had been found. Ballard, working almost round-the-clock, meanwhile flew *Argo* gingerly around the wreck.

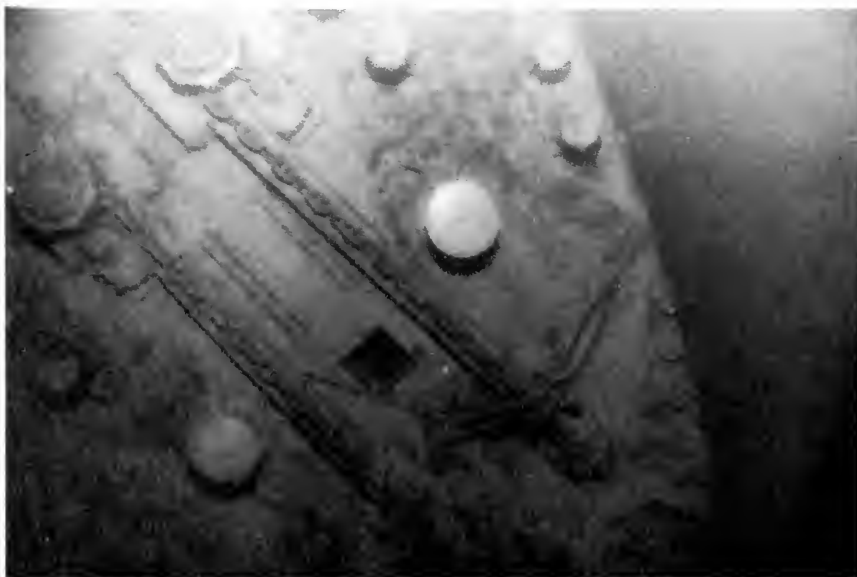
"I have never taken a pill in my life," he would later recall, "but I was tempted to take a Valium during this period." He did not want to have to go back to the Navy and report the loss of the expensive *Argo* vehicle in the *Titanic's* guy wires, saying "sorry about that." At the same time, pressure was beginning to build from the press,

(continued on page 33)

The Discovery in Pictures

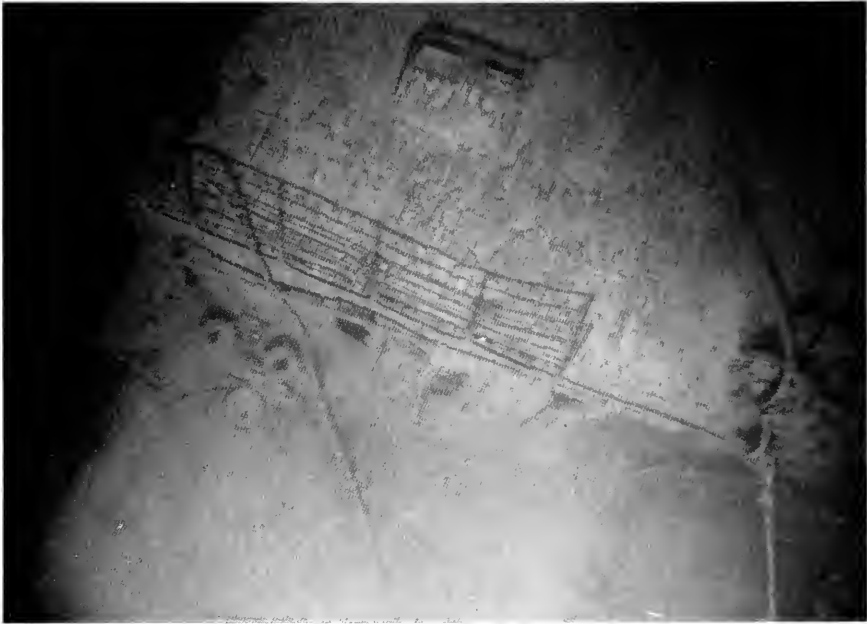
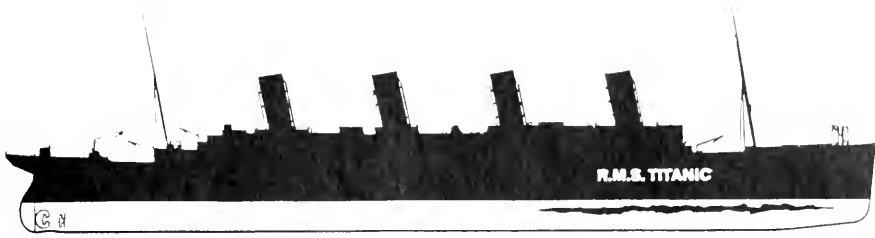


Peak of Titanic's bow with emergency anchor and handling boom



Anchor chains, capstan heads, and open ventilator shaft on bow

All photos this series courtesy of WHOI, Dr. Robert Ballard, and IFREMER



Entrance to fo'c'sle



Starboard railing with rattail fish (about 3 feet long) and mooring bits

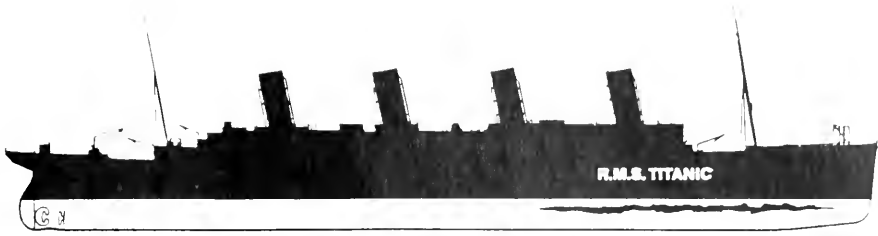
CQD . . . CQD . . . SOS . . . CQD . . . SOS
. . . MGY (Titanic) . . . come at once . . .
We have struck a berg . . . CQD OM,
position $41^{\circ}46' N$, $50^{\circ}14' W$. . . require
immediate assistance . . . We have
collided with an iceberg . . . Sinking . . .



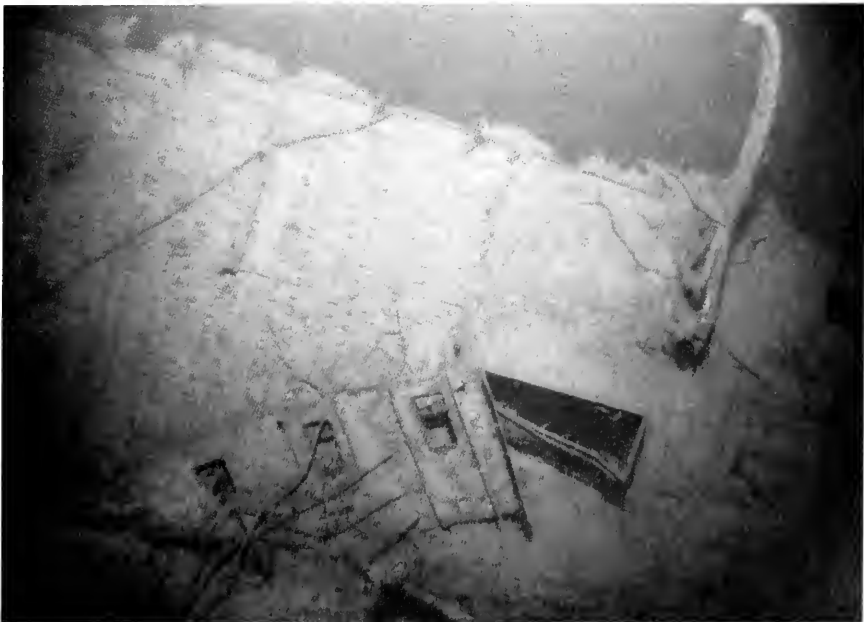
What once was glass dome above grand staircase



Hole where number 1 stack broke off



Wine bottles in debris field



Lifeboat davit at upper right

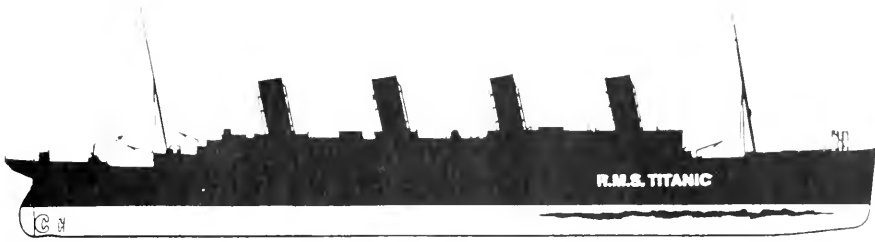
CQD . . . CQD . . . SOS . . . CQD . . . SOS
. . . MGY (Titanic) . . . come at once . . .
We have struck a berg . . . CQD OM,
position $41^{\circ}46' N$, $50^{\circ}14' W$. . . require
immediate assistance . . . We have
collided with an iceberg . . . Sinking . . .



Silver platter and coal in debris field



Ship's stern docking telegraph in debris at lower right

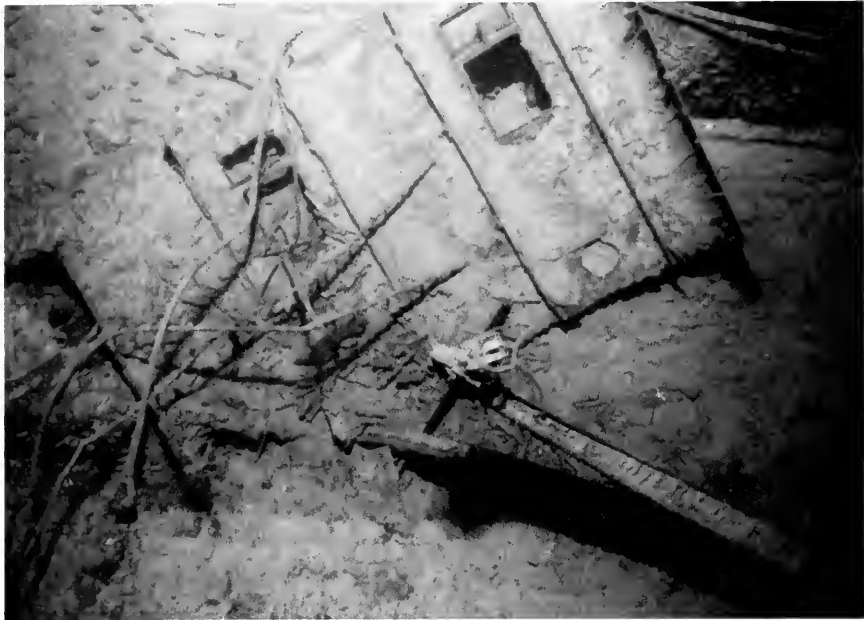


Base of stern cargo crane



Part of stern section with rollers

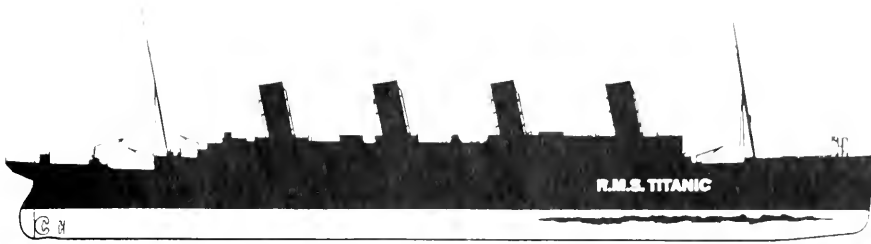
CQD . . . CQD . . . SOS . . . CQD . . . SOS
. . . MGY (Titanic) . . . come at once . . .
We have struck a berg . . . CQD OM,
position $41^{\circ}46' N, 50^{\circ}14' W$. . . require
immediate assistance . . . We have
collided with an iceberg . . . Sinking . . .



Collapsed bulkhead from Captain's quarters and davit



One of Titanic's lead cut-glass windows from lounge door at lower left



Starboard wing bridge, badly damaged



Section of steel hull plating

CQD . . . CQD . . . SOS . . . CQD . . . SOS
. . . MGY (Titanic) . . . come at once . . .
We have struck a berg . . . CQD OM,
position $41^{\circ}46' N$, $50^{\circ}14' W$. . . require
immediate assistance . . . We have
collided with an iceberg . . . Sinking . . .



Chamber pot, upper right (circled)



Bed springs in debris field

Titanic

Lost and Found (1985-1988)

Researchers from the Woods Hole Oceanographic Institution together with scientists from France recently discovered the broken hull of the *Titanic* in the North Atlantic.

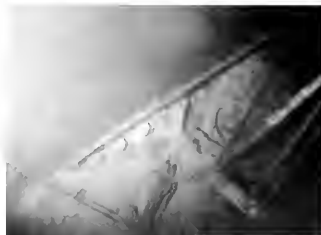
These exciting photographs were taken by cameras mounted on *Angus*, a towed sled maneuvered by operators on the research vessel, *Knorr*.

The stern of the *Titanic* broke off and is in pieces in a long debris field behind the main body of the wreck. The exact point of separation has not yet been determined.



The front smokestack of the luxury liner *Titanic* collapsed as the ship began its long journey to the bottom of the Atlantic Ocean.

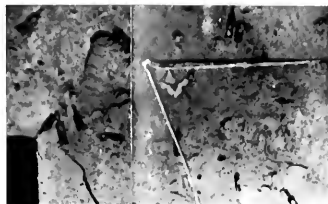
All photo credits Woods Hole Oceanographic Institution, Dr. Robert Ballard, and IFREMER.



The tip of the *Titanic*'s bow.



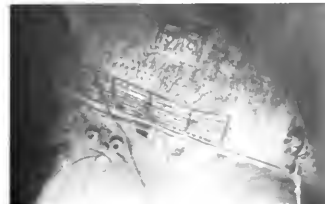
Looking down on a piece of the stern.



Bottles of wine, possibly French Bordeaux, champagne, Riesling, and Madeiras, litter the bottom of the Atlantic Ocean near the remains of the luxury liner *Titanic*.



The port and starboard bow cranes of the *Titanic*.



Looking down on the fo'c's'le. A railing and other remains of decking aboard the *Titanic* are mute reminders of havoc wreaked as the luxury liner sank.

Correction

In the caption of the pullout under the painting “Women and children loaded onto lifeboats aboard the *Titanic*,” the date should read April 15, 1912—not April 12.

home. At this point an aircraft appeared overhead

Anne Kabushka is Public Information Officer at WHOI.

The Homecoming



The Knorr returning home to Woods Hole after Titanic discovery. (Photo by Amy Rader)

WHOI, the Navy, and the *National Geographic* for more information about the discovery and the pictures being taken.

In the heaving seas at the surface, Ballard and Michel directed the navigation of *Argo* some 13,000 feet (4,000 meters) below. First surveying around the hull and then flying over it, Ballard determined that the wreck was sitting upright, that number 1 and 4 stacks were gone, and that the forward mast had toppled over, taking some of the guy wires with it. *Argo* flew so close to the *Titanic* that at one point it bounced off one of the stacks, picking up a small amount of paint on its steel frame.

At this point, Ballard decided to approach the ship from the stern, but, to his surprise, could not find it. Had it broken off somewhere beyond number 3 stack? Cruise time was running out. Ballard decided to lower *ANGUS* to get closeup high-quality 35 mm color pictures of the bow section covered with "a thin dusting of sediments, like a gentle snowstorm." Etched indelibly into the mind were images of wine bottles, silver plates, cut-glass windows, a mattress frame, twisted cranes, the ship's telegraph, and the crow's nest—a treasure trove of pictures from the deep.

Argo and *ANGUS* were finally secured on the aft deck. The transponders were retrieved. And the *Knorr*, which had been aided in her positioning on station by SatNav, a satellite system that provides position accuracy on the order of 35 meters even in the heavy seas, prepared to head home. At this point an aircraft appeared overhead

and circled for more than an hour. It had no identification markings. Ballard believes it was taking a navigational fix on the *Titanic*'s position, the exact coordinates of which he has kept secret.

On the trip back to Woods Hole, Ballard discovered that he had actually seen the stern after all—in pieces. A review of the film images disclosed that the stern was contained in a debris field extending more than a mile behind the wreck.

The *Knorr* reached port on 9 September 1985, giving a 360-degree demonstration of her cycloidal maneuverability on the way in. Families, crewmembers, and wellwishers celebrated with champagne. Meanwhile hundreds of reporters and 18 film crews recorded the event for posterity. Ballard (for profile see page 103) would comment at a later talk to WHOI Associates on a message he had received from his mother: "You've done a lot of great science; hope you survive the *Titanic*."

Argo will be transferred to the *Knorr*'s sister ship, Scripps's *R/V Melville* in December for a survey of nearly 200 kilometers along the East Pacific Rise in hydrothermal vent country (see *Oceanus*, Vol. 27, No. 3). The Rise is part of the 64,000-kilometer Mid-Ocean Ridge system. Since Project FAMOUS 12 years ago, scientists have explored only 192 kilometers of the ridge. In just 20 days, if all goes well, Ballard and a team of international scientists hope to double this mark.

Paul R. Ryan is Editor of *Oceanus* magazine at WHOI.
Anne Rabushka is Public Information Officer at WHOI.

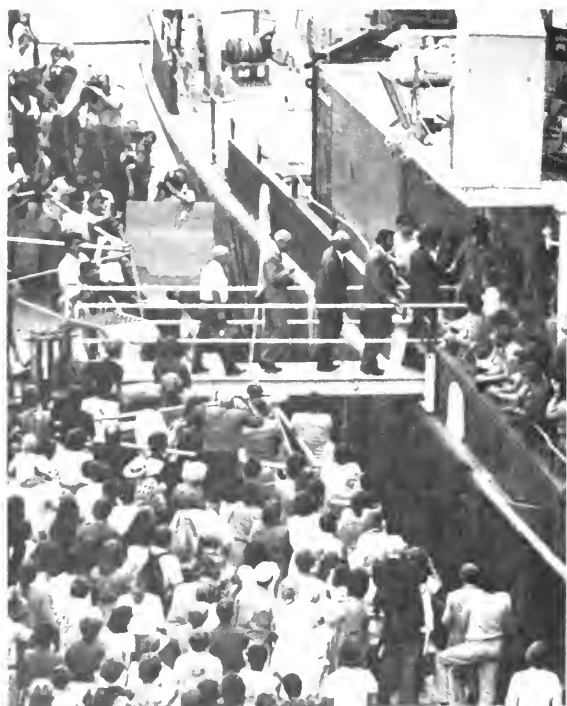
The Homecoming



The *Knorr* returning home to Woods Hole after *Titanic* discovery. (Photo by Amy Rader)



Photo by Amy Rader



At left, Ballard welcomes invited guests aboard the Knorr after docking. (Photo by N. C. Pascoe). Below, WHOI Director John Steele climbing up rope ladder from launch that met Knorr outside Woods Hole harbor. (Photo by Amy Rader) Lower left, Ballard shakes hands with his French co-chief scientist John-Louis Michel. At right, is Jean Jarry, the French Titanic Project Director. (WHOI photo)





The Titanic discovery merited world press coverage. Above, some of the "gentle persons" of the media at work. (Photo by Amy Rader) Below, Ballard shares a moment with Doug, one of his proud sons. (WHOI photo)



Above and below, WHOI Deep Submergence Lab crewmembers greet sweethearts and family members. (WHOI photos)



The *Titanic's* Role in History

by Frank Lowenstein

The whole civilized world was stirred to its depths when the full extent of loss of life was learned, and it has not yet recovered from the shock. And that is without a doubt a good thing. It should not recover from it until the possibility of such a disaster occurring again has been utterly removed from human society . . .

—from *The Loss of the SS Titanic*
by Lawrence Beesley

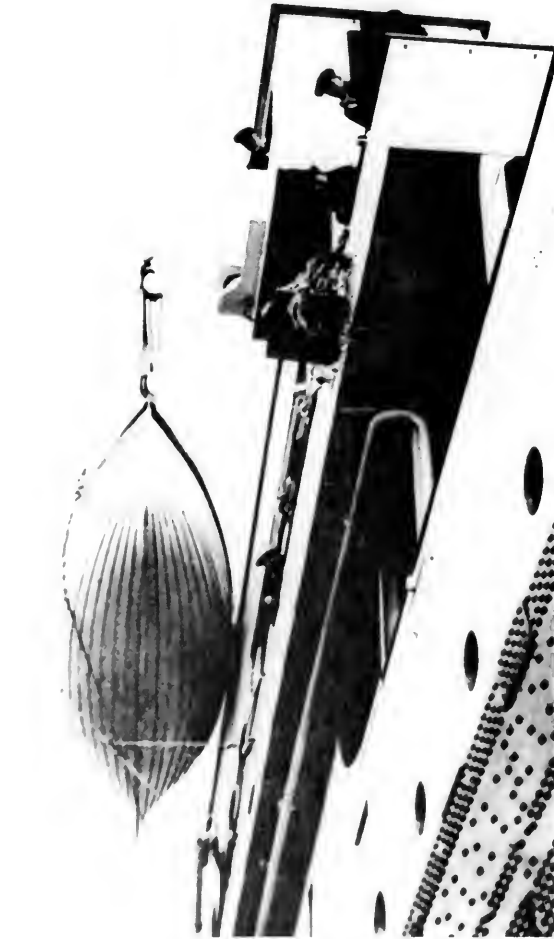
Few disasters have had such far-reaching effects on the fabric of society as the sinking of the *Titanic*. Besides altering the way the North Atlantic passenger trade was conducted, the loss also affected basic attitudes about social justice. In some cases the effects of the changes were immediate; the routes followed by passenger liners were shifted to the south four days after the disaster and an ice patrol was instituted during that same year. Other changes exerted subtle influences over the development of our culture that still echo today.

Alterations in Steamship Routes

On 17 April 1912, just two days after the sinking, the liner *Carmania* sailed from New York on a route 110 miles south of the route it would have followed before the *Titanic* sank. The United States and Great Britain had negotiated this change by telegraph. On April 19th, the U.S. Hydrographic Office announced an even more drastic change—liners were to follow courses 270 miles south of that followed by the *Titanic*, increasing the length of the New York to England trip by 9 to 14 hours. This swift shift of the sea lanes was but one symptom of an overall change in attitudes about technology. If the “unsinkable” *Titanic* could go down so easily, no ship was safe.

The practices followed by Captain E. J. Smith of the *Titanic* were, according to the British inquiry into the sinking, not unusual:

For many years past, indeed, for a quarter of a century or more, the practice of liners using this track when in the vicinity of ice at night had been in clear weather to keep the course, to maintain the speed, and to trust to a sharp lookout to enable them to avoid danger.



Looking up at the *Titanic's* bridge cab in Queensland, Ireland. Captain E. J. Smith can be seen leaning out of cab with lifeboat on davits below. This is believed to be the last photo taken of the captain before departing for New York. (Courtesy Paul Popper Photo, taken by Rev. E. M. Brown)



Newsboy hawks papers to a public hungry for information. (Photo courtesy Radio Times Hulton Picture Library)

In fact, according to *The New York Times*, many ships played chicken with the ice in pursuit of ever faster crossings:

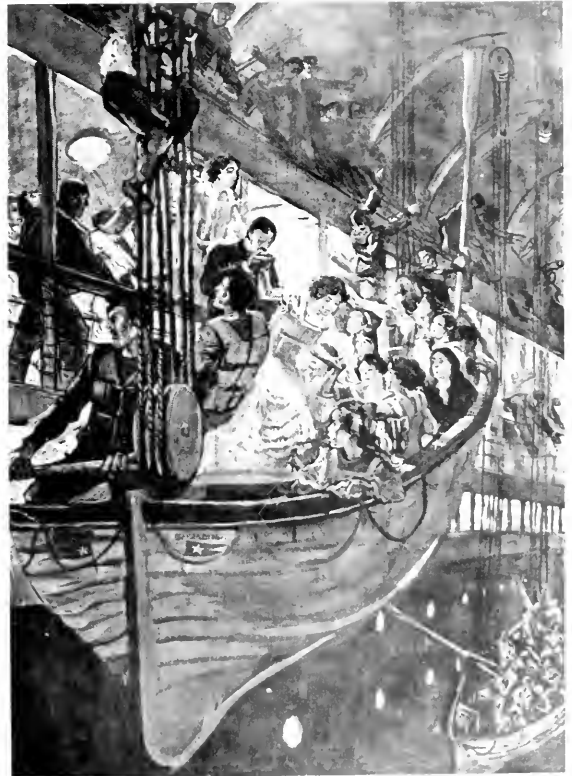
“Go to the north and save as much time as possible.” This has been looked upon as the unofficial order to many skippers, and it has been obeyed in many cases. . . . the passengers are not aware of the risk that is being taken to bring them across in good time. The skipper is often congratulated for the feat.

Lifeboats for All

Another transformation in the weeks following the *Titanic* disaster concerned the number of lifeboats carried on passenger ships. The British Board of Trade regulated the number of lifeboats carried aboard British passenger vessels, and its simple rule was that any vessel weighing more than 10,000 tons must carry 16 lifeboats. The *Titanic* exceeded this requirement, carrying 16 wooden lifeboats plus 4 collapsible boats; all the lifeboats combined could carry just under 1,200 people, or about half those on board. Had the ship been full, these boats would have sufficed for only a third of those on board. The regulations of the United States and Germany were tougher, requiring sufficient lifeboats for about two-thirds of the total capacity on a ship the size of the *Titanic*.

Since few expected the *Titanic* to sink, little thought had been given to use of the lifeboats. Two of the collapsible boats were strapped to the roof of the officers quarters and proved difficult to remove during the disaster.

Before the *Titanic* sank, E. K. Roden, a naval engineer, had written in *The Navy* that “boats enough are needed to accommodate every person on board. . . . Notwithstanding the many watertight compartments . . . no one can guarantee to build an



Artist's depiction of the loading of *Titanic*'s lifeboats with women and children. (The Bettmann Archive)

unsinkable ship. . . . Unsinkable ships like fireproof buildings are still dreams which we hope some day to realize.”

Such calls notwithstanding, ships regularly sailed without sufficient lifeboats in the early 1900s, and until the *Titanic* sank there was little public outcry to change the situation. Although Alexander Carlisle, one of the chief designers of the *Titanic*, originally proposed putting 50 boats on the ship, the White Star Line considered this unnecessary. The attitude of most of those in the trans-Atlantic passenger trade was summed up by Captain E. J. Smith (later captain of the *Titanic*), in an interview with *The New York Times* six years before the sinking:

I cannot imagine any condition which would cause a modern ship to founder. . . . Modern shipbuilding has gone beyond that.

When the unimaginable occurred, the *Titanic*'s officers did not fill the lifeboats to capacity, for fear the boats would collapse from the weight of the passengers as they were lowered. In fact, the shipyard where the *Titanic* was built had tested the boats for exactly this parameter, but the officers did not know it. Hence many lifeboats were lowered half full, or less. There had been no boat drill while at sea, and only a perfunctory one in port before leaving, so the crew of the ship was unfamiliar with their stations; many did not even know how to row. All lifeboats carried sails, but in only one boat was there sufficient knowledge among the crew to use them.

In 1914, the International Conference on Safety Of Life At Sea agreed on a treaty that called for every ship to carry sufficient lifeboats for all persons on board. It also mandated lifeboat drills, and that sufficient crew members be trained in manning the boats. Never again would so many die for lack of proper equipment. Other important provisions of the treaty included at least intermittent monitoring of the wireless around the clock for passenger vessels, and construction of watertight compartments and double bottoms on ships. Perhaps the most important outcome of the conference, however, was the formation of the International Ice Patrol.

The International Ice Patrol*

Immediately after the sinking of the *Titanic*, a British ship began patrolling the sea lanes to ensure that the location of ice was known to all ships crossing the Atlantic. On the *Titanic*, such knowledge had been haphazard, depending on reports from other ships. Two critical ice messages received by the *Titanic* on the day of the disaster were not seen by the officers on the bridge.

The British patrol was soon replaced by two U.S. Navy cruisers, which finished out the rest of the

1912 iceberg season (March through August). In 1913, two U.S. Revenue Cutters monitored the ice and a British vessel conducted some preliminary research on the movements of ice.

By January of 1914, the International Conference on Safety Of Life At Sea had suggested an international patrol to keep watch for icebergs and to do research on ice conditions in the sea lanes. The United States was asked to manage the patrol. On 17 February 1914, President Wilson authorized the Revenue Cutter Service to undertake the responsibility. (The Revenue Cutter Service and the Lifesaving Service were merged in the following year to form the Coast Guard.) Funding of the Ice Patrol was an international effort, with the bulk provided by Great Britain, the United States, France, and Germany.

In April of 1914, two U.S. Coast Guard cutters undertook the first official ice patrol. The area covered by the patrol extends from 40 degrees North to 52 degrees North, and from 39 degrees West to 57 degrees West. Thus it includes a portion of the island of Newfoundland.

After the iceberg season of 1914 was over, researchers from the Marine Biological Laboratory in Woods Hole and Harvard University went north to study ice distribution and to map the Labrador Current, which carries ice south from the Arctic to the sea lanes.

Lacking such conveniences as portable salinometers and modern current meters, the researchers depended on biological criteria—particularly the presence of an Arctic copepod—to identify waters of the Labrador flow, which carries ice south from the Arctic. The patrol asked ships traversing the Atlantic to radio in their position and the temperature of the surrounding sea, data also used to map currents.

From 1915 until the present, the International Ice Patrol has continued its mission. The only gaps occurred during the two world wars. Although there is no way to tell how many lives would have been lost without the patrol, in the decade prior to the formation of the Ice Patrol, approximately 2,000 lives were lost in shipwrecks involving ice. Since its inception, no lives have been lost in patrolled areas, although some interesting incidents have occurred.

On one cruise the patrol found a mother polar bear and cubs marooned on a berg far out to sea. After some thought, they rigged up a cage on the deck, and transferred the bears into it, but the outraged mother broke loose and started chasing the crew across the deck. Eventually, to the relief of those aboard, she jumped ship and swam away. Two cubs were brought back to the United States; one was sent to the National Zoo in Washington, D.C.

In the late 1920s another unusual incident occurred. In miserable weather, the Ice Patrol's ship stopped in the lee of a large berg near the edge of the ice. One commercial vessel kept on a course right into the ice, despite the warnings of the patrol. Finally, the ship reported that it had run aground on a berg, and it could not get free. When the Ice Patrol ship came out from behind their shelter to rescue the other ship, they found it aground on the opposite side of the same berg. Eventually the Ice

* This history of the International Ice Patrol is based largely on conversations with Robert Dinsmore, former Commander of the patrol and currently Consultant on Marine Operations and Planning at WHOI.



Top, an iceberg in the North Atlantic. At right, members of the International Ice Patrol prepare to drop annual wreath in waters near where the Titanic went down. (Photos courtesy of International Ice Patrol, USCG)



Patrol was able to pull the grounded ship free, and she proceeded with greater caution.

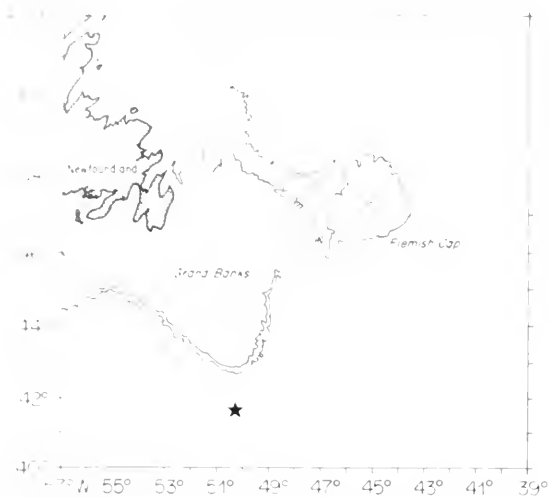
In areas not covered by the patrol, the loss of life continued, despite radar and other modern technologies. During World War II, when the patrol was temporarily suspended, a Canadian convoy ran into an ice field, losing several ships and many lives. In 1958, in Greenland waters (not covered by the patrol), the Danish liner *Hans Hedtoft* sank on her maiden voyage; about 200 lives were lost. Denmark and Canada have since instituted patrols in their northern waters.

For many years the patrol was based at the Coast Guard base in Woods Hole, Massachusetts. Most of the researchers with the patrol came from Harvard University or Woods Hole's Marine Biological Laboratory. In particular, Henry Bigelow, a Harvard professor and later the first director of the Woods Hole Oceanographic Institution, served as a consultant to the patrol from its inception. He convinced a young Coast Guardsman named Edward Smith to pursue a doctorate in physical oceanography to aid in the Ice Patrol's work. When Smith received his Ph.D. from the University of Bergen, Norway, in 1922, he was the first American to receive a doctorate in physical oceanography, and only the second to receive a doctorate in any branch of oceanography.

For most of the remainder of that decade, Smith served as commander of the International Ice Patrol, living and working in Woods Hole. When, in 1930, Henry Bigelow convinced the National Academy of Sciences that there was a need for an oceanographic institution on the East Coast, the work pursued by Smith and others connected with the International Ice Patrol influenced the decision to locate it in Woods Hole.

In the early 1930s, Floyd Soule came to Woods Hole to help with the scientific side of the patrol's work. Together Smith and Soule developed scientific instruments that had wide applications in oceanographic work and also improved the Ice Patrol's efficiency. One of these was an electrical salinometer to determine the salinity of water samples while still aboard ship. This greatly facilitated the mapping of currents, which, in turn, helped in charting the flow of ice.

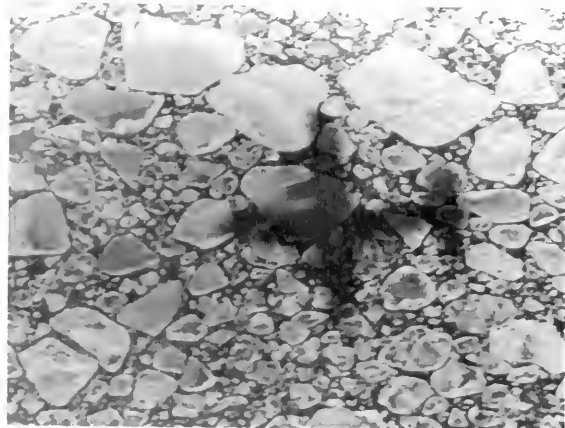
A more important outgrowth of the patrol's work was the development of sonar. In the early 1920s researchers were looking for a device to detect icebergs in fog or at night. One method tried bounced sound waves off of icebergs ahead of a ship. Because of the physical properties of water, the method had limited range, and consequently, limited usefulness. But these experiments with reflected sound led to the development of both sonar and the fathometer. Without these two devices, which were developed as an indirect result of the sinking of the *Titanic*, the *Titanic* might never have been found and many other oceanographic discoveries also might never have occurred.



Area of International Ice Patrol operations. Star marks approximate location of the *Titanic*.



Ice Patrol researchers surveying icebergs and glaciers off Greenland in the 1960s. (Photo courtesy of International Ice Patrol, USCG)



Today planes are the primary means of locating and tracking icebergs. (Photo courtesy of International Ice Patrol, USCG)

During World War II, the Ice Patrol suspended operations. Smith was sent to command U.S. forces in Greenland, largely because he knew more about the area than anyone else of appropriate rank. German submarines were active in Greenland waters. After the war, Admiral Smith, who had acquired the nickname "Iceberg," left the Coast Guard to become director of the Woods Hole Oceanographic Institution. Meanwhile, major transformations took place within the patrol.

Most significant of these was the use of aircraft for locating ice. The days when ships were stationed at the southern edge of the ice fields were over; although ships are still used to study ice conditions. In 1983, the patrol began using side-looking airborne radar (SLAR) to detect icebergs. This technology can detect icebergs as small as 10 meters long, and covers a swath 27 nautical miles wide. Once an iceberg has been spotted, the patrol uses computer models to predict its drift and break-up. As with oceanography itself, the tools of the Ice Patrol are changing, but its function remains thoroughly necessary.

All commercial ships crossing the North Atlantic still radio in their positions and ice sightings, without regard to nationality. This makes the patrol one of the longest running and most successful international efforts in existence.

Each year the patrol lays a wreath at sea to commemorate the *Titanic*. Through this ceremony, the connection between the patrol and the ship is kept alive.

The Role of Radio

Another enterprise affected by the sinking of the *Titanic* was the fledgling world of radio. Marchese Guglielmo Marconi had sent the first trans-Atlantic radio message in 1901, and in the succeeding 11 years the use of this new technology exploded. Almost all passenger liners carried a radio transmitter and operator. These operators were not employed by the steamship companies but by various wireless companies, the most successful of which was the Marconi Company, owned by Marconi himself. Since a means of transmitting voice signals was not yet available, all messages were sent in Morse code. Hence, these early radio sets were known as the wireless telegraphs.

The first lives saved by the use of radio occurred about 50 miles south of Nantucket, Massachusetts. There, in 1909, the White Star liner *Republic* collided with the Italian liner *Florida* in a dense fog, and, after some hours, sank. Another White Star liner, the *Baltic*, responded to the *Republic's* wireless call for help, and succeeded in finding the *Republic* in time to rescue almost all of the passengers and crew. This dramatic event brought wireless to the forefront of the public's imagination, and by the time the *Titanic* sank numerous amateur radio operators, as well as a much smaller number of professional operators, were listening.

Once again, the new technology proved its worth. The *Titanic* was able to summon many ships

to its location. The situation was not perfect, however. The *Californian*, which was only half as far from the *Titanic* as any other ship, had turned off her wireless set for the night (see page 61). Her only Marconi operator was sound asleep, and the captain would not learn of the *Titanic*'s distress until morning. Had the *Californian* learned of the disaster earlier, she might have been able to save many of those lost. But without wireless, all those aboard the *Titanic* probably would have been lost. Consequently, criticism of the rules under which wireless operated tended to be muted.

The last coherent word from the *Titanic* reported the engine room flooding; then a few weak signals were heard. After that the great ship was silent, and the world waited for word from the rescue vessels. The airwaves rang with messages between ships and calls from both amateur and professional stations ashore, as all sought to learn if the pride of the age had indeed sunk. The volume of traffic was too much for the few frequencies and weak receivers of the day; only fragmentary, contradictory, and incomplete messages reached New York.

Among those listening was a young Russian immigrant named David Sarnoff. He was employed by the Marconi Company to work at Wanamaker's Department Store in New York City, in theory facilitating communication between the New York and Philadelphia branches of Wanamaker's. Actually, his main purpose probably was to draw curious customers into the store. In any case, at 4:35 p.m. (New York time) on April 15, 1912, Sarnoff picked up the first definite confirmation that the *Titanic* had sunk from her sister ship, the *Olympic*. Sarnoff remained at his post for the next 72 hours, taking down information as it arrived, including the list of survivors and dead. President William Howard Taft ordered all other professional wireless stations on the East Coast shut down in an effort to improve reception. There was, however, no way to regulate amateur wireless operators, and their transmissions made the airwaves all but unintelligible.

As a result of the prominence he achieved in the wake of the *Titanic*'s sinking, Sarnoff was rapidly promoted within the Marconi Company, becoming Assistant Traffic Manager in 1915. One year later he sent a historic memo to Edward J. Nally, then General Manager of the Marconi Company:

I have in mind a plan of development which would make radio a household utility in the same sense as a piano or phonograph. The idea is to bring music into the home by wireless.

Sarnoff's idea would not be realized until 1920, when radio station KDKA began broadcasting in Pittsburgh. By this time Sarnoff had advanced to become Commercial Manager of the Marconi Company, and when the American branch of this company was bought by the newly formed Radio Corporation of American (RCA) in 1919, Sarnoff continued in the same capacity for RCA. By 1922, he was vice-president of RCA. Eventually he would play a vital role in the development of television and would become Chairman of the Board.



Guglielmo Marconi
 Bolognese
 Marchese Guglielmo Marconi (1874–1937).

Marconi lived long enough to see his invention become one of the dominant means of world communication, vital in both war and peace. He died in 1937 and was buried in his native Italy.

A Sign of the Times

Today, there is little question as to the dominant newspaper in the United States. *The New York Times* is read on both coasts and is widely available overseas. It has an unmatched reputation for accuracy and an extensive news gathering network, but its predominance was not always so great.

In the early 1900s, *The Times* was only one of many New York papers, including *The New York Herald*, the *New York American*, the *New York Tribune*, and *The World*. The sinking of the *Titanic* was one factor that helped put *The New York Times* a cut above the rest.

At 1:20 a.m. on April 15, 1912, the first edition of the paper was about to be printed, when the following bulletin arrived:

CAPE RACE, [Newfoundland] Sunday Night, April 14 (AP)—At 10:25 o'clock tonight the White Star Line steamship TITANIC called CQD to the Marconi station here, and reported having struck an iceberg. The steamer said that immediate assistance was required.

Carr Van Anda, managing editor of *The Times* shook the newsroom to action, stopping the presses to make room for a new lead story that reported the *Titanic* sinking in mid-ocean after striking an iceberg. One further report came in that night, which reported the *Titanic* down by the head and putting the women and children off in boats. Based on this report and the total silence that followed it, Carr Van Anda took a chance. The final edition of *The New York Times* reported the great liner sunk.

All newspapers had access to the same information at this point. As Elmer Davis explained in

his book, *History of The New York Times*, in dealing with this news "an individual newspaper could distinguish itself only by specially competent treatment." *The Times* accurately deduced from the AP bulletins that the ship had sunk. But most other newspapers relied on her watertight compartments, and ran timid reports of her distress call, many with assurances of her invulnerability. The last edition of *The New York Times* reported the *Titanic* sunk, even as the last edition of *The Evening Sun* (a Baltimore paper) reported that all of the passengers were safe and the liner was being towed to Halifax.

Even when the truth was out, *The New York Times* still kept its lead. *The Times* was the first paper to report the shortage of lifeboats, and when the *Carpathia* arrived in port, *The Times* had the best coverage of the arrival, including an exclusive interview with the *Titanic*'s surviving wireless operator (see page 46).

Its superior handling of the *Titanic* story gave *The Times* an edge over the competition that it was never to lose. During World War I, this edge was honed until, according to Barnett Fine's biography of Carr Van Anda, *A Giant of the Press*, "at the end it had achieved an international reputation that ranked it as the foremost newspaper in the world."

Social Effects?

Many people have postulated that the sinking of the *Titanic* was responsible for a number of social changes that took place in the first third of the 20th century. Everything from the decline of feminism, to the growth of black consciousness, to the declining idolization of the upper classes has been attributed to the *Titanic*. Although the *Titanic* doubtless had relevance for all these issues and many others besides, it is difficult to look back from 73 years' distance and say this event was responsible for any one particular change in attitudes. Thus the following section is intended merely to point out some of the changes in social attitudes following the *Titanic* disaster, and to indicate how the sinking may have influenced these developments.

Steerage Ignored

When the *Titanic* sank, public attention focused on the noted celebrities on its upper decks; the more numerous third-class passengers, many of whom were immigrants or foreigners and held in low regard by the class-conscious American society of the time, were all but forgotten. These passengers also had been largely ignored during the evacuation of the ship. Many were grouped together by the crew on E deck, 5 decks below the lifeboats. From there, they were largely on their own. Two groups of women and children were shepherded to the surface by Third Class Steward John Edward Hart, but most who escaped reached the boats only by dogged persistence.

Some steerage passengers reported that when they tried to cross into first- or second-class areas, they were blocked or threatened by crew members or officers of the *Titanic*, even though there was no way to the lifeboats without passing through these areas. Some actually climbed up and along the

The Plight of the Crew

Once ashore, there was a class that fared even worse than the steerage passengers, and that was the crew. Many individuals and organizations contributed funds for the aid of the rescued steerage passengers. Vincent Astor contributed \$10,000; Andrew Carnegie \$5,000; others contributed smaller amounts; and the New York Giants played a benefit exhibition game. Charles Steinway, of the Steinway Piano Company sponsored a \$2-a-plate benefit dinner and cabaret performance. (Remember, this was when *The New York Times* cost a penny.)

The crew, however, was by and large penniless, and White Star Line refused to issue them any pay until their return to England. Moreover, they would be paid for their work only until the moment the *Titanic* sank, after which they were no longer considered on the job. J. Bruce Ismay later donated £10,000 out of his own pocket to a fund for seamen; this money was used to help the surviving crew members of the *Titanic* and the widows of the men who perished.

—FL

Titanic's cranes to escape the doomed steerage compartments.

The troubles that faced these third-class passengers stemmed from a number of sources. Most were immigrants and did not speak English; thus they may not have been aware of the problem or may have had difficulty communicating with the crew. Many had all their worldly possessions with them and were reluctant to part with them. Steerage passengers were ordinarily locked out of first- and second-class areas, partially because of U.S. immigration law requirements, and no explicit orders were given to drop these barriers. Most importantly, the steerage passengers simply were not considered as valuable as the first- and second-class passengers.

When the survivors reached port, the biased treatment accorded the third-class passengers did not receive much attention from the press, public, and government. The heroism of those who managed through luck and perseverance to escape was ignored; the focus, instead, was on the chivalry of those first-class men who gave their lives to allow women to live. Any reports of unchivalrous behavior were ascribed to third-class men or, as by the *Titanic*'s fifth officer, Harold Lowe, to one particular nationality. In fact, Lowe's continual reference to the cowardly men he had encountered as Italians, brought a request for an apology from the Italian ambassador to the United States. Lowe's correction for the record is fascinating:

I do hereby cancel the word "Italian" and substitute the words "immigrants belonging to Latin races." In fact, I did not mean to infer that they were especially Italians, because I could only judge from their general appearance and complexion, and therefore I only meant

to imply that they were of the types of the Latin races. In any case, I did not intend to cast any reflection on the Italian nation.

This is the real truth, and therefore I feel honored to give out the present statement.

H. G. Lowe

Although some may still believe in superiority based on appearance or national origin as Lowe evidently did, few would be willing to state it so plainly. Any such public statement today would provoke a storm of outrage. In 1912, it passed with little public comment; Lowe was only echoing the assumptions of most Americans. Perhaps this is why the terrible loss of life in the steerage compartments evoked far fewer eulogies than the many fewer losses in first class.

This not-so-subtle racism and the accompanying fascination with the upper classes was one of the casualties of the decades following the *Titanic's* sinking. It seems likely, however, that this change had more to do with the heroism of the poor and rich alike in World War I, and with the development of new idols in the form of movie stars in the years following the war, than it does with the sinking of the *Titanic*.

Suffrage But No More

In the years immediately prior to the sinking of the *Titanic*, the women's suffrage movement was quite strong, and like today's feminists, the suffragettes were demanding equality on many levels. The *Titanic* dealt a blow to this move toward equality. If women were men's equals, then no distinction should have been made in filling the lifeboats. Many suffragettes argued that this was the way things should be ordered, but it was not a popular view. Harriet Stanton Blatch, president of the American Political Woman's Union, argued that since men were responsible for the lack of lifeboats on the ship, it was proper that they were the ones who went down with it. If women received the vote, she stated, "Then we would have laws requiring plenty of lifeboats."

A backwash of conservatism on women's issues swept the nation following the sinking. Led by First Lady Nellie Taft, antisuffragettes raised \$25,000 for a women's memorial to the chivalry of the men on the *Titanic*. The resulting 18-foot-tall statue of a half-clad man pays tribute to the men "who gave their lives that women and children might be saved."

What the ultimate effect of the *Titanic* disaster on the women's movement would have been is impossible to say. Two years later, World War I drowned out the sacrifice on board the *Titanic* in a massive wave of death. Although women received the vote in 1920, the issues of equality that were being discussed before the sinking were not raised so vigorously again until the carnage of World War II had begun to be forgotten.

Standing Black and Tall

While stiling the women's movement, the *Titanic* disaster raised the consciousness of blacks in the United States. That such a disaster could overcome

An Educational Legacy

One of the more unusual legacies of the sinking of the *Titanic* is Widener Library at Harvard University. This enormous building, the main library at Harvard, houses some 3 million volumes. It was donated to the university by Mrs. Eleanor Elkins Widener, a survivor of the *Titanic*, in memory of her son Harry Elkins Widener, who died in the wreck. Construction of the library was begun in 1912, and it was formally presented to the university on 24 June, 1915.

Mrs. Widener was convinced that if her son had known how to swim, he would have survived, and she donated the money for the library's construction on the condition that every person graduating Harvard College be required to pass a swimming test (50 yards of any stroke but backstroke) before receiving their diploma. The test is still given, although it has not been required for graduation since the late 1950s. Whether being able to swim 50 yards would have helped Harry Widener is a matter of conjecture. —FL

the epitome of white culture gave blacks new hope and confidence in themselves.

John and Alan Lomax, in their *Negro Folk Songs as Sung by Lead Belly* note that the sinking was "the most widely celebrated tragedy of that era, the event that seems to have caught the imagination of the Negro." A number of ballads appeared about the sinking, most of which either relished the fact that no blacks were lost in the sinking or made fun of white incompetence. Typical was a Lead Belly ballad called "De *Titanic*," collected and analyzed by the Lomaxes:

Lead Belly's ballad is 'worldly and sinitul' and it places the responsibility for the tragedy on 'Captain Smith,' who drew the color line too sharply in refusing passage to Jack Johnson: 'I ain't haulin' no coal.' But the song ends triumphantly: 'Black man oughta shout for joy, never lost a girl or either a boy.'

Such ballads represent one step in a mental transformation to equality, a gradual transition from emulating white people to standing up for their own values. Once again, the importance of the *Titanic* in this process is hard to pin down.

Although the total number of lives lost was tiny compared to the number of lives lost in the two world wars that followed, the fact that the *Titanic* captured people's imagination has given it great weight in public consciousness. Its significance is perhaps best estimated by the tremendous interest that has been evoked by the discovery of the ship. Its ultimate effects on society may not be complete even today.

Frank Lowenstein is Assistant Editor of *Oceanus*.

EDITOR'S NOTE: On 6 November 1985, the House Committee on Merchant Marine and Fisheries unanimously approved the following bill, with several amendments. The amendments emphasize that guidelines and agreements regarding the *Titanic* are intended to be cooperative and international in nature. Semi-annual reports to Congress on the progress of negotiations are required. Additionally, a provision was included stating it is the sense of Congress that only limited research and exploration should proceed (the site should not be altered or disturbed) pending an international agreement on the maritime memorial.

99TH CONGRESS
1ST SESSION

H. R. 3272

To designate the shipwreck of the *Titanic* as a maritime memorial and to provide for reasonable research, exploration, and, if appropriate, salvage activities.

IN THE HOUSE OF REPRESENTATIVES

SEPTEMBER 11, 1985

Mr. JONES of North Carolina (for himself, Mr. LENT, Mr. BIAGGI, Mr. STUDDS, Mr. LOWRY of Washington, Mr. CARPER, and Mr. HUGHES) introduced the following bill; which was referred to the Committee on Merchant Marine and Fisheries

A BILL

To designate the shipwreck of the *Titanic* as a maritime memorial and to provide for reasonable research, exploration, and, if appropriate, salvage activities.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as "The *Titanic* Maritime Memorial Act of 1985".

SEC. 2. FINDINGS AND PURPOSES.

(a) FINDINGS.—The Congress finds that—

(1) the *Titanic*, the ocean liner which sank on her maiden voyage after striking an iceberg on April 14, 1912, is a maritime memorial to the men, women, and children who perished aboard her;

(2) the recent discovery of the shipwreck *Titanic*, lying more than twelve thousand feet beneath the ocean surface, demonstrates the practical applications of ocean science and engineering;

(3) the shipwreck *Titanic*, well preserved in the cold, oxygen-poor waters of the deep North Atlantic Ocean, is of major national and international historical significance;

(4) the shipwreck *Titanic* represents a special opportunity for deep ocean scientific research and exploration; and

(5) the shipwreck *Titanic* is a cultural and historical memorial which merits reasonable international protection.

(b) PURPOSES.—The Congress declares that the purposes of this Act are—

(1) to establish the shipwreck *Titanic* as an international maritime memorial to those who lost their lives aboard her in 1912;

(2) to require the establishment of national guidelines for conducting research on and exploration and, if appropriate, salvage of the shipwreck *Titanic*;

(3) to express the sense of the United States Congress that all nations conduct their activities relating to the shipwreck *Titanic* in accordance with these guidelines; and

(4) to direct the United States to enter into negotiations with other interested nations, including Great Britain, France, and Canada, to establish an international agreement which will protect the scientific, historical, and cultural significance of the shipwreck *Titanic*.

SEC. 3. DEFINITIONS.

(a) "Administrator" means the Administrator of the National Oceanic and Atmospheric Administration (NOAA);

(b) "Secretary" means the Secretary of State;

(c) "Shipwreck" means the vessel, *Titanic*, her cargo, and other contents;

(d) "United States" means the several States, the District of Columbia, the Commonwealth of Puerto Rico,

American Samoa, the United States Virgin Islands, Guam, and any other Commonwealth, territory, or possession of the United States.

SEC. 4. COMMENDATION.

The Congress of the United States highly commends the members of the joint international expedition which discovered the shipwreck *Titanic*, and urges that this cooperative effort serve as a model for further international activities related to this memorial.

SEC. 5. NATIONAL GUIDELINES.

(a) The Administrator shall develop guidelines to govern research, exploration, and, if appropriate, salvage of the shipwreck *Titanic*, which: (1) are consistent with its historical and cultural significance, as well as the purposes and policies of this Act; (2) promote the safety of individuals involved in such operations; and (3) recognize the sanctity of the shipwreck *Titanic* as a maritime memorial.

(b) In developing these guidelines, the Administrator shall consult with other interested Federal agencies, academic and research institutions, and members of the public.

SEC. 6. INTERNATIONAL AGREEMENT.

(a) The Secretary is directed to enter into negotiations to develop an international agreement which provides for international research, exploration, and, if appropriate, salvage of the shipwreck *Titanic* consistent with guidelines developed pursuant to section 5 and the purposes and policies of this Act.

(b) The Secretary shall consult with the Administrator when fulfilling section 6(a) above. The Administrator shall provide research and technical assistance to the Secretary.

(c) Upon adoption of an international agreement under section 6, the Secretary shall provide notification of the agreement to the Committee on Merchant Marine and Fisheries in the House of Representatives and to the appropriate committee in the Senate, including recommendations for legislation to implement the agreement.

SEC. 7. SENSE OF CONGRESS.

It is the sense of Congress that pending adoption of an international agreement under section 6, no nations should undertake any activities in regard to the shipwreck *Titanic* which are not in compliance with the guidelines developed under section 5.

SEC. 8. DISCLAIMER OF EXTRATERRITORIAL SOVEREIGNTY.

By enactment of this Act, the United States does not assert sovereignty or jurisdiction over, or the ownership of, any marine areas, the vessel or any of its cargo, unless otherwise subject to its jurisdiction.



U.S. Position on *Titanic* Memorial Site

The Department of State supports the purpose of this legislation to designate the *Titanic* as an international maritime memorial. The *Titanic* represents a unique maritime event because of the circumstances of the disaster and the tremendous number of lives lost. This supposedly unsinkable vessel's loss became a turning point in international maritime safety law.

The bill announces the Sense of Congress that the *Titanic* be protected. The bill is an important step forward, in that it recognizes the international character of this subject. The United States cannot achieve the objective of this legislation unilaterally. The United States must consult, discuss, and negotiate with others to achieve the end which we all seek.

There are many complicated issues to be addressed. First, there is the vessel's location. It is located on the ocean floor in 12,000 feet of water

beyond the jurisdiction of any country. Ownership issues must also be sorted out. It is only with the assistance of the United Kingdom that we can hope to uncover the nature and character of the rights of its nationals in this vessel. Finally, discovery itself may afford certain rights under maritime law and so cooperation with the French government is vital. For these and other reasons we endorse an international approach to protect the *Titanic*.

Acknowledging this need for a cooperative approach, the Department of State endorses the concept that the guidelines for protection of the *Titanic* be developed internationally, rather than by the United States alone. A provision in the bill which recognizes the need for a cooperative approach would encourage other countries' support for the creation of a maritime memorial. We could also benefit from their advice in defining this concept so that it is used in a narrow, rather than a broad sense.

In proposing to create a maritime memorial beyond national jurisdiction the United States must be careful not to interfere unreasonably with the legitimate activities of other countries and their nationals. Although the United States does not have the right to prohibit the nationals of other countries from detaching or salvaging the *Titanic*, we may prohibit our own nationals and other persons subject to the jurisdiction of the U.S. from doing this. It is on this basis that we should proceed.

You may also hear calls for a moratorium. I would urge that language to this effect be avoided in this bill. The Department would support such an approach if it becomes necessary or desirable in the future. There may come a point in negotiating such an Agreement where it would be helpful. If that time comes we may need to return to the Congress for additional legislation.

Since introduction of the legislation, the United States has solicited the views of the three governments mentioned in the bill. Preliminary indications are positive, as long as the U.S. acts in a cooperative fashion. I know the Committee is interested, as we are, in how negotiations to obtain an Agreement to protect the *Titanic* would be conducted. This will be decided after further consultation with our allies and others, taking into account the approach most likely to be successful.

We are exploring the question of what role, if any, the International Maritime Organization (IMO) should play in the proposed negotiations. Tentative indications suggest that IMO officials would support the concept of that Organization providing the forum for negotiations. At the same time, because an Agreement through IMO may require two or more years to achieve, an Interim Agreement among the most concerned States may be necessary.

The Committee has asked for information regarding potential claims to the vessel. The rights to the vessel and its contents are indeed quite murky after 73 years. But potential claims could be made by Commercial Union, the company that insured the *Titanic*; a citizen to whom the company may have subrogated its rights; Cunard, the company which owns the vessel; and survivors or heirs of passengers who could prove ownership of recovered property, among others.

Salvage law is complicated and involves distinctions between proprietary or ownership and possessory rights. These issues must all be examined, in consultation with involved governments, if the *Titanic* is to be protected (See article page 94).

The United States will take the lead in encouraging an international agreement to protect the *Titanic*, to insure that it remains a lasting memorial to those who died in the tragedy. While we support the intent of H.R. 3272, we recommend that the legislation be amended as described in the addendum to my statement. I would also note that the costs to implement this legislation would include sums for personnel and overhead involved in assigning one or two persons to engage in multilateral talks, and appropriate sums for travel. This is based on the assumption that other states are interested in entering into a multilateral forum, to discuss coordination of activities pertaining to the *Titanic*. No additional appropriations will be requested by the Administration.

In concluding my testimony, I would like to emphasize that customary international law supports cooperation among States to protect objects of an archaeological and historical nature found at sea. The United States will work toward this end.

Addendum

The Department of State recommends that the legislation be amended in the following manner:

Section 2: Purposes—In order to promote a cooperative spirit among nations which would be the foundation of any agreement to protect the *Titanic*, this Section should encourage the establishment of an international maritime memorial and the establishment of international guidelines.

Section 5: National Guidelines—The word "International" should be substituted for the word "National" title of this Section. In Section 5 (b), language should be added to reflect that interested foreign governments are to be involved in the drafting of guidelines.

Section 6: International Guidelines—The Department recommends that language be added to Section 6 (a) in order to assure the proper cross referencing of the purpose of the bill which is to create a maritime memorial.

Letter Writers

The editor welcomes letters that comment on articles in this issue or that discuss other matters of importance to the marine community.

Early responses to articles have the best chance of being published. Please be concise and have your letter double-spaced for easier reading and editing.

**Statement of
Brian J. Hoyle, Director,
Office of Ocean Law and
Policy,
U.S. Department of State
Before the
House Merchant Marine and
Fisheries Committee
29 October 1985**

Robert D. Ballard's Statement Before the House Merchant Marine and Fisheries Committee

29 October 1985

Since man has built ships, nature and man himself have sent many of those crafts of commerce and of war back to the bottom of the sea. Those that sank in the deep sea were felt lost forever while those sinkings which occurred in shallow water have, at times, been the focus of intense search and recovery operations. Since Alexander the Great descended to the bottom of the sea in the first crude diving bell, salvaging the treasures of the sea has become a part of our folklore. To many Americans, underwater treasure hunters and salvagers are marine cowboys with the wind blowing in their faces and the wild seas to ride.

We have followed their exploits in the news and seen little harm in their actions except when they have clearly destroyed wrecks of historical value. This conflict of interest between salvagers and marine historians and archaeologists is at the center of public attention. Resting in 13,000 feet of water off the North American coast is the greatest shipwreck in man's history, the *RMS Titanic* and, unlike most shallow water wrecks, it is in excellent condition.

The chances that a ship sinking in shallow water will end up like the *Titanic* are small. Many ships which sink in shallow water have struck a reef and are severely damaged or went aground in a storm and were violently pounded against a reef or a rocky coastline. Once the remains of these ships came to rest, their wooden planks are food for the worm boring organisms that live in the shallow waters of the world's oceans. The metallic objects began to rust in the oxygen-rich waters and encrusting organisms flourished in the sun-bathed surface layers slowly turning man-made outlines into mounds of coral or current swept sand dunes. In many cases, all that remains is the cargo itself and the treasure hunters see no conflict in the salvage efforts.

I am neither an archaeologist nor treasure hunter; I am a marine scientist and explorer. I am not here to enter the debate as much as I am here to point out that the technological genius most Americans are so proud of has entered the deep sea in full force and placed before us a new reality. In short, the great pyramids of the deep are now accessible to man. He can either plunder them like the grave robbers of Egypt or protect them for the countless generations which will follow ours.

Unlike the shallow reefs off Florida which reduce a wreck to an unrecognizable mound of encrusted coral, the deep sea is a preserving environment. Ships in the deep were, in many cases, sent to the bottom without having sustained any major structural damage. They either took on water during a storm and sank, or like the *Titanic*, had a hole punched in their hull. In the deep sea,

shipwrecks enter a world of total darkness which makes the growth of plants impossible. Without plants, few animals can be found, creating a desert-like world with an organism here and another one there. The freezing temperatures of the deep sea further inhibit biological activity as does the extreme pressure. The pressure at the *Titanic* site is more than 6,000 pounds per square inch. Far from land, the rate of sedimentation in the deep sea is measured at an inch or so per thousand years. And in some deep sea environments like the historically travelled Mediterranean Sea, the bottom waters are poor in oxygen further making the deep sea a giant preserving refrigerator.

Some would say, so what. If the deep sea is a great preserver of man's history, what good does it do us if it is left in total darkness beyond the reach of man's inquiring mind. My answer is it isn't and each day we are moving at a faster and faster pace to make it easily accessible to the general public. The technology we used to find the *Titanic* is the vanguard of the very technology man will use to find, document, and revisit historic pieces of preserved history in the deep sea. Known as "telepresence," this technology in cruder form has been with us for many years. Going to the movies or turning on the television or picking up the phone are all forms of telepresence. The ability to project your thoughts, your eyes, and eventually your hands, is each day becoming an increasing reality. Exploration in the deep sea is not driving this technology, but it is beginning to benefit from it. The space program with its robots on Mars and Venus, the military with its desire to remove humans from the risks of combat, and the commercial world with their evolving television coverage and the proliferation of multiple cinemas, are the driving forces of telepresence technology. Cinemas are becoming smaller and eventually more personalized. Commercial companies are beginning to build small cinemas inside flight simulators for a life-like trip through the Universe.

I strongly believe that if the *Titanic* is left alone that within the next few years, beginning as early as next year, robotic vehicles will be able to enter its beautifully designed rooms and document in color its preserved splendor. No salvage operation in the world could duplicate this feat.

The *Titanic* is just one such example. Literally thousands of ships lie in the deep sea awaiting mankind. The question is, will he come to plunder or to appreciate? This is a debate which grows louder, not quieter. Technologists, like myself, can only cause this problem and suggest its possible impact, but Congress must take the necessary actions and, in my case, hopefully before the *Titanic* is destroyed.

Bride's Story

EDITOR'S NOTE: This statement was dictated by Harold Bride to a reporter for *The New York Times*, who visited him with Marchese Marconi in the wireless cabin of the *Carpathia* a few minutes after the rescue ship docked.

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When I was dragged aboard the *Carpathia* I went to the hospital at first. I stayed there for 10 hours. Then somebody brought word that the *Carpathia's* wireless operator was "getting queer" from the work.

They asked me if I could go up and help. I could not walk. Both my feet were broken or something, I don't know what. I went up on crutches with somebody helping me.

I took the key and I never left the wireless cabin after that. Our meals were brought to us. We kept the wireless working all the time. The Navy operators were a great nuisance. I advise them all to learn the Continental Morse and learn to speed up in it if they ever expect to be worth their salt. The *Chester's* man thought he knew it, but he was as slow as Christmas coming.

We worked all the time. Nothing went wrong. Sometimes the *Carpathia* man sent and sometimes I sent. There was a bed in the wireless cabin. I could sit on it and rest my feet while sending sometimes.

To begin at the beginning, I joined the *Titanic* at Belfast. I was born at Nunhead, England, 22 years ago, and joined the Marconi forces last July. I first worked on the *Hoverford*, and then on the *Lusitania*.

Asleep When Crash Came

I didn't have much to do aboard the *Titanic* except to relieve Phillips from midnight until some time in the morning, when he should be through sleeping. On the night of the accident, I was not sending, but was asleep. I was due to be up and relieve Phillips



J. C. (Jack) Phillips, senior radio operator on the *Titanic*, who lost his life when the vessel went down. (Photo courtesy *The Marconi Company, Ltd.*)

earlier than usual. And that reminds me—if it hadn't been for a lucky thing, we never could have sent any call for help.

The lucky thing was that the wireless broke down early enough for us to fix it before the accident. We noticed something wrong on Sunday and Phillips and I worked seven hours to find it. We found a "secretary" burned out, at last, and repaired it just a few hours before the iceberg was struck.

Phillips said to me as he took the night-shift, "You turn in, boy, and get some sleep, and go up as soon as you can and give me a chance. I'm all done for with this work of making repairs."

There were three rooms in the wireless cabin. One was a sleeping room, one a dynamo room, and one an operating room. I took off my clothes and went to sleep in bed. Then I was conscious of waking up and hearing Phillips sending to Cape Race. I read what he was sending. It was traffic matter.

I remembered how tired he was and I got out of bed without my clothes on to relieve him. I didn't even feel the shock. I hardly knew it had happened after the Captain had come to us. There was no jolt whatever.

I was standing by Phillips telling him to go to bed when the Captain put his head in the cabin.

"We've struck an iceberg," the Captain said, "and I'm having an inspection made to tell what it has done for us. You better get ready to send out a call for assistance. But don't send it until I tell you."

The Captain went away and in 10 minutes, I should estimate the time, he came back. We could



Marconi Marine 1912 installation, as fitted in the wireless room of the Titanic. At left is a valved receiver with headphones; fitted to the wall is the magnetic detector and, beneath this, the Marconi/Franklin multiple tuner; partly obscured by the head of the operator is the 10 inch induction coil spark transmitter. On wall at right are the controls of the power generator, housed in the adjoining cabin. (Photo courtesy The Marconi Company, Ltd.)

hear a terrible confusion outside, but there was not the least thing to indicate that there was any trouble. The wireless was working perfectly.

"Send the call for assistance," ordered the Captain, barely putting his head in the door.

"What call should I send?" Phillips asked.

"The regulation international call for help. Just that."

Then the Captain was gone. Phillips began to send "C.Q.D." He flashed away at it and we joked while he did so. All of us made light of the disaster.

Joked at Distress Call

We joked that way while he flashed signals for about five minutes. Then the Captain came back.

"What are you sending?" he asked.

"C.Q.D.," Phillips replied.

The humor of the situation appealed to me. I cut in with a little remark that made us all laugh, including the Captain.

"Send 'S.O.S.,' I said. 'It's the new call, and it may be your last chance to send it.'"

Phillips with a laugh changed the signal to "S.O.S." The Captain told us we had been struck amidships, or just back of amidships. It was 10

minutes, Phillips told me, after he had noticed the iceberg, that the slight jolt that was the collision's only signal to us occurred. We thought we were a good distance away.

We said lots of funny things to each other in the next few minutes. We picked up first the steamship *Frankfurt*. We gave her our position and said we had struck an iceberg and needed assistance. The *Frankfurt* operator went away to tell his Captain.

He came back and we told him we were sinking by the head. By that time we could observe a distinct list forward.

The *Carpathia* answered our signal. We told her our position and said we were sinking by the head. The operator went to tell the Captain, and in five minutes returned and told us that the Captain of the *Carpathia* was putting about and heading for us.

Great Scramble on Deck

Our Captain had left us at this time and Phillips told me to run and tell him what the *Carpathia* had answered. I did so, and I went through an awful mass of people to his cabin. The decks were full of

scrambling men and women. I saw no fighting, but I heard tell of it.

I came back and heard Phillips giving the *Carpathia* fuller directions. Phillips told me to put on my clothes. Until that moment I forgot that I was not dressed.

I went to my cabin and dressed. I brought an overcoat to Phillips, it was very cold. I slipped the overcoat upon him while he worked.

Every few minutes Phillips would send me to the Captain with little messages. They were merely telling how the *Carpathia* was coming our way and gave her speed.

I noticed as I came back from one trip that they were putting off women and children in lifeboats. I noticed that the list forward was increasing.

Phillips told me the wireless was growing weaker. The Captain came and told us our engine rooms were taking water and that the dynamos might not last much longer. We sent that word to the *Carpathia*.

I went out on deck and looked around. The water was pretty close up to the boat deck. There was a great scramble aft, and how poor Phillips worked through it I don't know.

He was a brave man. I learned to love him that night and I suddenly felt for him a great reverence to see him standing there sticking to his work while everybody else was raging about. I will never live to forget the work of Phillips for the last awful 15 minutes.

I thought it was about time to look about and see if there was anything detached that would float. I remembered that every member of the crew had a special life belt and ought to know where it was. I remembered mine was under my bunk. I went and got it. Then I thought how cold the water was.

I remembered I had some boots and I put those on, and an extra jacket and I put that on. I saw Phillips standing out there still sending away, giving the *Carpathia* details of just how we were doing.

We picked up the *Olympic* and told her we were sinking by the head and were about all down. As Phillips was sending the message I strapped his life belt to his back. I had already put on his overcoat.

I wondered if I could get him into his boots. He suggested with a sort of laugh that I look out and see if all the people were off in the boats, or if any boats were left, or how things were.

The Last Boat Left

I saw a collapsible boat near a funnel and went over to it. Twelve men were trying to boost it down to the boat deck. They were having an awful time. It was the last boat left. I looked at it longingly a few minutes. Then I gave them a hand, and over she went. They all started to scramble in on the boat deck, and I walked back to Phillips. I said the last raft had gone.

Then came the Captain's voice: "Men, you have done your full duty. You can do no more. Abandon your cabin. Now it's every man for himself.

You look out for yourselves. I release you. That's the way of it at this kind of a time. Every man for himself."

I looked out. The boat deck was awash. Phillips clung on sending and sending. He clung on for about 10 minutes or maybe 15 minutes after the Captain had released him. The water was then coming into our cabin.

While he worked something happened I hate to tell about. I was back in my room getting Phillips's money for him, and as I looked out the door I saw a stoker, or somebody from below decks, leaning over Phillips from behind. He was too busy to notice what the man was doing. The man was slipping the life belt off Phillips's back.

He was a big man, too. As you can see, I am very small. I don't know what it was I got hold of. I remembered in a flash the way Phillips had clung on—how I had to fix that life belt in place because he was too busy to do it.

I knew that man from below decks had his own life belt and should have known where to get it.

I suddenly felt a passion not to let that man die a decent sailor's death. I wished he might have stretched rope or walked a plank. I did my duty. I hope I finished him. I don't know. We left him on the cabin floor of the wireless room and he was not moving.

Band Plays in Ragtime

From aft came the tunes of the band. It was a rag-time tune, I don't know what. Then there was "Autumn." Phillips ran aft and that was the last I ever saw of him alive.

I went to the place I had seen the collapsible boat on the boat deck, and to my surprise I saw the boat and the men still trying to push it off. I guess there wasn't a sailor in the crowd. They couldn't do it. I went up to them and was just lending a hand when a large wave came awash of the deck.

The big wave carried the boat off. I had hold of an oarlock and I went off with it. The next I knew I was in the boat.

But that was not all. I was in the boat and the boat was upside down and I was under it. And I remember realizing I was wet through, and that whatever happened I must not breathe, for I was under water.

I knew I had to fight for it and I did. How I got out from under the boat I do not know, but I felt a breath of air at last.

There were men all around me—hundreds of them. The sea was dotted with them, all depending on the life belts. I felt I simply had to get away from the ship. She was a beautiful sight then.

Smoke and sparks were rushing out of her funnel. There must have been an explosion, but we had heard none. We only saw the big stream of sparks. The ship was gradually turning on her nose—just like a duck does that goes down for a dive. I had only one thing on my mind—to get away from the suction. The band was still playing. I guess all of the band went down.

They were playing "Autumn" then. I swam with all my might. I suppose I was 150 feet away

when the *Titanic*, on her nose with her after-quarter sticking straight up in the air, began to settle—slowly.

Pulled Into a Boat

When at last the waves washed over her rudder there wasn't the least bit of suction I could feel. She must have kept going just so slowly as she had been.

I forgot to mention that, besides the *Olympic* and *Carpathia* we spoke to some German boat, I don't know which, and told them how we were. We also spoke to the *Baltic*. I remembered those things as I began to figure what ships would be coming toward us.

I felt, after a little while, like sinking. I was very cold. I saw a boat of some kind near me and put all my strength into an effort to swim to it. It was hard work. I was all done when a hand reached out from the boat and pulled me aboard. It was our same collapsible. The same crowd was on it.

There was just room for me to roll on the edge. I lay there not caring what happened. Somebody sat on my legs. They were wedged in between slats and were being wrenched. I had not the heart left to ask the man to move. It was a terrible sight all around—men swimming and sinking.

I lay where I was, letting the man wrench my feet out of shape. Others came near. Nobody gave them a hand. The bottom-up boat already had more men than it would hold and it was sinking.

At first the larger waves splashed over my clothing. Then they began to splash over my head and I had to breathe when I could.

As we floated around on our capsized boat and I kept straining my eyes for a ship's lights, somebody said, "Don't the rest of you think we ought to pray?" The man who made the suggestion asked what the religion of the others was. Each man called out his religion. One was a Catholic, one a Methodist, one a Presbyterian.

It was decided the most appropriate prayer for all was the Lord's Prayer. We spoke it over in chorus with the man who first suggested that we pray as the leader.

Some splendid people saved us. They had a right-side-up boat, and it was full to its capacity. Yet they came to us and loaded us all into it. I saw some lights off in the distance and knew a steamship was coming to our aid.

I didn't care what happened. I just lay and gasped when I could and felt the pain in my feet. At last the *Carpathia* was alongside and the people were being taken up a rope ladder. Our boat drew near and one by one the men were taken off of it.

One Dead on the Raft

One man was dead. I passed him and went to the ladder, although my feet pained terribly. The dead man was Phillips. He had died on the raft from exposure and cold, I guess. He had been all in from work before the wreck came. He stood his ground until the crisis had passed, and then he had collapsed, I guess.

But I hardly thought that then. I didn't think much of anything. I tried the rope ladder. My feet

pained terribly, but I got to the top and felt hands reaching out to me. The next I knew a woman was leaning over me in a cabin and I felt her hand waving back my hair and rubbing my face.

I felt somebody at my feet and felt the warmth of a jolt of liquor. Somebody got me under the arms. Then I was hustled down below to the hospital. That was early in the day I guess. I lay in the hospital until near night and they told me the *Carpathia's* wireless man was getting "queer" and would I help.

After that I never was out of the wireless room, so I don't know what happened among the passengers. I saw nothing of Mrs. Astor or any of them. I just worked wireless. The splutter never died down. I knew it soothed the hurt and felt like a tie to the world of friends and home.

How could I then take news queries? Sometimes I let a newspaper ask a question and get a long string of stuff asking for full particulars about everything. Whenever I started to take such a message I thought of the poor people waiting for their messages to go—hoping for answers to them.

I shut off the inquirers, and sent my personal messages. And I feel I did the right thing.

If the *Chester* had had a decent operator I could have worked with him longer but he got terribly on my nerves with his insufferable incompetence. I was still sending my personal messages when Mr. Marconi and *The Times* reporter arrived to ask that I prepare this statement.

There were, maybe, 100 left. I would like to send them all, because I could rest easier if I knew all those messages had gone to the friends waiting for them. But an ambulance man is waiting with a stretcher, and I guess I have got to go with him. I hope my legs get better soon.

The way the band kept playing was a noble thing. I heard it first while still we were working wireless, when there was a ragtime tune for us, and the last I saw of the band, when I was floating out in the sea with my life belt on, it was still on deck playing "Autumn." How they ever did it I cannot imagine.

That and the way Phillips kept sending after the Captain told him his life was his own, and to look out for himself, are two things that stand out in my mind over all the rest.

Iceberg Carriers

British scientists in World War II planned to sculpt aircraft carriers out of polar icebergs and tow them to the English Channel, where they would be clad in metal. Prime Minister Winston Churchill ordered that Project Habbakuk be given top priority.

The plan was never implemented, but would have been had the war lasted longer. The British Association for the Advancement of Science commented: "Had not the atomic bomb been dropped on Japan and the war come to an end, ice ships would have almost certainly appeared on the oceans of the world."

Titanic Survivor Statistics

First class:	
Adult males	57 out of 175, or 32.57 percent.
Adult females	140 out of 144, or 97.22 percent.
Male children (all saved)	5
Female children (all saved)	1
	<u>203</u> out of 325, or 62.46 percent.
Second class:	
Adult males	14 out of 168, or 8.33 percent.
Adult females	80 out of 93, or 86.02 percent.
Male children (all saved)	11
Female children (all saved)	13
	<u>118</u> out of 285, or 41.40 percent.
Third class:	
Adult males	75 out of 462, or 16.23 percent.
Adult females	76 out of 165, or 46.06 percent.
Male children	13 out of 48, or 27.08 percent.
Female children	14 out of 31, or 45.16 percent.
	<u>178</u> out of 706, or 25.21 percent.
Total	<u>499</u> out of 1,316, or 37.94 percent.
Crew saved:	
Deck department	43 out of 66, or 65.15 percent.
Engine-room department	72 out of 325, or 22.15 percent.
Food department (including 20 women out of 23)	97 out of 494, or 19.63 percent.
Total	<u>212</u> out of 885, or 23.95 percent.
Total on board saved	<u>711</u> out of 2,201, or 32.30 percent.
Passengers and crew:	
Adult males	338 out of 1,667, or 20.27 percent.
Adult females	316 out of 425, or 74.35 percent.
Children	57 out of 109, or 52.29 percent.
Total	<u>711</u> out of 2,201 or 32.30 percent.

Source: British government report "Loss of the Steamship *Titanic*." Editor's note: The total number of people aboard the *Titanic* at the time of the disaster has varied considerably over the years from one published account to another, the discrepancies mostly involving the number of crew aboard. The figure 2,201 represents the lowest figure in circulation.

Wireless Revisited: The Radio Room of the *R/V Knorr*

by Ernest "Butch" Smith

EDITOR'S NOTE: Ernest "Butch" Smith is the Radio Officer aboard the Woods Hole Oceanographic Institution's research vessel *Knorr*. Like most of the people on board at the time of the discovery, he believes that the *Titanic* should be left undisturbed. He also has received many cards and letters expressing similar sentiments from HAM radio operators around the country.

We arrived on the *Titanic* search site at approximately 2200 Greenwich Mean Time (GMT), 24 August 1985. The first thing I did from the radio room was to verify via the International Ice Patrol data how far we were from the ice. The closest icebergs were more than 200 miles to our north. We were in the clear. The weather was overcast with a slight drizzle and the temperature was around 67 degrees Fahrenheit. Seas were running between 5

and 7 feet and seemed to calm somewhat after our arrival.

There was a feeling of excitement, and at the same time a feeling of sadness among crew and scientists alike, realizing that this was the location of the great *Titanic* disaster. From a Radio Officer's point of view, I tried to visualize what the Chief Marconi Operator of the *Titanic*, Jack Phillips, and his able assistant, Harold Bride, had gone through so many years ago on this exact location. (In those days, in contrast to today, wireless operators were not considered nor treated as Officers, but were employees of Marconi Marine.) How tremendously busy they must have been even before disaster struck.

In that day, wireless had brought the world a new dimension in living. It was being used extensively on the larger ocean going vessels to provide communications, entertainment, and, in case of an emergency, infinite help. It also was still



Radio Officer Ernest "Butch" Smith at work in the radio room aboard the Knorr. (Photo courtesy of the author)

somewhat of a novelty among the passengers to be able to send messages to just about any place in the civilized world. Phillips and Bride were both outstanding wireless operators. Phillips had graduated at the top of his class from the Marconi School. A wireless operator did not get assigned to a great ship like the *Titanic* unless he had proven himself over the years. Both Phillips and Bride had spent some time as Postal Telegraphers before they took to the sea, both were Marconi School graduates, and both had served on four or five other ships before their appointment to the *Titanic*. It was an assignment, I am sure, that they were both very proud of.

On that tragic night, they had received reports of icebergs from other ships to their west and had relayed the information to the bridge of the *Titanic*. (With the exception of the message received from the *Mesaba*, which reportedly never reached the bridge.) Following that, they once again resumed trying to clear the ever growing pile of official and personal messages from the passengers, sending to the wireless coast station on Cape Race, Newfoundland, which in turn would relay the messages via "land line" to various final destinations.

Once disaster had struck, Phillips and Bride courageously stayed on duty in the wireless room sending out reports on the *Titanic's* condition and position to all within hearing range. Even after Captain Smith had released them from duty, they continued on. The last signals heard from the *Titanic* were likely heard by Harold Cottam, Marconi Operator on board the *Carpathia*, which eventually rescued more than 700 of the 2,224 people on board the *Titanic*. These last signals were heard at approximately 12:28 a.m. (New York time) shortly before the great ship descended toward the bottom

of the sea. Both Phillips and Bride were washed overboard as the ship disappeared from the surface. Bride managed to survive by clinging to one of the two (upside-down) collapsible life boats that were washed off the *Titanic* at the same time. Phillips was among the many who perished from exposure to the frigid waters. Cottam, who so gallantly stayed on his key from the time they first heard the *Titanic's* "CDQ/SOS" until they reached New York, died in 1984 at the age of 93.

The resting place of the *Titanic* was located at 0405 GMT on September 1, 1985, 73 years and some months after she was last seen on the surface. About half of the people on board the *Knorr* were off duty when this occurred. I was one of them, soundly asleep in my stateroom adjacent to the radio room. It was only a matter of minutes before I was called on the ship's telephone by Captain Richard Bowen, who told me the news of the discovery. Among those awake, which was now just about everyone, there was much excitement. The 12 to 4 watch on the *Knorr's* bridge, commanded by Dave Megathlin (2nd Mate) who was assisted by Peter Flaherty and Roger Hunt (both Able Bodied Seamen) could hardly contain their excitement. In the control van, the scientists and technicians were wild with excitement. A few minutes after the discovery, Robert Ballard (co-Chief Scientist) assembled those who were free on the fantail of the *R/V Knorr* where he raised the *Titanic's* builders' flag and then held a brief memorial service, remembering those who had perished on that tragic night. It was a very touching moment, one that I will always remember.

From that moment forward, the "traffic" through the radio room increased tremendously. Something on the order of 100 commercial radio telephone calls, 40 radio telegraph messages, 81

HAM radio phone patches (calls) via Mr. Gil Geitner (W4LLA), and numerous calls from coast stations with "traffic" for the *R/V Knorr* passed through the radio room. On a normal trip I only handle about 1/20 of this amount during a 30-day leg—and this all took place in just 8 or 9 days!

One memorable experience occurred just after I cleared with Ocean Gate Radio in New York. I received a call from Potishead Radio in England who said they were holding hundreds of calls for the *Knorr* and wanted to know to whom they could refer the calls since I was not handling traffic via their station. I asked them to kindly refer the calls to Ocean Gate Radio in New York. They in turn replied they would cooperate and then immediately called the *Queen Elizabeth II* to continue traffic with that vessel. It struck me as ironic that we were sitting over the resting place of the *R.M.S. Titanic* and were in a way linked yet to another great British passenger vessel, the *QE II*.

Interviews with Robert Ballard were conducted via radio with David Hartman of "Good Morning America," Peter Jennings of "The ABC Evening News," Tom Brokaw of NBC, Maria Schriver of "The CBS Morning News," Terry Drinkwater of CBS, and Walter Sullivan, science writer for *The New York Times*. To handle the list of calls continuously coming in for the *Knorr*, I would simply get the party's name and phone number from the marine operator and add it to my fast growing list. Ballard would then return calls when he was able to take some time from the control van to do so. Between these calls, the French scientists on board were quite often on the radio to France. When time permitted, I would attempt to catch up on my radiotelegraph traffic. (These messages were sometimes in French.) Also helicopter operations had to be coordinated via the radio room between Captain Bowen and the helicopter operations center in St. Johns, Newfoundland. All of this together took a good portion out of a 24-hour communications day.

It is ironic that the radiotelegraph (a radio signal sent in Morse code) is still used extensively in this day and age, some 73 years after it played such an important role in saving lives during the *Titanic* disaster. On a routine day, the *Knorr* sends in weather observations and ice reports (when appropriate) to the United States Coast Guard (three to four times a day), as well as messages to our ship's agents in various ports of call, via radiotelegraph. Since the days of the sinking of the *Titanic* it has been mandatory that vessels of 1,600 gross tons and larger carry at least one licensed Radio Officer on the vessel, primarily for safety purposes. These vessels are also equipped with an auto alarm device that alerts the Radio Officer of an "SOS" while he is off duty. The Radio Officer is required to monitor 500 kilohertz (KHZ), one of the international distress and calling frequencies, for an aggregate of eight hours a day. This is totally radiotelegraph work. Two other distress and calling channels are monitored continuously on the bridge of the *Knorr*—very-high frequency (VHF) voice Channel 16 and single side-band (SSB) voice Channel 2182 KHZ. The vessel is

equipped with devices for sending out automatic alarms (required by international law) on both 500 KHZ and 2182 KHZ. The International Ice Patrol transmits information on iceberg location and ice conditions several times daily. The ice patrol was established as a direct result of the *Titanic* sinking (see page 38). These measures have saved many lives on the high seas over the years. Sea travel today is as safe as our technology can make it, due directly to the saga of the *Titanic*. It truly can be said that those who perished on that night did not die in vain.

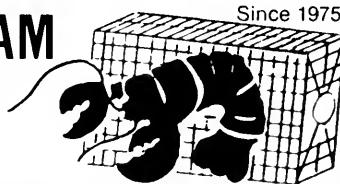
Ernest "Butch" Smith is Radio Officer on the *R/V Knorr*, operated by the Woods Hole Oceanographic Institution for the U.S. Navy.

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I Was Aboard the Titanic

by Edith Russell*

It was not really my idea to sail on the *Titanic*. I had booked passage on the *George Washington*, to sail April 7, 1912, but my editor cabled me from New York to postpone my sailing in order to report the fashions at the Paris Easter Sunday races. By taking the *Titanic*, a faster ship on the Wednesday following Easter Sunday, I could still arrive in America at about the same time. In any event, the opportunity of crossing on this much-publicized, and above all unsinkable, floating palace, delighted me.

I was a fashion writer, buyer, and stylist. This trip was one of the first of my career, as I had just started in business, and I was taking with me not only my own wardrobe, but many orders executed for business firms and private clients. They were uninsured, as when I applied for insurance on this merchandise, I was told that it was ridiculous to spend money for insurance when travelling on an unsinkable vessel. So, misled like the rest of the world, I placed full confidence in the world's greatest ship: "46,328 tons . . . 882 feet long . . . 3 propellers . . . 4 smoke stacks rising 175 feet above the water. . . ." She was truly almost a skyscraper. We were not used to ships of such dimensions and grandeur in those days. The *Olympic* and *Titanic* were sister ships, the first of their kind.

The train-run from Paris to Cherbourg was quite pleasant. I chatted with some Swedish and American ladies in the compartment and with a Mexican gentleman who informed us he was a Member of Parliament in Mexico. We formed a very merry little party. The fact that we were all sailing on this exceptional vessel on her maiden voyage, seemed to draw us together. Everybody was looking forward to seeing the monster ship.

We sat about on the huge tender, which had been especially built the year before for these new White Star ships, and for three hours shivered and waited. It was cold. It had been raining. I remember sitting next to Colonel and Mrs. John Jacob Astor, who were on their wedding trip and playing with their big dog. The Colonel told me the *Titanic* had cost \$10 million to build, and emphasized that she was unsinkable, "a miracle of modern ship-building."

Finally a murmur went around the tender: "The *Titanic* is in sight." I saw what seemed like a huge building, 11 stories high with tier upon tier of glittering electric lights, dressed over-all. Truly a beautiful and impressive spectacle.



Edith Russell and toy pig. (Photo courtesy Titanic Historical Society)

The *Titanic* had had an accident coming out of Southampton, when she went too close to the *New York* and caused the latter to break loose from her moorings. I did not know this at the time, of course, and if I had, I should probably have been imagining all kinds of ominous things. As it was, I could not help being strangely impressed by the way the tender rolled and heaved, in this calm sea, alongside the great ship. The gangway over which we climbed aboard seemed in danger of being pulled loose from its fastening.

I hated the idea of crossing that gangplank, and no sooner had I got on board than I sought out Nicholas Martin, the General Manager of the White Star Line, Paris bureau, to see if it would not be possible to collect my luggage and book by a later steamer, as I was frankly afraid. Martin said he would gladly release me from the sailing, if I felt that way,

* Originally published in the *Ladies Home Companion*, May, 1964. Reprinted by permission.

but he could not get my luggage off. "You are just nervous. You are perfectly safe. This ship is unsinkable. You can get off if you want to, but your luggage will have to go on to New York."

Beginning Hours

The first days of the trip were uneventful, marked by the usual making of acquaintances, promenades on deck, tea in the Winter Garden, and so forth. It was only by looking out to sea that one realized one was on the ocean.

On Sunday, April 14, it was brilliantly sunny, but so intensely cold that it seemed the only sensible thing to do was to stay in bed to keep warm, which I did until 4 o'clock in the afternoon. I then went out on deck, and noticed a large crowd of men passengers looking down at the water being thrown up from the blades of the propellers. The foam whirled in a great cascade, made blood-red by the rays of a glorious setting sun. It looked like a crimson carpet stretching from the ship to the horizon. I remember commenting to a group of people standing there about this beautiful and awesome watertall, and then I walked forward in the ship. I was never to see any of these people again.

There was much commenting on the intense cold, and some of the men said they had heard notices were posted that we were in ice-fields. However, that did not seem to make very much difference. We were going full speed ahead and would arrive positively in New York on the following Tuesday as it was intended the ship should make a record trip. And with this calm sea and perfect weather, there was no reason why we should not do so.

On Sunday night I dressed in a white satin evening gown, as there was a gala dinner. The men were all in their evening clothes and the ladies in full dress. But I wish to say there was *no dancing*. British ships do not, or did not at that time, permit dancing on the Sabbath night. Nor was there excessive drinking on the part of the captain or anyone else, as has been frequently stated. It was a calm, well-behaved crowd of people. I distinctly remember the lounge, a very beautiful spectacle, everyone sitting about in evening clothes, the orchestra playing.

About 9:30 p.m., having some letters to write, I went up to the drawing room and, incidentally chatted with a little lady from Los Angeles. Her husband came along and said he was going to the smoking room to play bridge. "Play all the bridge you want to," she said, "but under no circumstances do I want you to come down and wake me. I want to have a good night's sleep." Both perished.

I had been writing for some time when the library steward called "Lights out, please, it's 11:30." I handed him a number of letters telling him that I did not have my purse with me but would pay for the stamps the next morning, and I took a couple of books from the library to read.

The Collision

I walked from the stern of the ship to my room, which was way forward on the same deck. I was just turning on the electric light when I felt a very slight

jar, then a second, a little stronger, and a third, accompanied by a heavy shock, strong enough to make me cling to my bedpost. I noticed immediately that the door of my room had a decided list. The ship seemed to have come to a dead stop; but as I thrust my head out of the stateroom window, I noticed a huge white mass, like a mountain, slowly drifting by. I put on my fur coat and ran round to a friend's room and said, "Come along, let's go out and see what has happened."

We were quickly joined by several others in various stages of undress. We all looked at this white mass, and someone said, "It's an iceberg!" I must say I was overjoyed, because I had always wanted to see an iceberg from the time of my school days. Someone said icebergs showed only one-ninth above water, and another remarked that this one must be a "corker" under the surface. It towered well above the smoke stacks of the ship. I found out afterwards that an iceberg has a light side and a dark side. Unfortunately destiny decreed that the dark side should be toward the ship.

Looking down towards the Cabin Class deck, I noticed a number of stokers walking across it and going down below, the ice crunching beneath their boots. Someone said: "Why, they are walking on a solid ground of ice." Nobody had any fear or thought of danger. The calm sea and brilliant, starry sky, completely reassured us. The only disagreeable factor was the intense cold, enough to numb one's face and hands.

We walked about the deck, and I spoke to several officers and asked them what it was all about. They said: "We have struck an iceberg. There is nothing to worry about. The best thing to do is to go back to bed." After about three-quarters of an hour, I decided I would do so, to get warm. I returned to my room, started to undress, and was ready for bed, when a young man I met earlier in the day called through the door: "An order has been given that we are to put on lifebelts." I called back: "What for?" "Well," he said, "that's the order."

I went to the lounge on A Deck where I saw my bedroom steward, Wareham. He was fully dressed, with black coat and bowler hat. "Miss," he said, "I am glad indeed to see that you are up and dressed."

"Wareham, do you think there is any danger, or is this just one of those English rules that requires us to put on lifebelts?"

He replied: "It is a rule of the Board of Trade that in time of danger lifebelts must be worn by the passengers. But please don't be alarmed."

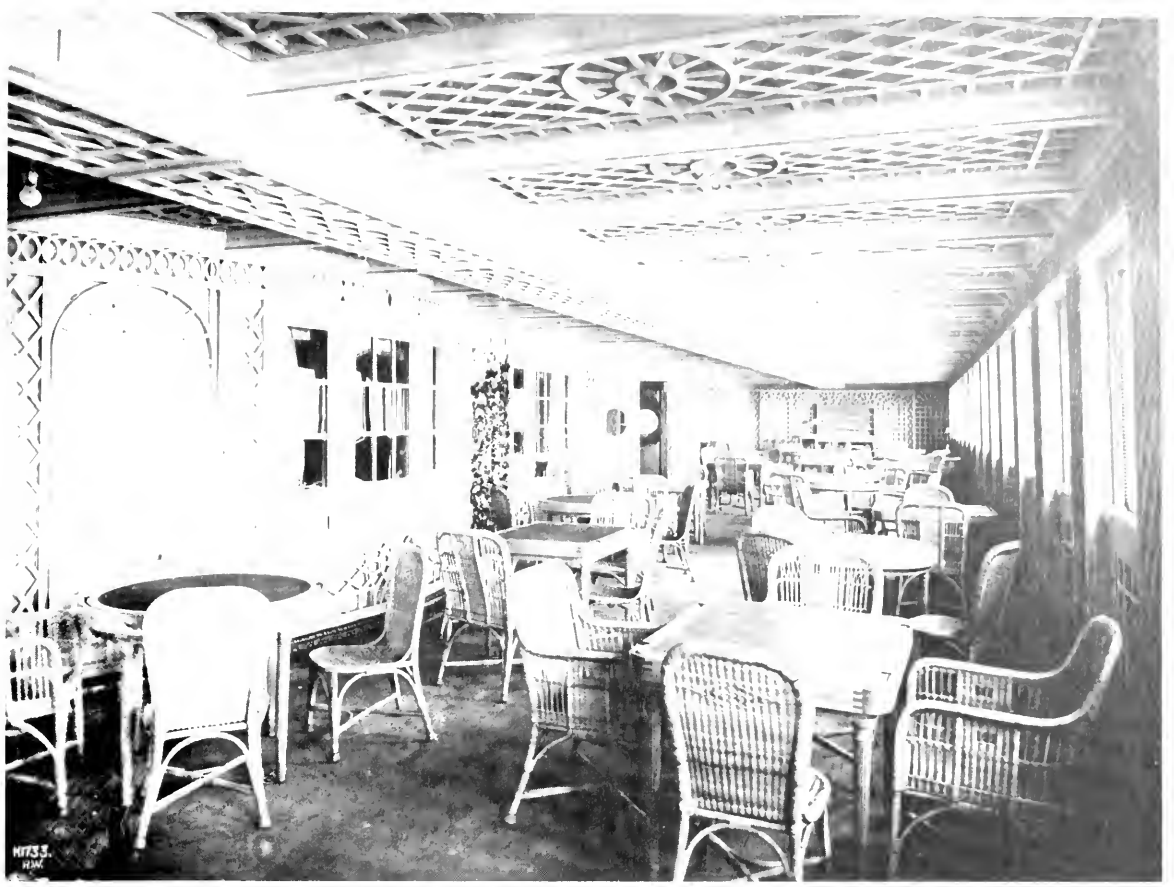
"Wareham, what about my dresses and other things . . . Do you think they will transfer the luggage?"

To this he replied: "Now, if I were you, I think I would go back to my room and kiss them good-bye."

"In that case, do you think the ship is going to sink?"

"No, Miss. She certainly ought to be able to hold out a good 48 hours anyway."

"Wareham, I think it would be a good idea if I had my mascot with me. I left it on the dressing



Above, the Titanic's Parisian cafe. Below, the gymnasium (Harland and Wolff photos courtesy of Charles Barbicid, ON)

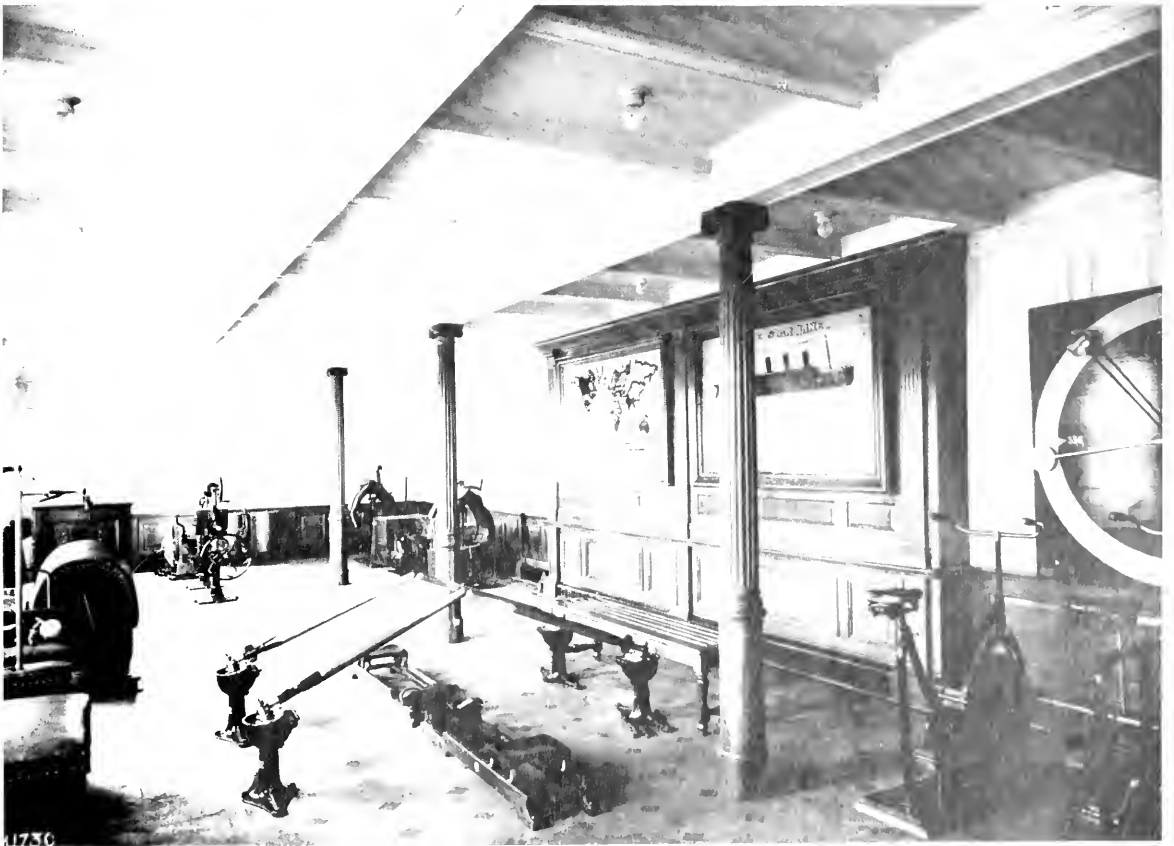


table. Would you mind going to the stateroom to get it for me?"

My mother, having heard that the pig was considered a symbol of good luck in France, and feeling that good luck was just what I needed, had presented me with a toy pig, the size of a big kitten and covered with white fur and black spots. I cherished it, the more so as it was really a music-box, and by twisting its tail one produced the then popular air "La Maxixe." I promised my mother that I would keep this mascot with me at all times. This little pig later saved my life.

And as I saw him going back down the corridor to fetch it, I noticed that there was an incline from the drawing room down the passage. As I learned afterwards, it was beneath my stateroom that the iceberg had torn into the ship's side, directly under the swimming pool, and then come up against the water-tight bulkheads, which were holding the ship up for the time being.

Wareham brought me back my toy pig, and the people all around me smiled. I felt a little more reassured. I never saw Wareham again, but remember his wistful remark "I hope we get out of this alright. I have a wife and five little kiddies at home."* The stewards, in fact all the employees of the *Titanic* were an exceptionally fine lot of men and women, glad that they had been transferred from the *Olympic* where nearly all of them had served. They undoubtedly knew there was danger, but at no time did they portray their fear to the passengers. No words can adequately praise these magnificent officers and crewmen.

I went up to the Boat Deck and remember seeing a lot of men standing about. We waited and stood around aimlessly and then another order was shouted: "All women and children will immediately return to A Deck." Again I stood quite a long time wondering what it all meant. Then yet another order: "Women and children back again up to the Boat Deck."

I thought this just a farce, a sort of boat drill, for frankly I did not know what it could mean. So I disregarded these instructions, went back to the lounge, found a nice comfortable armchair, and sat down where it was warm and cozy. There were four or five men passengers seated about the lounge, and one of them said he had heard they had launched five lifeboats.

"Surely there is no danger," I said. And he answered: "No, but you know these English. They are the greatest people for rules and regulations and the greatest sticklers for this sort of thing."

"Well if it is only a question of rules and regulations, I for one do not propose to go out on that deck and freeze to death," I retorted.

Just then I saw an officer and called out to him: "Mister officer, should I leave in a lifeboat? Is there any danger?" To this he replied: "No, I do not know that there is any immediate danger, but this ship is damaged and she certainly cannot proceed to New York. She may be towed into the nearest



Captain E. J. Smith on the *Titanic's* promenade deck.
(Photo courtesy Paul Popper Photo)

harbor. We expect the *Olympic* along in the next two or three hours. They will take the passengers off. However, there is no immediate danger, Madam. You can use your own judgement in this matter."

I then went to the Boat Deck and found

* Wareham's body was picked up by the *Mackay-Bennett* and buried in Halifax.

myself standing next to Bruce Ismay, the Managing Director of the White Star Line, who was wearing his black evening trousers and a nightshirt with frills down the front. He was shouting orders. A number of men on the other side of him were banked up almost in a solid mass near the cabin bulkhead. He spied me and called out: "What are you doing on this ship? I thought all women and children had left. If there are any more women and children on this ship, let them step forward and come over to this stairway immediately."

Ismay practically threw me down a narrow iron stairway to the deck below. There has been much criticism of Ismay, but he certainly saved my life. I passed between lines of sailors to the rail. Two burly sailors got hold of me and attempted to throw me head foremost into the lifeboat which was suspended alongside. But when I noticed how far from the rail the lifeboat was, swinging off its davits from above, I became terrified—so much so that my legs and feet went rigid and my slippers fell off. I screamed to the two men: "Don't push me!" One replied, "If you don't want to go, stay!"

I then looked about in the gutter of the deck for my slippers, which I found minus a diamond buckle that had fallen off. I never found the buckle.

Then I looked up at the rail and at the lifeboat which was swinging so perilously far from it, about seven stories above the sea.

The boat was very full and slightly tilted to one side. The thought of getting up on that rail and jumping petrified me; it seemed to me a feat that only an acrobat could perform, especially as I had on a narrow skirt and a coat which reached right down to the ankles. So there I stood with my little pig under my arm. One of the sailors reached forward and exclaimed: "If you don't want to go, we'll save your baby anyway," and he grabbed my little pig which, perhaps in the excitement he mistook for a baby, and threw it into the lifeboat. I stood looking towards the lifeboat thinking: "There is my mascot. I promised my mother it would be with me, always."

Just then I heard a very quiet voice next to me saying: "Madam, if you will put your foot on my knee and put your arm around my neck, I will lift you to the rail and from there you will be able to jump into the boat with less danger, and you will not be so frightened."

"Would you really go?" I asked the man, "if you were me?"

He answered: "Yes, without a doubt."

He then made a chair of hands with one of the sailors (such as we do in playing games), each one holding the other's wrist, and lifted me. I jumped and fell into the lifeboat, landing on my head at the bottom of the boat, where I groped about for my mascot and found it almost immediately with its little forelegs broken. I struggled into an upright position. The man who had helped me leapt in immediately afterwards and then came the order: "Lower away!"

We were lowered toward the water very slowly, with a decided tilt, and someone in the boat cut the fall ropes before we actually touched the water. One of the men near me said: "Shove her off

Titanic Dimensions

Along with some 1,500 lives, a considerable volume of steel was lost when the Titanic went down. The ship was 882.5 feet long and 93 feet wide. Her boat deck and bridge were some 70 feet above the water and about 92 feet above the keel. The ship weighed 46,328 gross tons (103,774,720 pounds), and at the time of her construction she was the largest moving object in the world. When floating, she displaced 66,000 tons of water. To move this bulk she carried 2 four-cylinder reciprocating engines. These drove the port and starboard propellers. The center propeller was driven by a turbine that ran off the exhaust from the engines and steam from the boilers. Together these engines could generate at least 55,000 horsepower—equivalent to more than 500 automobiles straining at her propellers. The Titanic's top speed was in the neighborhood of 24 to 25 knots (a speed she never reached).

Although the Titanic could accommodate 3,502 passengers and crew members, on her maiden voyage she carried only 2,201 people. Nonetheless she seemed a floating city to those aboard, and even crew members became lost in her labyrinthian passageways. She carried a swimming pool, a gymnasium, a squash court, palm-decorated verandas, a Turkish bath, and a special compartment for storing automobiles. There was even a darkroom available for the use of any amateur photographers aboard. —FL*

** This figure comes from the 1912 report of the British Titanic Wreck Commission. Other estimates from the time ranged up to 2,340, and estimates by modern historians also differ, with estimates ranging from 2,207 to 2,235. Naturally, these discrepancies result in significant disagreement as to how many people died.*

quickly, or we are going to be sucked under." I did not understand what he meant.

In the Lifeboat

Looking up from the lifeboat, the *Titanic* seemed the biggest thing in the world. I saw many people hanging over the rail. I distinctly heard music, but I do not remember hearing "Nearer My God To Thee." As we drew away, everything was calm and still, with the reflection of the lights on the water, passengers leaning over the rails . . . nothing to predict the horror of the next few minutes.

Despite the many stars in the sky, it was the blackest night I have ever seen. The mate, who was in some sort of command, had found a piece of rope. He would light it and let it flare for a few minutes, swinging it around as a signal, and then extinguish it. His idea was that by flourishing this light he could warn other lifeboats in the vicinity and so prevent our being rammed.

I now looked toward the starboard light of the *Titanic*—shining bright green. I noticed that this light seemed to be getting lower, nearer to the water. We had left the liner at about 1:45 a.m. At 2:00 a.m. I looked at my wrist-watch. One of the stewards rowing made the remark: "She won't hold out much longer."

I did not realize even then what he meant, but I heard him say to the other steward "Let's lean into it and get away or she may still suck us under."

Gradually the green starboard light dropped closer to the water. At about two o'clock green rockets were fired from the upper deck of the ship, her very last call for help. At 2:20 I saw the starboard light disappear into the water. The stern of the ship, tully lighted, stood up to the sky—suggesting a skyscraper by night, so high and straight did it rise into the air. Then it seemed to shoot down into the water, every light blazing. There was a heavy explosion beneath the water, then a second and a third. Contrary to what the men in our boat had feared, these explosions actually thrust us farther away, as by an invisible hand.

Just before the ship went down, there came a huge roar from her, as though from one's throat. The men in our boat asked us all to cheer, saying that what we heard were shouts of joy indicating that all aboard had cleared the ship and were saved. And everyone in our boat did actually cheer three times. This, of course, was merely a device to distract us from the awful sound as the ship went down, and it did at least serve that purpose. Somehow or other we were still quite incapable of realizing the full extent of the tragedy in which we were participants.

The sea was absolutely calm and there were stars out, but the night was so black that we could see the silent icefloes around us only when our boat came close up on them, and it was bitterly cold. Against this background of cold "tranquility" a number of women in the boat had become half hysterical with apprehension over absent husbands and children. The babies fretted and cried all night and I played "La Maxixe" to calm them, twirling the pig's tail around and around to produce the music. Next day the pig could hardly play, so many times had he been called upon. Finally, that intense cold which precedes dawn settled on the water. Only those who have stood a night watch of any kind can realize the peculiarly penetrating chillness of the half-hour that divides night from morning. In searching for extra clothing for one of the stewards, we suddenly came upon a passenger in the bottom of the boat whom we had not noticed before, although he had been lying practically at my feet. By now there was enough light to recognize him as a stoker. The poor fellow was dead. I suppose he may have jumped head first into the boat, knocked himself unconscious and had frozen to death without being noticed.

Rescue

Presently I saw another light on the horizon, and told the young man rowing next to me about it. He was too depressed to believe me. "Madame, don't get

imaginative. There is no light, and there will not be any light. It's no use looking for good things when none are coming." Another seaman echoed this pessimism. "This is my third shipwreck," he said. "If I get out of this one, I'm going back home to be a milkman."

But before long, we all saw the white light and then a red one beneath it, which signified the arrival of the *Carpathia*. As the sun rose, beautiful and clear, we rowed as best we could toward the rescue ship, amid ice peaks which made me think of the mountains rising out of the Italian lakes. Brilliantly lighted, she seemed so big that we thought she might be the *Olympic*, and we feared her suction.

As we drew closer to the rescue ship, we noticed other lifeboats also making for her, together with the collapsible raft, with Bruce Ismay and other passengers aboard. About 8 a.m. my lifeboat, number 11, drew alongside the *Carpathia*. Up to that time the sea had remained absolutely calm, but now a great many whitecaps appeared. We were tossing and rolling. Having left the *Titanic* at about 1:45 a.m. this made about 6½ hours that I had spent in the lifeboat, but it seemed only an hour.

The first person to leave our boat was a baby boy, who was hoisted up in a canvas sack and the other babies were hoisted aboard in the same way. One little baby struggled madly and did not want to leave at all.

After this, a "boatswain's chair," very much like an old-fashioned swing, was lowered for the grown-ups. The women were told to sit on the little wooden seat, close their eyes, and hold on tightly to the ropes. Thus we were hoisted with great speed up into the *Carpathia*. Welcoming hands were stretched out to receive us. After we had been underway for about three quarters of an hour the ship slowed down and the bodies of six sailors who had been taken on board, but who had died of exposure, were buried in the sea. A priest aboard delivered a prayer.

I was indeed lucky to be saved. My losses were only material, while there were so many who lost those whom they loved. I have crossed the Atlantic often since—nearly a hundred times—but still I will not travel by airplane. Steamships and automobiles are my favorite modes of transport.

Edith Russell had travelled on the Titanic in first class passage, using her professional name "Miss Rosenbaum." When the premiere of the 20th Century-Fox movie Titanic took place in 1953, Life magazine presented an article entitled "Movie Re-Enactment Awakens Dramatic Memories." Edith was pictured with her toy pig and the dress she wore on the Titanic in 1912. A few years after the article was written, her luggage was lost during one of her Atlantic crossings, and most of her Titanic memorabilia with it—except her toy pig. Edith L. Russell died in a London hospital on April 4, 1975. In her obituary, a reporter quoted her as once saying, "I'm accident prone. I've been in shipwrecks, car crashes, fires, floods and tornadoes. I've had every disaster but bubonic plague and a husband." She was 98 years old when she died.

The Steamship Californian Controversy



Captain Stanley Lord after the British Inquiry and after being dismissed from the Leyland Line.

We had to assume that the data from the *Californian* had either been altered, collected poorly, or something—we could not believe it.

—Robert D. Ballard, September 11, 1985

The following is from the “report of a formal investigation into the circumstances attending the foundering on April 15, 1912, of the British steamship ‘Titanic,’ of Liverpool, after striking ice in or near latitude 41° 46’ N., longitude 50° 14’ W., North Atlantic Ocean, as conducted by the British government” and presented by Senator William Alden Smith of Michigan to the U.S. Senate, August 12, 1912.

On the 14th of April the steamship *Californian*, of the Leyland Line, Mr. Stanley Lord, master, was on her passage from London, which port she left on April 5, to Boston, United States, where she subsequently arrived on April 19. She was a vessel of 6,223 tons gross and 4,038 net. Her full speed was 12½ to 13 knots. She had a passenger certificate, but was not carrying any passengers at the time. She belonged to the International Mercantile Marine Co., the owners of the *Titanic*.

At 7:30 p.m., ship’s time, on April 14, a wireless message was sent from this ship to the *Antillian*:

To Captain, *Antillian*:

Six thirty p.m., apparent ship’s time, latitude 42° 3’ N., longitude 49° 9’ W. Three large bergs. 5 miles to southward of us. Regards.

Lord.

The message was intercepted by the *Titanic*, and when the Marconi operator (Evans) of the *Californian* offered this ice report to the Marconi operator of the *Titanic*, shortly after 7:30 p.m., the latter replied:

It is all right. I heard you sending it to the Antillian, and I have got it.

The *Californian* proceeded on her course S. 89°W. true until 10:20 p.m., ship’s time, when she was obliged to stop and reverse engines because she was running into field ice, which stretched as far as could then be seen to the northward and southward.

The master told the court that he made her position at that time to be 42° 5’ N., 57° 7’ W. This position is recorded in the log book, which was written up from the scrap log book by the chief officer. The

scrap log is destroyed. It is a position about 19 miles N. by E. of the position of the *Titanic* when she foundered, and is said to have been fixed by dead reckoning and verified by observations. I am satisfied that this position is not accurate. The master "twisted her head" to E.N.E. by the compass and she remained approximately stationary until 5:15 a.m. on the following morning. The ship was slowly swinging around to starboard during the night.

At about 11 p.m. a steamer's light was seen approaching from the eastward. The master went to Evans's room and asked what ships he had. The latter replied: "I think the *Titanic* is near us. I have got her." The master said; "You had better advise the *Titanic* we are stopped and surrounded with ice." This Evans did, calling up the *Titanic* and sending: "We are stopped and surrounded by ice." The *Titanic* replied: "Keep out." The *Titanic* was in communication with Cape Race, which station was then sending messages to her. The reason why the *Titanic* answered "keep out" was that her Marconi operator could not hear what Cape Race was saying, as from her proximity the message from the *Californian* was much stronger than any message being taken in by the *Titanic* from Cape Race, which was much farther off. Evans heard the *Titanic* continuing to communicate with Cape Race [Newfoundland] up to the time he turned in at 11:30 p.m.

The master of the *Californian* states that when observing the approaching steamer as she got nearer he saw more lights, a few deck lights, and also her green side light. He considered that at 11 o'clock she was approximately 6 or 7 miles away, and at some time between 11 and 11:30 he first saw her green light; she was then about 5 miles off. He noticed that about 11:30 she stopped. In his opinion this steamer was of about the same size as the *Californian*—a medium-sized steamer, "something like ourselves."

From the evidence of Mr. Groves, third officer of the *Californian*, who was the officer of the first watch, it would appear that the master was not actually on the bridge when the steamer was sighted.

Mr. Groves made out two masthead lights; the steamer was changing her bearing slowly as she got closer, and as she approached he went to the chart room and reported this to the master; he added, "She is evidently a passenger steamer." In fact, Mr. Groves never appears to have had any doubt on this subject. In answer to a question during his examination, "Had she much light?" he said, "Yes, a lot of light. There was absolutely no doubt of her being a passenger steamer, at least in my mind."

Gill, the assistant donkeyman of the *Californian*, who was on deck at midnight, said, referring to this steamer: "It could not have been anything but a passenger boat, she was too large."

By the evidence of Mr. Groves, the master, in reply to his report, said: "Call her up on the Morse lamp, and see if you can get any answer." This he proceeded to do. The master came up and joined him on the bridge and remarked: "That does not look like a passenger steamer." Mr. Groves replied: "It is, sir. When she stopped her lights seemed to go out, and I suppose they have been put out for the night." Mr. Groves states that these lights went out at 11:40, and remembers that time because "one bell was struck to call the middle watch." The master did not join him on the bridge until shortly afterwards, and consequently after the steamer had stopped.

In his examination Mr. Groves admitted that if this steamer's head was turning to port after she stopped, it might account for the diminution of lights, by many of them being shut out. Her steaming lights were still visible and also her port side light.

The captain only remained upon the bridge for a few minutes. In his evidence he stated that Mr. Groves had made no observations to him about the steamer's deck lights going out. Mr. Groves's Morse signaling appears to have been ineffectual (although at one moment he thought he was being answered), and he gave it up. He remained on the bridge until relieved by Mr. Stone, the second officer, just after midnight. In turning the *Californian* over to him, he pointed out the steamer and said: "she has been stopped since 11:40; she is a passenger steamer. At about the moment she stopped she put her lights out." When Mr. Groves was in the witness box the following questions were put to him by me [the Chief Justice, Lord Mersey]:

Speaking as an experienced seaman and knowing what you do know now, do you think that steamer that you know was throwing up rockets, and that you say was a passenger steamer, was the Titanic?—Do I think it? Yes. From what I have heard subsequently? Yes. Most decidedly I do, but I do not put myself as being an experienced man.—But that is your opinion as far as your experience goes?—Yes, it is, my lord.

Mr. Stone states that the master, who was also up (but apparently not on the bridge), pointed out the steamer to him with instructions to tell him if her bearings altered or if she got any closer; he also stated that Mr. Groves had called her up on the Morse lamp and had received no reply.

Mr. Stone had with him during the middle watch an apprentice named Gibson, whose attention was first drawn to the steamer's lights at about 12:20 a.m. He could see a masthead light, her red light (with glasses), and a "glare of white lights on her afterdeck." He first thought her masthead light was flickering and next thought it was a Morse light, "calling us up." He replied, but could not get into communication, and finally came to the conclusion that it was, as he had first supposed, the masthead light flickering. Sometime after 12:30 a.m., Gill, the donkeyman, states that he saw two rockets fired from the ship which he had been observing, and about 1:10 a.m., Mr. Stone reported to the captain by voice pipe, that he had seen five white rockets from the direction of the steamer. He states that the master answered, "Are they company's signals?" and that he replied, "I do not know, but they appear to me to be white rockets." The master told him to "go on Morsing," and, when he received any information, to send the apprentice down to him with it. Gibson states that Mr. Stone informed him that he had reported to the master, and that the master had said the

steamer was to be called up by Morse light. This witness thinks the time was 12:55; he at once proceeded again to call the steamer up by Morse. He got no reply, but the vessel fired three more white rockets; these rockets were also seen by Mr. Stone.

Both Mr. Stone and the apprentice kept the steamer under observation, looking at her from time to time with their glasses. Between 1 o'clock and 1:40 some conversation passed between them. Mr. Stone remarked to Gibson: "Look at her now, she looks very queer out of water, her lights look queer." He also is said by Gibson to have remarked, "A ship is not going to fire rockets at sea for nothing;" and admits himself that he may possibly have used that expression.

Mr. Stone states that he saw the last of the rockets fired at about 1:40, and after watching the steamer for some 20 minutes more he sent Gibson down to the master.

I told Gibson to go down to the master, and be sure and wake him, and tell him that altogether we had seen eight of these white lights like white rockets in the direction of this other steamer; that this steamer was disappearing in the southwest, that we had called her up repeatedly on the Morse lamp and received no information whatsoever.

Gibson states that he went down to the chart room and told the master; that the master asked him if all the rockets were white, and also asked him the time. Gibson stated that at this time the master was awake. It was five minutes past two, and Gibson returned to the bridge to Mr. Stone and reported. They both continued to keep the ship under observation until she disappeared. Mr. Stone describes this as "A gradual disappearing of all her lights, which would be perfectly natural with a ship steaming away from us."

At about 2:40 a.m. Mr. Stone again called up the master by voice pipe and told him that the ship from which he had seen the rockets come had disappeared bearing SW. $\frac{1}{2}$ W., the last he had seen of the light; and the master again asked him if he was certain there was no color in the lights. "I again assured him they were all white, just white rockets." There is considerable discrepancy between the evidence of Mr. Stone and that of the master. The latter states that he went to the voice pipe at about 1:15, but was told then of a white rocket (not five white rockets). Moreover, between 1:30 and 4:30, when he was called by the chief officer (Mr. Stewart), he had no recollection of anything being reported to him at all, although he remembered Gibson opening and closing the chart-room door.

Mr. Stewart relieved Mr. Stone at 4 a.m. The latter told him he had seen a ship 4 or 5 miles off when he went on deck at 12 o'clock, and at 1 o'clock he had seen some white rockets, and that the moment the ship started firing them she started to steam away. Just at this time (about 4 a.m.) a steamer came in sight with two white masthead lights and a few lights amidships. He asked Mr. Stone whether he thought this was the steamer which had fired rockets, and Mr. Stone said he did not think it was. At 4:30 he called the master and informed him that Mr. Stone had told him he had seen rockets in the middle watch. The master said, "Yes, I know; he has been telling me." The master came at once on to the bridge, and apparently took the fresh steamer for the one which had fired rockets, and said, "She looks all right; she is not making any signals now." This mistake was not corrected. He, however, had the wireless operator called.

At about 6 a.m. Capt. Lord heard from the *Virginian* that the "*Titanic* had struck a berg, passengers in boats, ship sinking;" and he at once started through the field ice at full speed for the position given.

Capt. Lord stated that about 7:30 a.m. he passed the *Mount Temple*, stopped, and that she was in the vicinity of the position given him as where the *Titanic* had collided (lat $41^{\circ} 46' N.$; long. $50^{\circ} 14' W.$). He saw no wreckage there, but did later on near the *Carpathia*, which ship he closed soon afterwards, and he stated that the position where he subsequently left this wreckage was $41^{\circ} 33' N.$; $50^{\circ} 1' W.$ It is said in the evidence of Mr. Stewart that the position of the *Californian* was verified by stellar observations at 7:30 p.m. on the Sunday evening, and that he verified the captain's position given when the ship stopped ($42^{\circ} 5' N.$; $50^{\circ} 7' W.$) as accurate on the next day. The position in which the wreckage was said to have been seen on the Monday morning was verified by sights taken on that morning.

All the officers are stated to have taken sights, and Mr. Stewart in his evidence remarks that they all agreed. If it is admitted that these positions were correct, then it follows that the *Titanic's* position as given by that ship when making the CQD signal was approximately S. $16^{\circ} W.$ (true), 19 miles from the *Californian*; and further that the position in which the *Californian* was stopped during the night, was 30 miles away from where the wreckage was seen by her in the morning, or that the wreckage had drifted 11 miles in a little more than five hours.

There are contradictions and inconsistencies in the story as told by the different witnesses. But the truth of the matter is plain. The *Titanic* collided with the berg at 11:40. The vessel seen by the *Californian* stopped at this time. The rockets sent up from the *Titanic* were distress signals. The *Californian* saw distress signals. The number sent up by the *Titanic* was about eight. The *Californian* saw eight. The time over which the rockets from the *Titanic* were sent up was from about 12:45 to 1:45 o'clock. It was about this time that the *Californian* saw the rockets. At 2:40 Mr. Stone called to the master that the ship from which he had seen the rockets had disappeared. At 2:20 a.m. the *Titanic* had foundered. It was suggested that the rockets seen by the *Californian* were from some other ship, not the *Titanic*. But no other ship to fit this theory has ever been heard of.

These circumstances convince me that the ship seen by the *Californian* was the *Titanic*, and if so, according to Capt. Lord, the two vessels were about 5 miles apart at the time of the disaster. The evidence from the *Titanic* corroborates this estimate, but I am advised that the distance was probably greater, though

not more than 8 to 10 miles. The ice by which the *Californian* was surrounded was loose ice extending for a distance of not more than 2 or 3 miles in the direction of the *Titanic*. The night was clear and the sea was smooth. When she first saw the rockets, the *Californian* could have pushed through the ice to the open water without any serious risk and so have come to the assistance of the *Titanic*. Had she done so she might have saved many if not all of the lives that were lost.

The Third Ship Mystery

The *Californian*, whose captain according to the Inquiry committed gross neglect by ignoring the distress calls, did not arrive until after the *Carpathia* had picked up all the survivors. After sending the rebuffed warning to the *Titanic*, the *Californian*'s wireless operator had switched off his set and turned in for the night—seconds before the S.O.S. was sent out. On deck the Second Officer definitely *did* see flares but failed to deal with the matter with any sense of urgency believing them to be a signal to another ship, or, it has been suggested, a firework display not uncommon on transatlantic liners. According to him, the vessel turned away and vanished. Captain Lord, asleep in his cabin, slept through two calls from the officer on watch. He was unused to Atlantic emergencies and it was the first time he had been caught in ice, but whether he was 10 or 20 miles away not enough effort was made to find out the true nature of the signals. The radio operator was not wakened until much later in the morning.

Charles Lightoller, Second Officer on the *Titanic*, believed that the ship close to was the *Californian* and at the Inquiries Captain Lord was made a scapegoat for the disaster. Since then several other boats have been named as a third ship seen by both the *Californian* and the *Titanic*. A Canadian ship, the *Mount Royal*, was suspected, but the Board of Trade refused to take further action unless *Mount Royal* crew members came forward. None did. Others have suggested it to be an American fishing vessel. In 1962, the Secretary of the Mercantile Marine Service Association, who took up the campaign to clear Captain Lord's name, named a Norwegian ship, the *Samson*, which he claimed had deliberately steamed away. Its chief officer, Henrik Naess, said that he had seen the rocket signals at a distance of about 10 miles. They steamed away, he claimed, because the ship was on an illegal seal-hunting operation.

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Lord of the *Californian*

by John C. Carrothers

EDITOR'S NOTE: The April, 1962, issue of the U.S. Naval Institute's *Proceedings* marked the 50th anniversary of the sinking of the R.M.S. *Titanic* with the publication of an article titled *The Titanic Disaster* by John C. Carrothers. In 1967, Carrothers, convinced that he had done a grave injustice to Captain Stanley Lord, wrote the following article, which also appeared in *Proceedings*. It is reprinted here by permission of the U.S. Naval Institute.

Mersey, in London, England. The Congressional investigation began just four days after the disaster; the British inquiry started on 3 May 1912.

The findings of both these investigations can be summarized by quoting from the British Court of Inquiry:

There are contradictions and inconsistencies in the story as told by the different witnesses. But the truth of the matter is plain. The Titanic collided with the berg at 11:40. The vessel seen by the Californian stopped at this time. The rockets sent up from the Titanic were distress signals. The Californian saw distress signals. The number sent up by the Titanic was about eight. The Californian saw eight. The time over which the rockets from the Titanic were sent up was from about 12:45 to 1:45 o'clock. It was about

The first of the two official inquiries into the *Titanic* disaster was a U.S. Congressional investigation conducted under the chairmanship of Senator William A. Smith of Michigan, commencing on 19 April 1912. The second, was the official British Court of Inquiry conducted under the jurisdiction of Lord

this time that the Californian saw the rockets. At 2:40 the Second Officer called to the Master that the ship from which he had seen the rockets had disappeared. At 2:20 a.m. the Titanic had foundered. It was suggested that the rockets seen by the Californian were from some other ship not the Titanic. But no other ship to fit this theory has ever been heard of.

These circumstances convince me (the President of the Court) that the ship seen by the Californian was the Titanic and if so, according to Captain Lord, the two vessels were about five miles apart at the time of the disaster. The evidence from the Titanic corroborates this estimate, but I am advised that the distance was probably greater, though not more than eight to ten miles. The ice by which the Californian was surrounded was loose ice extending for a distance of not more than two or three miles in the direction of the Titanic. The night was clear and the sea was smooth. When she first saw the rockets the Californian could have pushed through the ice to the open water without serious risk and so have come to the assistance of the Titanic. Had she done so, she might have saved many if not all of the lives that were lost.

The foregoing statements had long been accepted by me as being a valid judgment of what happened at the time of the *Titanic* disaster.

Among the many letters received at the Naval Institute commenting on my previous article (*Proceedings*, April 1962) was one from Leslie Harrison, General Secretary of the Mercantile Marine Service Association, in Liverpool, England. Harrison was extremely critical and he stated emphatically that from the evidence presented at both investigations, the light (or lights) seen from the *Titanic* during the sinking could not possibly have been those of the *Californian*. Furthermore, Harrison continued:

Captain Lord, of the Californian, was condemned by a Court of Inquiry at which he appeared only relatively briefly as a witness; was never formally charged with the offense, (of) which he was later found guilty; was not effectively represented, and subsequently was refused any right of appeal. The circumstances are such that the Council of the Mercantile Marine Service Association (all of whom are serving or retired British shipmasters) and their advisors are convinced that the findings of the British Court of Inquiry insofar as they relate to Captain Lord and the Californian cannot be sustained, and constitute the grossest miscarriage of justice in the history of British Inquiries.

To say the least, Harrison's letter came as a complete surprise, especially 50 years after the disaster. In my reply, I reiterated certain facts and circumstances which still convinced me beyond doubt that Lord Mersey's and Senator Smith's

conclusions and evaluations of the evidence relative to Captain Lord were correct; that every statement of fact quoted in extract from the findings of the British Court of Inquiry I had read myself in the transcripts of the witnesses' testimonies.

In recent years, there has been a growing agitation for a complete review of the part played by Captain Stanley Lord and the *Californian* in the *Titanic* disaster. On 5 February 1965, the Mercantile Marine Service Association presented a strong petition, on behalf of the late Captain Lord, addressed to the President of the British Board of Trade. The petition's introductory paragraph read:

The Council of the Mercantile Marine Service Association present this their petition to the President of the Board of Trade and ask him to exercise his powers under Section 475 of the Merchant Shipping Act, 1894, and order the rehearing of that part of the 1912 inquiry into the loss of the White Star liner Titanic which found that the British ship Californian, of the Leyland Line, could have come to the liner's assistance and saved many, if not all, of the 1,500 lives which were lost.

The petition then went on to present, in Captain Lord's defense, a powerful case which would be difficult, if not impossible, to deny. Nevertheless, in September 1965, the Board of Trade rejected this petition. The Board informed the Mercantile Marine Association that:

Your petition does not suggest that there is any new and important evidence which could not have been produced at the formal investigation into the loss of the Titanic; and the president has asked me to tell you that, having carefully considered your petition, he is satisfied that there is no reason to believe that a miscarriage of justice has occurred.

The Board of Trade's letter concluded with ". . . the President does not consider that the Board should exercise their discretionary power to order a rehearing."

Other Investigations

Concurrent with the presentation of this petition to the Board of Trade, a book entitled, *The Titanic and the Californian* was published. The book, written by Peter Padfield, contains a complete and unbiased analysis of the sworn testimony given by the various witnesses from the *Titanic* and *Californian* at the U.S. and British inquiries. The book, written, ". . . in the cold light of 50 years afterwards," is a revelation and should leave no doubt in any reader's mind that Captain Lord has been unjustly charged with being responsible for the loss of more than 1,500 persons in the sinking of the *Titanic*.

This article deals with only a few of the most relevant points brought out in Padfield's book. These substantiate the contention that the *Californian* was

never in a position to render assistance to the *Titanic's* passengers before the ship sank.

Every statement quoted herein is taken from the extracts of the findings of the official British Inquiry and can be found in the testimony of the witnesses. After a careful study of the full testimony, however, it appears obvious that Lord Mersey lifted these statements out of context. Consequently, he presented an erroneous version of the facts. In context, these extract statements present a picture which is foreign to the one shown by Lord Mersey. It should be noted also that this testimony was given before there was any inkling of what charges, if any, might arise at a later date against any of the witnesses.

As far as the *Titanic* was concerned, it has been established that on Sunday night, 14 April 1912, the ship was traveling west-bound at about 23 knots. At 11:40 p.m. the ship collided with an iceberg. Two hours and 40 minutes later the ship sank and with her about 1,500 persons went to their deaths. The 712 survivors were picked up by the *Carpathia* which arrived at the scene a couple of hours after the *Titanic* had sunk. About an hour after the collision the lights of a ship appeared from over the horizon. It was then that the *Titanic* started sending up distress rockets in an effort to gain the ship's, or any ship's, attention. In addition, the *Titanic's* powerful blinker light (known in those days as a Morse Lamp) was put into action. Every effort to gain attention failed. The ship eventually approached close enough to the *Titanic* for her port and starboard sidelights to be seen with the naked eye. The stranger then gradually closed out her sidelights, showing only her stern lights as she slowly sailed away and disappeared into the night.

The *Californian*, under the command of 35-year-old Captain Lord, was also west-bound on that April night. Cruising at 11.6 knots she began to encounter ice late in the evening. At 10:21 p.m., the ice conditions became so severe that Captain Lord decided to stop and heave to for the night.

At about 11:00 p.m., Captain Lord pointed out to Charles V. Groves, his Third Officer, what appeared to be a ship's light at a considerable distance on the *Californian's* starboard quarter. The night was so clear, however, that they both agreed that perhaps the light might just be a star very low on the horizon. The Captain then left the upper bridge. At about 11:30 p.m., the Third Officer reported to Captain Lord that the light was actually a ship and that she was approaching the *Californian*. Captain Lord instructed the Third Officer to call by Morse code with the blinker light. This Groves did for several minutes. The strange ship, however, did not respond to these repeated calls. Shortly after 11:40 p.m., Captain Lord returned to the upper bridge where he rejoined his Third Officer. Together they sized up the situation and concluded that, like themselves, the ship had now stopped on account of the ice conditions. After instructing Groves to continue calling the other ship with the blinker light, Captain Lord returned to the chartroom one deck below the upper bridge. Here he stretched out, fully dressed, on the settee.

Shortly after midnight, Herbert Stone, the

Californian's Second Officer, started for the bridge to relieve the watch. On his way he encountered Captain Lord who advised him of the ice conditions and of the other ship. Stone then continued on to the upper bridge where he relieved the watch after discussing the conditions with Groves. Stone immediately began calling the other ship by blinker light. But like Groves, he received no acknowledgment of his signals. Shortly thereafter the Apprentice Officer, James Gibson, appeared on the bridge with coffee for Stone. Stone discussed the other ship with the Apprentice, who then tried his hand at calling the ship by blinker light but without success.*

At about 12:45 a.m., Stone observed a flash in the sky in the direction of the other ship. Shortly thereafter he observed another flash which he made out to be a rocket. Between then and about 1:15 a.m., three more rockets were observed in the same general direction. Neither Stone nor the Apprentice noticed any flash from the other ship's decks nor did they hear any sound of detonations which usually accompany distress rockets. The rockets, they said, did not appear to rise above the horizon any higher than the other ship's masts. This caused the men on the *Californian's* bridge to believe that the rockets were rising from some point beyond the other ship.

At this point, Stone called Captain Lord by voice tube and informed him of what he had seen. In reply to a question by Captain Lord, Stone said the rockets had all been white in color. The Captain then instructed the Second Officer to continue calling the other ship by blinker light and to let him know when he received an answer. The other ship never did reply. During this interval three more rockets were observed. Also, the other ship was now slowly closing out her red sidelight, and showing only her stern light, as she slowly got under way in the opposite direction. By 2:00 a.m., Stone noted that the ship was now steaming away fast in a southwesterly direction. This was the same direction from which the ship had initially appeared. At the British inquiry, Stone commented that he was somewhat puzzled by the fact that the rockets appeared to change their bearings as the ship moved away.

At 2:05 a.m., Stone sent the Apprentice to call the Captain and inform him of the additional rockets and the actions of the other ship. In reply to a question concerning any color in the rockets, Gibson replied that they all had been white. Captain Lord then asked for the time, to which Gibson replied, "2:05." With no further word from the Captain, Gibson returned to the bridge.**

* Many of the smaller ships were not equipped with electricity and still used oil lamps. Without electrical power, a ship would not have the means to communicate with a blinker light. Also, very few ships had wireless sets as a means of communications.

** Different companies used different colored flares to identify themselves to other passing steamers. Apparently this is what Captain Lord was trying to determine.

At 2:45 a.m., the Second Officer again contacted Captain Lord by voice tube. He informed the Captain that there had been no more rockets and that the other ship had now completely disappeared in a southwesterly direction.

At the inquiries, Captain Lord disclaimed any knowledge of conversation with anyone between 1:15 a.m., when Stone spoke to him through the voice tube, and some time after 4:00 a.m., when the Chief Officer, George F. Stewart, awakened him. He said, however, that he did have some recollection of someone being in the chart room with him during this period. Evidently, Captain Lord was in deep slumber and had not been sufficiently aroused to understand clearly what was being said. Vital as Captain Lord's actions may appear at this juncture, they have no bearing upon what is being proved in this article. The point is that the *Californian* could not possibly have reached the *Titanic*'s side to offer assistance before the ship sank.

Returning to the light that Captain Lord pointed out to Groves at 11:00 p.m., five men on the *Californian* testified that they saw the ship's lights. They all agreed that the *Californian* had been stopped for a considerable length of time when they had first observed the ship. There is, however, a vast discrepancy in their opinions as to what they actually saw. Three men—Captain Lord, Second Officer Stone, and Apprentice Gibson—said that the ship was moderate in size or comparable to the *Californian* and that she was showing about half a dozen lights from her masts and decks. At the same time, Groves and Ernest Gill, the *Californian*'s donkeyman, claimed that the ship was a large passenger liner illuminated with many lights about her decks.*

Let us now consider the testimony of Groves, the *Californian*'s Third Officer, and Donkeyman Gill. These are the men who claimed that the ship seen by them was the *Titanic*.

It will be recalled that at 11:30 a.m., Groves reported to Captain Lord that a ship was coming up on the *Californian*'s starboard quarter. Following is Groves' testimony concerning his conversation with Captain Lord by voice tube, that, "Captain Lord said to me, 'Can you make anything out of her lights?' I said, 'Yes, she is evidently a passenger steamer coming up on us'."

Groves continued that Captain Lord instructed him to call the ship by blinker light. This he did but received no answer to his repeated calls. At 11:40 p.m., Groves noted that the ship had stopped and, at the same time, Captain Lord joined him on the upper bridge. Again I quote from Groves' testimony.

Groves said, "When he came on the bridge he said to me, 'That does not look like a passenger steamer.' I said, 'It is, sir. When she stopped her lights seemed to go out, and I suppose they have put them out for the night.'"^{**}

Groves resumed his testimony by saying that, in his opinion, the other ship's lights would appear to go out if she altered her course and presented more or less of a head-on exposure to the *Californian*.

Groves concluded his testimony by saying that he remained on the upper bridge for another half-hour, when he was relieved of the watch by Stone shortly after midnight. During this period, he said, the other ship continued to remain in her darkened condition with only a few lights showing around her open decks. Thus we have the picture of the situation as given by Groves himself.

Yet, in the face of his own testimony and the known facts of the case, Groves answered a question put to him by Lord Mersey as follows: "Speaking as an experienced seaman and knowing what you do now, do you think that the steamer that you know as throwing up rockets, and you say was a passenger steamer, was the *Titanic*?"

Groves replied: "Most decidedly I do, but I do not put myself as being an experienced man."

For several reasons it is difficult, if not impossible, to go along with Groves' testimony and contentions. In the first place, the *Titanic* was ablaze with hundreds upon hundreds of lights both inside and outside. These lights did not fail until a few minutes before the ship sank, which was after 2:00 a.m., and more than two hours after Groves had left the *Californian*'s bridge to retire for the night. And, even if viewed head on, these lights would have cast off a glare of sufficient magnitude, from both sides of the ship, to make her identity as a tremendous passenger liner unmistakable. Yet, according to Groves, this ship which he identified only as a "passenger steamer" remained in her darkened condition after 11:40 p.m. He said he was able to pinpoint the time at 11:40 p.m. when the ship stopped and put the majority of her lights out, because this happened just as the quartermaster struck one bell for the lookout to rouse out the men to relieve the watch at midnight. Stone, the Second Officer, and Gibson the Apprentice, testified that the ship remained in this darkened condition and close enough for her sidelight to be seen with the naked eye until she finally sailed away sometime after 2:00 a.m., which was more than two hours after Groves had left the bridge. Under these circumstances how can anyone accept Groves' contention that this ship was the *Titanic*?

Gill's Story

The following narrative has been produced from the pertinent facts in the sworn statement of

^{**} At this juncture, Lord Mersey exposed a marked ignorance in naval and maritime operations. He argued at considerable length with various counsels that the lights, except for emergency lighting, must go out when a ship's main engines are stopped. The discussion became quite heated even between Lord Mersey and his nautical advisors sitting at his side. He was adamant and said, "At some time the light which was produced by the main engines did go out!" There the matter apparently stood and the questioning of the witness continued.

* In my original article, I was under the mistaken impression that all but Captain Lord had identified this ship as a large passenger liner.

Donkeyman Gill of the *Californian*. The affidavit was read to him at the U.S. Congressional Investigation, and Gill agreed that this was his statement.

Gill stated that he was working on a piece of machinery in the engine room when he checked the clock and noted that the time was 11:56 p.m. He immediately left the engine room to rouse out the man who was to relieve him at midnight. The *Californian*, he said, had then been stopped for about an hour and a half. During the moment that he was on the open deck en route to the quarters, he looked over the *Californian's* starboard rail and saw the lights of a very large steamer at a distance of about 10 miles.

At the British Inquiry, Gill elaborated on this remark by saying, "I could see two rows of lights and several groups of lights which I took to be saloon or deck lights."

Continuing with Gill's affidavit, the steamer, he said, was traveling at full speed. After waking his relief, Gill went to bed but could not sleep. At about 12:30 a.m., he decided to smoke a cigarette. Because of the ship's cargo, he continued, the crew was not permitted to smoke below deck. Therefore, he went out on the open deck to smoke. When he had been on deck for about 10 minutes, he claimed he saw a white rocket at a considerable distance away on the starboard side. Although the very large steamer was no longer in sight, the rocket did come from the same general direction relative to the *Californian's* heading, in which he had seen the ship some 40 minutes earlier. Seven or eight minutes later, he said that he distinctly saw a second rocket in the same area. He then disposed of his cigarette and went back to bed.

In his affidavit, Gill was extremely critical of Captain Lord before he concluded his statement concerning the night's events with, "I am quite sure that the *Californian* was less than 20 miles from the *Titanic*, which the officers report to have been our position. I could not have seen her if she had been more than 10 miles distant, and I saw her very plainly."

All one has to do is to compare Gill's story with the irrefutable facts of the case to realize that his story will not stand up under examination.

It has been established that, at the time of the collision, the *Titanic's* clocks were operating 12 minutes ahead of the *Californian's* clocks. Therefore, when Gill said he saw "... a very large steamer going at full speed after 11:56 p.m.," it was actually 12:08 a.m. on the *Titanic*. The *Titanic* had collided with the iceberg at 11:40 p.m. and did not move again.

Another weak point in Gill's story is that nobody could have determined with a glance over the rail, whether or not a ship about 10 miles away was actually stopped or moving—let alone running at full speed. And, even at less than half the distance he claimed the ship was away from him, the hundreds of lights glaring from the *Titanic's* decks and portholes would have fused into one tremendous glow and he would never have been able to distinguish, "... two rows of lights and several groups of lights which I took to be saloon and deck lights."

Does it not seem strange that Groves, the *Californian's* Third Officer in charge of her bridge, never saw this "very large steamer" lit up with two rows of porthole lights and going at full speed? Remember, Groves had firmly established that his "passenger steamer" had stopped and put out all but a few of her lights at 11:40 p.m. which was 16 minutes before 11:56 p.m. the time which Gill has firmly established as the time that he left the engine room.

There are those who believe that Gill had an ulterior motive in giving these statements. It was brought out at the Congressional investigation that Gill had given his story to a Boston newspaper and had told Cyril F. Evans, the *Californian's* wireless operator that, "I think I will make about \$500 on this." In those days, \$500 would represent about a year's wages for a person serving in Gill's capacity as a donkeyman.

Some Discrepancies

Before entering into the navigational aspects of this disaster, there are a couple of points relative to the physical actions of the tragedy, which simply cannot be reconciled.

One point is, how could two ships, stopped close enough to each other so as to be able to identify each other's sidelights and with experienced officers on their bridges, flash their powerful blinker lights, which could be read at a distance of 10 miles, with the *Titanic* using her light for the better part of an hour and the *Californian* using hers for even a longer period of time, without these blinker light signals being seen from or by either ship?

Another point, which I believe cannot be reconciled, is that at 11:40 p.m., when the *Titanic* collided with the iceberg, there was no other ship in sight. About an hour after the collision, the masthead light of a ship was sighted from the *Titanic's* bridge. The ship approached close enough to the *Titanic* for her sidelight to be seen with the naked eye. The ship then gradually reversed her course and sailed away in the opposite direction. The following testimony given by Frederick Fleet, one of the *Titanic's* lookouts stationed in the crow's nest, serves to substantiate this contention.

Court: Before you left the *Titanic*, did you observe the lights of any ship in your neighborhood?

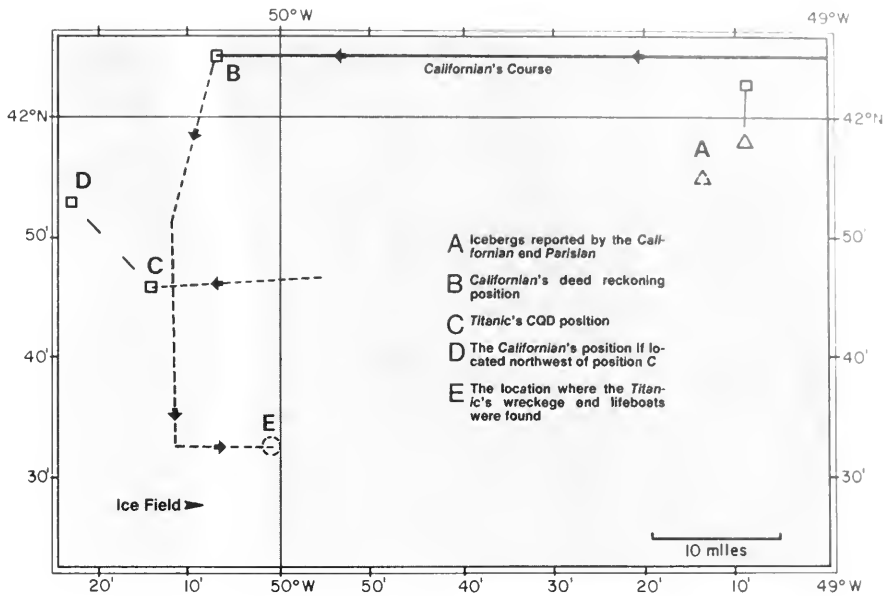
Fleet: Well, there was a light on the port bow.

Court: Did you see this light on the port bow before you left the crow's nest?

Fleet: No, it must have been about one o'clock.

Fleet was on lookout duty in the crow's nest with another lookout named Lee. It was Fleet who first sighted and passed the word of the iceberg ahead at 11:40 p.m. He remained in the crow's nest until he was relieved by another lookout at midnight. He finally left the *Titanic* at about one o'clock in a lifeboat.

How can these facts be reconciled to the fact that the *Californian* had stopped in the ice field at least an hour before the *Titanic* collided with the



Movements of Californian and Titanic. The triangles at upper right show positions of point A reported by the Californian (solid) and Parisian. (Chart reproduced courtesy of U.S. Naval Institute Proceedings)

iceberg, and she did not move again until a considerable length of time after the *Titanic* had sunk? The *Californian's* actions in this respect have been corroborated by every witness appearing from the ship at the inquiries and by the ship's bridge and engine room log books.

One final point: If the lights seen by the *Titanic* had been the *Californian's*, then these lights simply had to be in view of the *Titanic* at the time of the collision. Therefore, under these circumstances, it is more than reasonable to believe that Captain Edward J. Smith of the *Titanic* would have moved his ship over close to the *Californian* when he found that his ship was doomed and while he still had ample power remaining in his engines to make the move. As it was, when the first lifeboats were launched more than an hour after the collision, they were instructed to row over to the strange ship about five miles away, deliver the passengers, and return to the *Titanic* for more survivors.

Navigation and Rescue

In considering Captain Lord's contention that his ship was never close enough to the *Titanic* to render assistance to her passengers before the ship sank, we must also consider the navigational phases of the tragedy. These are set forth on the plot depicting the area in which the *Titanic* was lost.

Point "B" is the position at which the *Californian* had stopped for the night at 10:21 p.m. because of the ice conditions. This position was fixed by Captain Lord and his navigators as being 42 degrees, 05 minutes north Latitude and 50 degrees, 07 minutes west Longitude. This was done by projection from the ship's noon position fix at her normal rate of speed calculated from the patent log and engine revolutions. The ship's track of 270 degrees true was verified at 7:30 p.m. by a Pole Star sight worked out under ideal conditions. This 7:30 star sight proved that the ship was still making due

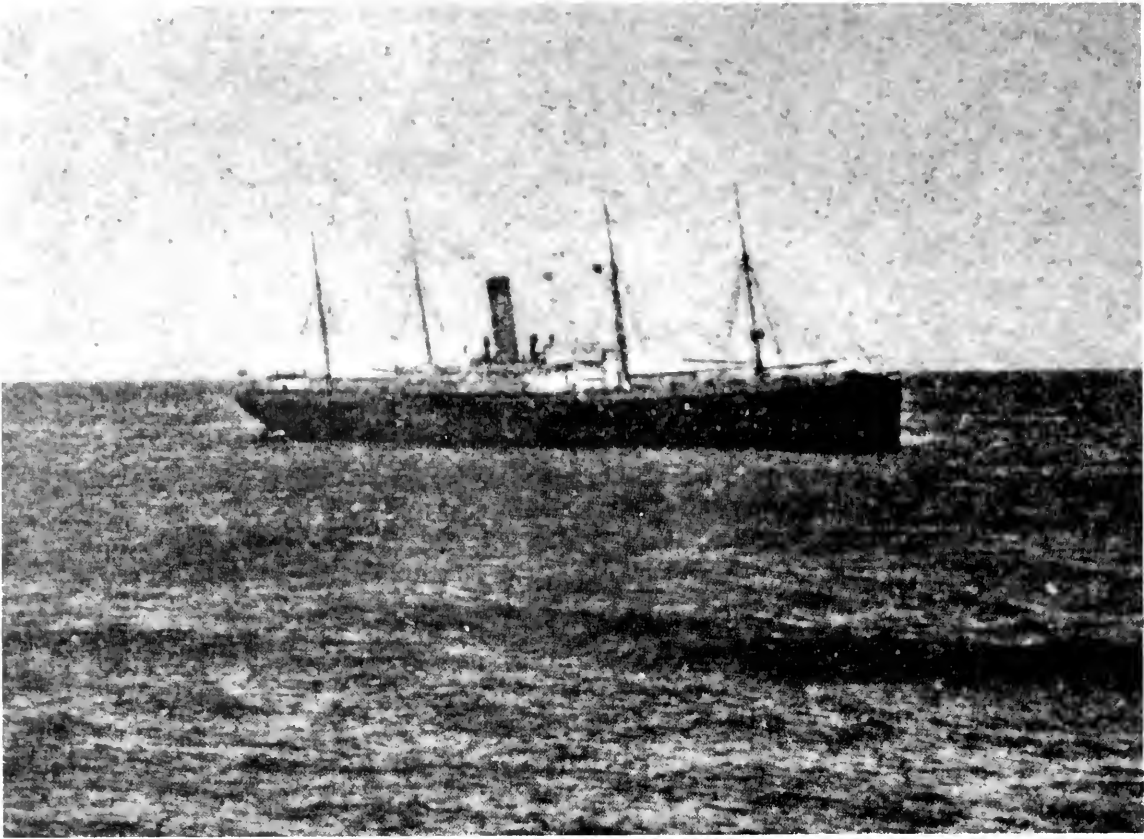
west in a latitude of 42 degrees, 05 minutes North, which was the same latitude as in the ship's noon position fix. The *Californian's* latitude was further established by the fact that earlier in the evening, Captain Lord had sent a general message to all ships warning them of three large icebergs as illustrated at point A on the plot. It is ironical that the *Titanic* was one of several ships that picked up this warning message. It is highly significant that the *Parisian* had broadcast an earlier warning message about these same icebergs. And the positions given by the *Californian* and *Parisian* were within a few miles of each other, with both ships being north of the icebergs.

The *Titanic's* second, or corrected, distress position was 41 degrees, 46 minutes north latitude and 50 degrees 14 minutes west longitude. This position is shown at point "C" on the plot. The straightline distance between points C and B is 19.75 miles.

Point D is the position that the *Californian* would have been in according to Lord Mersey's contention that the ship was no more than eight to ten miles away from the *Titanic* while she was sinking.

The following narrative has been produced from Captain Lord's testimony:

At about 5:20 a.m., the *Californian* heard from the *Mount Temple* that the *Titanic* had sunk. The *Mount Temple* also gave the *Californian* the *Titanic's* distress position. It was now daylight and Captain Lord pushed the *Californian*, in a southerly direction, through the icefield. At about 6:30 a.m., the *Californian* was through the icefield and in clear water. Captain Lord then set his course and ran the *Californian* at top speed to the distress position that had been given to him. When he arrived at this position, he found only the *Mount Temple*, which was stopped. By now, Captain Lord had heard that the *Carpathia* was at the scene of the disaster and



A passenger in the *Carpathia* photographed the *Californian* arriving on the scene with a coal basket visible in which a lookout searched for the *Titanic*'s lifeboats. And, as further mute evidence of Lord's taut ship, his code flag "J" signalled, "I wish to communicate by semaphore." (Photo courtesy U.S. Naval Institute/Louis M. Ogden)

was taking the survivors on board. Continuing at full speed in a southerly direction, Captain Lord finally found the *Carpathia* on the other, or eastern, side of the icefield. Eventually he found an opening in the icefield when he was just about abeam of the *Carpathia*. Recrossing the icefield to the *Carpathia*'s side, he found that all of the survivors were now safely on board the *Carpathia*. The *Carpathia* then set her course toward New York with the *Titanic*'s survivors. The *Californian* remained in the area for several hours, searching for any additional survivors.

There is substantial evidence to indicate that the *Titanic*'s distress position was not entirely accurate. It will be noted, on the plot, that the *Titanic*'s distress position placed her on the western side of the icefield. This fact has been confirmed by five ships, the *Californian*, *Mount Temple*, *Almerian*, *Burma*, and *Frankfurt*. When these ships arrived at the distress position, they found nothing of the *Titanic* nor any wreckage. Shortly thereafter, the *Carpathia* was observed on the eastern side of the icefield. The ships worked their way through and around the icefield to the *Carpathia* where they found the rescue operations had been completed.

Captain Arthur H. Rostron, of the *Carpathia*, said that he felt that the *Titanic*'s distress position was correct. The only reason to question Captain Rostron's opinion in this respect is that for the last hour or so he had been guided to the scene by the

flares being shown from the *Titanic*'s lifeboats. Consequently, he would have had no reason to check the accuracy of the *Titanic*'s broadcast distress position during the final hour.

Captain Rostron also gave the following testimony at the British Inquiry: "He (a junior officer) counted 25 large ones (icebergs), 150 to 200 feet high, and stopped counting the smaller ones: there were dozens and dozens all over the place; and about two or three miles from the position of the *Titanic*'s wreckage we saw a huge icefield extending as far as we could see, northwest to southeast."

The *Carpathia*, which approached the distress area from the southeast, would have been required to pass straight through this icefield that Captain Rostron has described so graphically in order to reach the *Titanic*'s given distress position.

The westbound *Titanic* would also have been required to negotiate this same icefield before the collision in order to reach her given distress position. This is highly improbable, because, from the testimony of the lookouts in the *Titanic*'s crow's nest, nothing had been seen until they actually sighted the iceberg with which the *Titanic* collided.

It will be remembered that the westbound *Californian* stopped for the night on the eastern side of the icefield. After she received the *Titanic*'s distress position, she crossed to the western side of the field to approach the position; she found nothing



On the voyage immediately preceding that in which his ship was involved with the *Titanic*, a relaxed Captain Lord (lower left) and his Chief Officer, Mr. Stewart, posed with two young passengers while, behind them, stood Second Officer Stone, left, and Third Officer Groves. (Photo courtesy U.S. Naval Institute from Captain Lord's Private Collection)

and was then required to recross the icefield, from west to east, in order to reach the *Carpathia* then in the process of picking up survivors. This west-to-east crossing of the icefield by the *Californian* was verified by Captain Rostron of the *Carpathia*.

The *Californian* continued searching the area until about 11:20 a.m. when she resumed her voyage toward Boston. In order to lay out the ship's new course, it was necessary for her navigators to obtain an accurate position fix. This was done at 12 o'clock noon. From this fix worked out by all of the bridge officers, Captain Lord placed the *Titanic's* wreckage at 41 degrees, 33 minutes north Latitude and 50 degrees, 01 minutes west Longitude. This was actually a distance of 33 miles south of the position that the *Californian* was in at 10:21 p.m. the previous night when she stopped because of the ice conditions.

In their summation of the facts, Senator Smith and Lord Mersey apparently chose to ignore the fact that there were any ships in the area other than the *Titanic*, the *Californian* and, slightly further away, the *Carpathia*, whereas in reality, there were several more, two or three of which were seen by the *Californian*, *Mount Temple*, and *Carpathia*. To this day these ships have never been identified.

Whether these ships were attracted to the area by the distress calls or rockets or, like the *Californian*, they had stopped for the night because of the ice will never be known. The *Mount Temple*

sighted a schooner very close to the SOS position. It is also known that at least one poacher, which had been illegally hunting seals, was in the vicinity. Naturally, a poacher would not want to be detected.

In view of all the evidence, it does seem strange that Senator Smith and Lord Mersey chose to ignore these highly significant and relevant facts in the summation of their inquiries. The testimonies of highly qualified and respected men were disregarded in favor of two witnesses, Groves, the *Californian's* Third Officer, and Gill, the donkeyman, whose accounts of the facts and circumstances so obviously lacked validity. On the basis of this testimony, nevertheless, both Courts concluded that the *Californian* was at a distance of between five and eight miles from the *Titanic* while she sank. They also concluded that, because of Captain Lord's inaction during this vital period, 1,500 lives were unnecessarily lost in the disaster.

There has been considerable controversy over whether the rockets seen by the *Californian* were actually those sent up by the *Titanic*. Many contend that it would have been impossible for the *Californian* to have seen these rockets because of the vast distance between the two ships, which to their satisfaction had been proved. And, although the *Titanic* fired about eight rockets and the *Californian* saw eight rockets, the timing and sequence of the *Titanic's* firing as compared to the *Californian's* sighting is so far apart that it is impossible for them to

believe that the *Californian* actually saw the *Titanic's* rockets.

Those who believe the *Californian* did see the *Titanic's* rockets counter with, "If it was not the *Titanic's* rockets that the *Californian* saw, then whose rockets were they or what were the rockets all about? After all, the sighting of rockets is rare and unusual."

In an attempt to clear up this difference in opinions, let us assume that the rockets seen from the *Californian* by her Second Officer, Gibson the Apprentice, and Donkeyman Gill, were actually the *Titanic's* rockets. At the time it was obvious that at least the Second Officer and Apprentice did not recognize them as distress signals. The testimony of the three men, in describing what they saw that night, is quite similar. Their claims were that the rockets rose no higher than half a ship's mast height above the horizon. It was eight miles to the horizon from the *Californian's* bridge (elevation 49 feet). The known capability of the rockets was that they: "... burst from two to three hundred feet up with an explosion..." Calculations show that a rocket fired from the *Titanic's* deck (elevation at least 70 feet) and rising to a possible height of 300 feet above the deck could have been seen at the horizon on a clear night, at a distance of better than 22 miles. Thus, it becomes clear that, under the ideal weather conditions which prevailed on that night, the *Californian* could have observed the *Titanic's* rockets at a distance of more than 30 miles. Of much greater importance is that the sighting of the rockets as described by these men proves that they were fired from a distance closer to 30 miles away rather than the eight-to-ten-mile distance claimed by Lord Mersey at the British Inquiry.

In further consideration of the rockets seen by Stone, the *Californian's* Second Officer, he testified that after observing a couple of rockets he notified the Captain about them at "about 1:15 a.m." This would have been about 1:27 a.m. on the *Titanic*, or about 53 minutes before she sank. Assuming that the *Californian* had disregarded the dangerous ice conditions and had gotten under way at her maximum speed of 13 miles per hour, or one mile every 4.6 minutes, at the instant that the Captain was notified or at the instant that the Second Officer sighted his first rocket at about 12:45 a.m., simple mathematics prove that it would have been impossible for the *Californian* to have reached the *Titanic's* side before the ship sank.

The *Californian's* Second Officer has been criticized by some because it is felt that if he believed the circumstances warranted calling the Captain, he should have been more forceful in his approach, perhaps going to the chartroom and rousing him out himself. It is also felt that natural curiosity should have caused him to awaken the Marconi operator. Be all this as it may, it did not alter the outcome of the tragedy in any way and the hard fact still remains that the *Californian* could not possibly have reached the *Titanic's* side before the ship foundered.

In his book entitled, *The Titanic and the Californian*, Peter Padfield said, in his concluding

remarks concerning the U.S. Congressional Investigation:

The evidence from this Inquiry examined in the cold light of 50 years afterwards brings out only the undoubted fact about "the Californian incident": Captain Lord was "framed."

He was "framed" either consciously or subconsciously for one of three reasons. Either all the leading actors in the construction of the Report were natural idiots, or the edict had gone out that a scapegoat had to be found and they were doing the best they could to make it plausible, or the very magnitude and shock of the tragedy so unhinged them that they were incapable of examining the evidence with clear minds.

Clear and unbiased consideration of the sworn testimony and the circumstantial evidence cannot but help to bring agreement with Padfield when he claimed that Captain Lord had been "framed," the reason being that most probably it was felt that a scapegoat was necessary.

Thus, the seed which propagated the Captain Lord-*Californian* legend was originally planted at the U.S. Congressional Investigation, which convened less than a week after the tragedy. A few weeks later, the British Inquiry, conducted by Lord Mersey, got under way in London. Obviously, the British Inquiry had the findings and conclusions of the American investigation at its disposal and apparently it lost no time in capitalizing on them.

A Scapegoat?

There are several factors that back up this scapegoat theory. Shortly after the tragedy, tremendous adverse public opinion was leveled at the British Board of Trade, Bruce Ismay, the managing director of the White Star Line, owners of the *Titanic*, and Sir Cosmo Duff Gordon, both of whom were passengers on the *Titanic*. These men were saved, and many unsavory stories concerning their behavior during the sinking spread like wildfire. The lifeboat in which Sir Cosmo Duff Gordon left the *Titanic* with his wife and a few other lady passengers was dubbed, "The Millionaire's Special."

Bruce Ismay felt the heat of public opinion after stories had circulated that he had ordered Captain Smith of the *Titanic* to continue at full speed in spite of the repeated ice warnings. According to the rumors, Ismay issued the order in the hope that the *Titanic* would set a new speed record on this, her maiden voyage. It was also rumored that he left the ship with all of his baggage. None of these stories about Bruce Ismay, however, have ever been substantiated. In fact, from the evidence given by some of the responsible survivors, it appears that Ismay did all that he could to help before leaving the sinking ship in one of the last lifeboats.

The British Board of Trade, under whose auspices the British Inquiry was conducted, also felt the heat of public opinion. It was this body that had permitted the *Titanic* to sail with a lifeboat capacity

that could only accommodate approximately one-third of the ship's potential carrying capacity.

Under these circumstances, it is reasonable to believe that because of all this adverse public opinion it was felt necessary to find a scapegoat to draw the focal point of this bad publicity away from the members of the Board. Captain Lord fit the bill.

The wheels of injustice, at both of these investigations, turned most unfairly against Captain Lord. He appeared only briefly at them, just long enough to give his testimony and leave. While at the inquiries, he never once heard any mention of the charges that were to be brought against him by Senator Smith and Lord Mersey.

To be found guilty of such heinous conduct without being formally charged with the offense and without recourse to defend himself against the charges is contrary to the concept of justice both in the United States and Great Britain. This miscarriage of justice caused C. R. Dunlop, an attorney at the British Inquiry to say, "It is manifest that Captain Lord has been treated in a way which is absolutely contrary to the principles on which justice is usually administered." Yet, with irresponsible testimony, Senator Smith and Lord Mersey held Captain Lord responsible for the loss of 1,500 lives. This disgrace of their actions is compounded by the fact that Captain Lord was refused, time and time again, any opportunity to defend himself against these accusations.

As a result of these charges, Captain Lord was forced to give up his command of the *Californian*. A director in his organization threatened to resign if Captain Lord was retained as an employee of the company. Many of his contemporaries and immediate superiors in his own company, however, knew he had been used as a scapegoat, and they went to bat for him elsewhere. Consequently, within a few months, Captain Lord again had a command with a highly reputable steamship company.

Every subsequent attempt made by Captain Lord to be heard by the authorities who had convicted him of gross dereliction of the first law of the sea was thwarted. After nearly two years of total frustration, and with the advent of World War I, Captain Lord ceased his attempts to be heard and devoted his full energies to the war effort.

During the four-year World War, Captain Lord lost none of his sense of outrage at the damage done to his professional and personal reputation. This injustice, however, did not affect his life adversely; therefore, he decided not to pursue the matter further.

In March of 1927, Captain Lord, at the age of 50, retired from the sea. He had given 14 years of "invaluable service" to the steamship company that had placed its faith in him.

Forty-six years after the tragedy, in 1958, Captain Lord's wound was again laid wide open when he was once more pictured to the world as the captain who slept while his ship, a few miles away from and in full sight of the sinking *Titanic*, did nothing. As a result of his inactivity, Captain Lord was again blamed for the more than 1,500 lives lost. This was done through the publication of Walter

Lord's book entitled *A Night to Remember*. The book was rated as one of the best sellers of the decade and a motion picture was produced from the text. To this day, the motion picture, also entitled, *A Night To Remember*, is being shown in theaters throughout the world, and on television.

Although nearly 80 years of age at the time of the book's publication, Captain Lord again sought the legal assistance and guidance of the Mercantile Marine Service Association, an organization of shipmasters of which he had been a member in good standing since 1897. The Association's council carefully studied the evidence and testimony and agreed unanimously that Captain Lord had been crucified at both inquiries.

The Association's latest efforts in Captain Lord's behalf was the petition presented in February 1965 to the British Board of Trade, requesting a re-hearing of the evidence against Captain Lord. Among the opening paragraphs in the "Text of Petition" are the following statements:

Although since 1958 the M.M.S.A. at Captain Lord's request has done all that it can to defend him by publishing the true facts of the case, it is now quite clear that so long as the findings of the British and American inquiries remain on record there will be writers who will ignore the evidence in Captain Lord's favour, and will continue to publish what are often grossly defamatory attacks upon him. In the opinion of the council of the M.M.S.A. the findings cannot be upheld and the failure of the courts to give him proper legal protection constitutes a miscarriage of justice which permits the Board of Trade to order a rehearing.

As stated earlier, the Board of Trade turned down this request for a re-hearing on the grounds that the "... petition does not suggest that there is any new and important evidence which could not have been produced at the formal investigation ...".

Granted, the Board of Trade is correct in their statement. This fact has never been disputed or challenged by Captain Lord or the Mercantile Marine Service Association. All that is being asked for now—and all that Captain Lord asked for in 1912 and 1913—is that the existing testimony and circumstantial evidence be reviewed in the light of common sense and decency; that all of the facts remain in context; and from this a fair evaluation of the facts be produced by qualified and experienced men. Had this been done in the first place, we who have found the subject fascinating and have written about the tragedy could not possibly have produced the articles and books which for these many years have spread the defamation of Captain Stanley Lord of the *Californian*.

A surveyor in the construction and repair division of the Matson Navigation Company, San Francisco, during World War II, John C. Carrothers sailed as a chief engineer with the Matson Company and as a watch engineer with the United States Lines. He also was an inspection engineer with the Vitro Corporation of America and chief engineer of the Moore-McCormack Line's SS Brasil.

Gill, the Donkeyman's Tale

by Eugene Seder

EDITOR'S NOTE: The following article, originally entitled "Man of Californian: I saw *Titanic's* Signals," appeared in the Spring 1985 issue of *The Titanic Commutator*, the official journal of the Titanic Historical Society. It is reprinted with permission.

"I am actuated by the desire," said Ernest Gill, second donkeyman aboard the Leyland Liner *Californian*, "that no captain who refuses or neglects to give aid to a vessel in distress should be able to hush his men up."

The year was 1912—the day, April 25, 10 days after the *Titanic* sank—the place, Boston—the words, the finale of a statement of Ernest Gill, page one of *The Boston American*—an accusation of guilt against his ship and her captain for not responding to the sinking *Titanic* and the 1,500 who died with her.

Gill sounded the cry against the *Californian*—not stilled to this day.

By now everybody who's read Walter Lord's book, *A Night to Remember*, (or seen the movie) must know by heart the case against the *Californian*. Chapter after chapter ends like this—the still ship watching the *Titanic* sink:

"Ten miles away on the *Californian*, Second Officer Stone and apprentice Gibson watched the strange ship slowly disappear. . . .

"Call the Captain and tell him that the ship is disappearing in the southwest and had fired altogether eight rockets.

"Captain Lord (Stanley Lord—no relative of author Walter Lord) looked up sleepily from his couch: 'were they all white rockets?'

"Gibson said, yes, and Lord asked the time. Gibson replied that it was 2:05 by the wheelhouse clock. Lord rolled over and Gibson went back to the bridge."

Where did it come from—this notion that the steamship *Californian* lay stopped amidst ice floes, her captain asleep while her officers on the bridge counted eight rockets and watched the *Titanic* sink before their eyes?

It came from the two official inquiries into the *Titanic* sinking—the first a U.S. Senatorial subcommittee hearing which convened four days after the *Titanic* sank. The second the British Board of Trade Inquiry a month later.

The U.S. Senatorial inquiry laid the *Californian* out on a board:

"The Committee is forced to the inevitable

conclusion that the *Californian*, controlled by the same company, was nearer the *Titanic* than the 19 miles reported by her Captain and crew and that her officers and crew saw the distress signals of the *Titanic* and failed to respond to them in accordance with the dictates of humanity, international usage and the requirement of law. . . . Had assistance been promptly proffered or had the wireless operator of the *Californian* remained a few minutes longer at his post on Sunday evening, that ship might have had the proud distinction of rescuing the passengers and crew of the *Titanic*."

The British inquiry found nearly the same negligence. Lord Mersey, who wrote the opinion for the London inquiry, noted that about eight distress rockets had been sent up by the *Titanic*—eight had been seen from the *Californian*; and that the ship which stopped near the *Californian* had stopped about the same time the *Titanic* had stopped and disappeared at the same times the *Titanic* sank.

"These circumstances convince me," Lord Mersey concluded, "that the ship seen by the *Californian* was the *Titanic*, and if so, according to Captain Lord, the two ships were about five miles apart at the time of the disaster. The evidence from the *Titanic* corroborates this estimate but I am advised that the distance was probably greater though not more than 8 or 10 miles. The ice by which the *Californian* was surrounded was loose ice extending for a distance of not more than two or three miles in the direction of the *Titanic*. The night was clear and the sea smooth. When she first saw the rockets, the *Californian* could have pushed through the ice to the open water without any serious risk and so have come to the rescue of the *Titanic*. Had she done so, she might have saved many if not all of the lives that were lost."

And whence came the seed of these opinions?

Why, from Ernest Gill, donkeyman, in Boston on April 25, 1912.

Now, a donkeyman is not a man with long ears. He is the mechanic who maintains the ship's donkey engines—small steam engines, in the case of the *Californian*, which work the deck winches to hoist cargo in and out.

Until Gill's story splashed across *The Boston American*—the *Californian* had been only a dark entity. She hadn't been five or eight or ten miles away but 17 or 19—out of sight over the horizon. So the searchlight for guilt lit her for an instant and then swept on—until Gill's story hit the streets.

Who was Ernest Gill?

A young man in his 20s, said *The New York Times* reporter who covered Gill's testimony at the Senatorial hearing in Washington—"a small man with red hair without a trace of color in his cheeks. He described himself as a Yorkshire man and his English accent was noticeable. He was nervous in manner but answered concisely the few questions that were put to him."

Gill earned six pounds a month—about \$500 a year at the exchange rate then. He bragged to his shipmates that *The Boston American* had paid him \$500 for his story. Let no man think that his story was manufactured from whole cloth for a year's pay. In full truth, the *Californian* lying silent and forgotten at her East Boston pier, seethed with rumor and suspicion. Gill was something like the mushroom which appears overnight from a long-festering underground organism.

Was Gill's statement true or was it a rotten fruit—the product of guilt festering in darkness? Judge for yourself.

Gill's Testimony

Gill's story broke in Boston on the evening of April 25, 1912—the third time the *Californian* had been mentioned in print along with the *Titanic*.

The first time, the day after the sinking, a paragraph deep down in the *Titanic* story said that the *Californian* was on the scene picking up bodies and would arrive in Boston on the 18th or 19th.

But the *Californian* found no bodies. So she was forgotten and steamed into Boston on the night of April 18, greeted only by the harbor pilot who steered her to a grimy steel-girdered freight pier in East Boston. Earlier that same day spraying fireboats and shouting crowds had ushered the *Carpathia* with the *Titanic* survivors into New York.

The searchlight next caught the *Californian* on April 24. By then the Senatorial inquiry had discovered that some ship had hoven into sight of the sinking *Titanic*, ignored her Morse signals, and turned away.

By the 23rd, the search rode in full cry for that ship. The finger of suspicion pointed at the Canadian Pacific liner *Mount Temple*. A passenger told a newsman he had seen rockets. The captain emphatically denied that. Talk spouted of seating a Canadian inquiry. But the search swept every ship nearby.

The New York Times remembered the brief second day mention of the *Californian* and dispatched a reporter. On April 24, *The Times* printed single-column top of page one:

April 23, 1912—from Boston: *The Leyland steamer Californian was less than 20 miles from the Titanic when the latter foundered. Captain Lord of the Californian said tonight that had he only known of the Titanic's plight, all the passengers could have been saved. That his ship was the steamer reported to have passed within five miles of the sinking, Captain Lord denied emphatically.*

'I figure that we were from 17 to 19 miles distant from the Titanic that night.'



Ernest Gill as he appeared in *The Boston American* of 1912. (Courtesy of Titanic Historical Society)

The Times quoted Lord: "the wireless, of course, was not working."

That was wrong. The *Californian* lights were on and the wireless working until the operator went to bed. Captain Lord would hardly seem responsible for the error unless he had responded to a newsman's ignorant speculation with silence. His quotation: "All the passengers could have been saved . . ." seems highly questionable, too.

In any case, the story had been printed; the *Californian* examined and allowed to slide back into oblivion. She was not the ship seen five miles from the *Titanic*. She had been 19 miles away.

Next day Gill's story hit the Boston streets. The *Californian* was not forgotten again.

What made the difference between Gill's story and that of *The New York Times*?

Rockets. *The Times* had not thought to ask about rockets. Gill said rockets had been seen from the *Californian* and she had done nothing.

The Boston American played Gill as a full banner headline on page one above the masthead.

'FROM CALIFORNIAN I SAW TITANIC SIGNALS' SAYS GILL

Beneath the masthead, a four-column head:

MAN OF CALIFORNIAN CREW SAYS WAS NEAR THE TITANIC

And beneath that a picture captioned:

Ernest Gill Who Says He Saw Titanic Rockets

The photograph showed a healthy-looking young man with a visor cap and handlebar

moustache looking obliquely off to his left, his head and upper chest framed in a curlicued 'G'.

Underneath, the outline said:

"Gill was donkeyman on the Leyland Liner *Californian* and says his captain paid no attention to the doomed vessel."

The major portion of the story, set bold face, recorded Gill's affidavit which he attested to the next day before the Senatorial subcommittee in Washington. After Gill, the *Californian's* obscurity vanished along with any notion of a deep inquiry into the *Mount Temple*.

Seven major newspapers competed for Boston's attention in 1912. No sooner would one splash a sensational story, than the next would try to discredit it. So *The American* took more than a little trouble to back Gill's words.

Gill's charges, wrote *The American*, had been repeated before four other members of the crew (unnamed) as well as notary public Samuel Putnam, who certified Gill's affidavit. More to the point, *The American* added, the story had been "affirmed" by an officer of the *Californian* "whose name *The American* is withholding."

The story said that the officer "had affirmed them (Gill's charges) in a confidential communication to *The Boston American*. . . . *The American's* informant says he worked out the position and it was 17 miles (from the *Titanic*) when the wireless operator was called at 6 a.m."

The American's reportage rings clear. Before *The American's* story, neither public nor officialdom knew that the *Californian* had seen rockets. Captain Lord never mentioned rockets and his story disappeared. Gill told about rockets, and he and the captain and the radio operator were called to Washington the next day.

Instantly, with Gill's story, a fair portion of the *Californian's* part in the *Titanic* affair had been written in fine hand, more than a little of it accurate. The next month, in London at the British inquiry, the *Californian's* Third Officer, Charles Victor Groves, would testify he believed the ship he had seen steam up and stop and "shut off" her lights on the night of April 14 had been the *Titanic*.

The rockets converted a story into a scoop and the story laid on guilt with a trowel. The *Californian's* obscurity burned away like morning mist.

On the surface, it looked like the *Californian* could well have been the ship seen five miles from the *Titanic*. Some ship had stopped five miles from the *Californian* at 11:30 p.m. and disappeared about 2:20 a.m.

Guilt shrouded that silent black ship at her East Boston pier. Who knows but that she might have steamed back to England still wrapped in her dark secret had it not been for a donkeyman, paid six pounds a month, who would not be "hushed up."

That night every Boston newspaper and national wire service asked Captain Lord if the *Titanic's* rockets had been seen from the *Californian* and ignored. Captain Lord said no.

The next morning, Friday, April 26, 1912,

Senator William Alden Smith, the hearing chairman, set aside his witness schedule and called Gill to testify.

"I want," said Senator Smith, "to read you the following statement, and ask you whether it is true.

"I, the undersigned, Ernest Gill, being employed as second donkeyman on the steamer *Californian*, Captain Lord, give the following statement of the incidents on the night of Sunday, April 14th. . . ."

The statement, clearly, almost punctiliously written, was exactly the statement which had been printed in the *Boston American* the day before. At first hearing, it might, in its simplicity, seem the direct work of Ernest Gill. But to the experienced eye, its simplicity smacks more of disingenuity. Its dramatic structure is superb and its expression sometimes elegant.

Smith read on:

"On the night of April 14, I was on duty from 8 p.m. until 12 in the engine room. At 11:56, I came on deck. The stars were shining brightly. It was very clear and I could see for a long distance."

Some thought that coming from the illuminated engine room into the moonless dark, it might take several minutes for his night vision to adjust—the very reason watch officers avoided looking into the lit wheelhouse. But it has to be said that even unaccommodated eyes could see electric lights.

"The ship's engines had been stopped since 10:30 and she was drifting amidst floe ice. I looked over the rail on the starboard side and saw the lights of a very large steamer about 10 miles away. I could see the broadside lights. I watched her for fully a minute. They could not have helped but see her from the bridge."

Note here that the sight line from the bridge of a ship such as the *Californian* to the horizon would be about eight miles. The portholes of a fair-sized ship might show at the horizon at 10 miles but the lights would be right at the horizon and look like an indistinguishable blur. Questioned afterwards by the Senators, Gill said he distinguished two rows of lights.

Senator Smith read on:

"It was now about 12 o'clock and I went to my cabin. I woke my mate William Thomas. He heard the ice crunching alongside the ship and asked, "Are we in ice?" [Thomas remembered this.] I replied, "Yes, but we must be clear off to the starboard for I saw a big vessel going along at full speed. She looked as if she might be a big German." [Thomas did not remember this.]"

Thomas' thoughts on Gill are detailed later. As for the "big vessel going along at full speed," the Senators examined Gill about that. Gill hedged. "I did not take particular notice of it with the rushing to call my mate," said Gill instantly shifting ground to matters of greater consequence—rockets and such.

The moving ship had significance. Remember that the *Titanic* ripped her bottom on the ice at 11:40 by her clock and stopped minutes afterwards. Now at 11:56, Gill testified, he saw "a big vessel going along at full speed." And because the *Titanic*

steamed about twice as fast as the *Californian* (both going west) her clocks probably read 12 minutes later than the *Californian* which meant the *Titanic* had stopped about 25 minutes before Gill came on deck.

Smith read on:

"I turned in but could not sleep. In half an hour I turned out, thinking to smoke a cigarette. Because of the cargo, I could not smoke 'tween decks. So I went on deck again.

'Why the devil didn't they wake the wireless man up?,' the second engineer was quoted as having said.

"I had been on deck about 10 minutes when I saw a white rocket about 10 miles away on the starboard side. I thought it must be a shooting star. In seven or eight minutes I saw a second rocket in the same place and I said to myself, "that must be a vessel in distress."

"It was not my business to notify the bridge or the lookout but they could not have helped but see them."

Questioned about the color of the rockets, Gill hedged again.

"They looked to me to be pale blue or white."

"Which, pale blue or white?"

"It would apt to be a very clear blue. But I could not catch it when it was dying. I did not catch the exact tint, but I reckon it was white."

"Did it look as if the rocket had been sent up and the explosion had taken place in the air and the stars spangled out (all characteristics of distress rockets)?"

Gill: "Yes sir, the stars spangled out. I could not say about the stars. I say I caught the tail end of the rocket."

These answers may seem confusing—perhaps contradictory, but they're not the essence of Gill's testimony. Closer to the point lay his exposure of the guilty secret of the silent ship.

Smith read on, "I turned in immediately after, supposing the ship would pay attention to the rockets."

This ends Gill's personal observation upon which his authority rests, though it hardly ends his statement. The remainder examines guilt.

"I knew no more until I was awakened at 6:40 by the chief engineer who said, 'Turn out and render assistance. The *Titanic* has gone down.'

"I exclaimed and leaped from my bunk. I went on deck and found the vessel underway and proceeding at full speed. She was clear of the ice field but there were plenty of bergs around.

"I went down on watch and heard the second and the fourth engineers in conversation. Mr. J. C. Evans is the second and Mr. Wooten is the fourth.

The second was telling the fourth that the Third Officer had reported rockets going off on his watch. I knew then it must have been the *Titanic* I had seen."

All this shows that *The American* had done its reasonable best to document the story. The paper, after all, had paid a second donkeyman a year's wages for his story. The paper stood to look a lot sillier than Gill if it proved a hoax—hence the substantiation from a responsible officer as well as other members of the crew. *The American* seems to have checked the story every whichway short of the Captain and spilling it to the other papers.

Although Gill's hearsay could have been accurate, the statement itself—that the Third Officer had reported rockets on his watch—was wrong. Charles Victor Groves had gone off watch shortly after midnight and never saw any rockets. But he had seen the "passenger ship" stop near the *Californian* and put out or "shut out" her lights about the time the *Titanic* struck.

Senator Smith read on:

"The second engineer added that the captain has been notified by the apprentice officer, whose name I think is Gibson, of the rockets. The skipper had told him to Morse to the vessel in distress. Mr. Stone, the second navigating officer, was on the bridge at the time, said Mr. Evans.

"I overheard Mr. Evans say that Morse lights had been shown and more rockets went up. Then according to Mr. Evans, Mr. Gibson went to the captain again and reported more rockets. The skipper told him to continue to Morse until he got a reply, but no reply was received.

"The next remark I heard the second make was, "Why the devil didn't they wake the wireless man up?""

I personally urged several crewmembers to join me in protesting against the conduct of the Captain, but they feared for their jobs.

Here ends Gill's second and third-hand report of the events of the night—all of it new material to the world, thanks to *The Boston American*. From here on the statement offers Gill's impression of the crew's opinion.

"The entire crew of the steamer have been talking among themselves about the disregard of the rockets. I personally urged several to join me in protesting against the conduct of the captain but they refused because they feared to lose their jobs. [Gill's "bunkie" Williams, said he never heard Gill do this.]

"A day or two before the ship reached port, the skipper called the quartermaster who was on duty at the time the rockets were discharged, into his cabin. They were in consultation about three-

quarters of an hour. The quartermaster declares he did not see the rockets."

That seems possible. The *Titanic's* quartermaster testified he could not even see the sea from his lit wheelhouse and her officers said they avoided looking in toward the light lest they spoil their night vision. It's even a fair guess that with nothing to do, the quartermaster might have been asleep or below.

But it was true that Captain Lord had called in each man who had been on the bridge and the wireless operator during the night and had each prepare and sign a statement before the ship reached Boston. That makes it plain Captain Lord perceived his parlous position.

Now Gill's penultimate:

"I am quite sure that the *Californian* was less than 20 miles from the *Titanic*, which the officers report to be our position. I could not have seen her if she had been more than 10 miles distance and I saw her plainly."

*The test of a piece of writing is—
does it work in the world? This
worked. It wrote history.*

Now, the ultimate—the guilty ship exposed at whatever peril.

"I have no ill will toward the captain or any other officer of the ship and I am losing a profitable berth by making this statement. I am actuated by the desire that no captain who refuses or neglects to give aid to a vessel in distress should be able to hush up the men."

That's Gill's statement. The language is simple, sometimes elegant. It makes the points with honed precision—with rising drama, starting with Gill's personal observation—through the gossip of the ship—to Gill's jeopardy in speaking out—to his and the ship's crew's finding of guilt.

A smart and experienced newspaper man could handle this selection and structuring. The test of a piece of writing is—does it work in the world? This worked. It wrote history. The British inquiry's finding seemed to rest upon it as heavily as the American hearing. Lord Mersey's prejudice which he freely admitted—"It is in my brain that the vessel seen from the *Californian* was the *Titanic*. Clear it up if you can"—came from somewhere.

Gill's testimony under cross-examination might have sunk him but he always twisted smartly out of grasp with confusing, contradictory statements. Besides he had provided all new and surprising material—all but self-accusing to the *Californian*.

"I will ask you witness," concluded Senator Smith, "whether this statement is true?"

"Yes sir," replied Gill, "that is correct."

"The committee," *The New York Times* wrote the next day, "made no effort to go into his testimony at length or to question the Captain on the point, presumably because of the Captain's anxiety to return to Boston to sail with his ship tomorrow."

The beaten *Boston Globe* reported the next day in a heavy-headlined inside story that Gill "was listened to with the deepest interest by the committee."

Captain Lord testified that afternoon followed by wireless man Cyril Evans. Evans said that Gill had told him in Boston he would get \$500 for his story.

The \$500 seems in no way to have depreciated Gill in the Senator's eyes. Smith usually questioned each British seaman about his pay and marveled aloud at the low scale. The *Titanic's* second wireless operator, Harold Bride one of the heroes of the day, got £4 a month.

Gill's story instantly smothered any suspicion of the *Mount Temple*. Whatever the *Mount Temple's* timidity about entering ice, she could not be accused of negligence. She had responded to the *Titanic's* first wireless distress call; had steamed up at full speed, until she encountered ice. After that, judgement applied. She had 1,609 passengers, a crew of 143 and lifeboats for only 1,069. She would have done no one any good by smashing into ice. She wasn't even "unsinkable."

Besides her captain, Henry Moore, possessed much of Gill's talent for obfuscation of possibly embarrassing matters, although he spoke in limpid clarity when the facts favored him.

As for Charles Victor Groves, Third Officer of the *Californian*—if he were the one who computed the 17-mile distance—did reason abandon him when he reached London and testified he thought the ship lying five miles from the *Californian* to be the *Titanic*?

Could Captain Lord have been brooding in his own abyss of guilt?

After all, the *Californian's* log bore no record of the ship which stopped near her at 11:30 p.m. Nor did the ship's "fair log," the neat copy with addendums usually written the next day, mention rockets. The fair log was written after the *Californian* discovered the *Titanic* had sunk and after the *Californian* had steamed down to the *Carpathia*.

That two-and-a-half hour steaming, from 6 until 8:30 a.m., was fully recorded. The *Californian's* log also showed her noon position that day, concurred in by all the ship's officers—all clearly defensive material.

Senator Smith asked Captain Lord at the Washington hearing: Suppose the *Californian* had received the wireless distress call and steamed directly to the rescue, how long would it have taken?

"At the very least two hours," blurted Lord.

But it took him two-and-a-half hours in the light of morning because he had to cross and recross the ice field.

Could Lord have spent that dark time brooding about the absolute minimum time to get to the *Titanic* had he recognized the rockets for what they were and steamed directly toward them?

In the morning, he had only the *Titanic's* radio SOS location to guide him. To reach it he had to pick his way from east to west through the ice and then run south. But the distress signal had placed the *Titanic* somewhat west of where she really was. So when Lord reached the place he found only the *Mount Temple*. Lord said he saw the *Carpathia* on the east side of the ice and steamed through a break in the field over to her. But if rockets had been his guide the night before, he could have stayed east of the ice run most of the 19 miles straight down at 13 knots and had a fair chance to make it in two hours.

Distress rockets rose 300 feet and exploded with a ponderous boom audible 12 miles away on a still night—Nobody on the Californian heard any detonation.

By the British inquiry, Lord had modified his answer: "I do not think we could have got there before the *Carpathia* did, if we would have got there that soon."

On Captain Lord's side too lay Second Officer Stone's description of the height of the rocket—less than mast height over the nearby ship he had been watching. Distress rockets rose 300 feet and exploded with a pondrous boom audible 12 miles away on a still night like this. Nobody aboard the *Californian* said he heard any detonation.

The Gill question, though, remains. Did Gill truly describe what he saw or did he fabricate a myth for profit in the haze of a Marginal Street saloon and incarnate it with the rumors and suspicions of the crew?

Captain Lord's denial had to be expected and discounted according to his interest.

The Boston Herald, beaten by *The American*, did what it could the next day to discredit *The American's* source. Every paper, of course, covered Lord, but *The Herald* dug deeper and turned up the man who knew him best, Gill's "mate," William Thomas.

Both Gill and his "bunkie," William Thomas, *The Herald* said, proffered their custom to a Marginal Street bar—sometimes together. *The Herald* reported that Thomas said that on the day before Gill's story broke in *The American*, the barman from the Marginal Street saloon had come to him at the ship "and said I was wanted at the bar." Thomas went to the saloon, was told he wasn't the one. They wanted his companion, Gill.

"So I went back and told him," said Thomas, "He went away without telling me where he was going. He came back some time later, didn't say a word to me but soon went ashore again. He must have taken all his dunnage with him because there isn't any here now."

What came of Gill's departure, of course, appeared the day after he "jumped ship," full-width banner across the front page of *The Boston American*.

What did Thomas think of Gill's statement? "It was now 12 o'clock and I went to my cabin. I woke my mate, William Thomas. He heard the ice crunching alongside the ship and asked 'are we in ice?' I replied, 'Yes, but it must be clear off to starboard for I saw a big vessel going along at full speed. She looked as if she might be a big German.'"

"William Thomas," wrote *The Herald's* reporter, "a donkeyman and Gill's 'bunkie' was highly indignant yesterday that his name had been brought into the affidavit."

The Herald quoted Thomas, "I knew nothing about this affidavit and I am positive Gill said nothing to me about the steamer in distress, if he saw such a thing. . . ."

"Gill woke me up soon after 12 that night and I asked him why he was late. 'It's all right, the engines aren't running,' he answered. Then I heard a bumping against the side of the ship and I asked if it was ice. He said it was. . . ."

"I think that Gill would have told me if he had seen rockets. I can't believe he could see a ship 10 miles off if there was one because the change from the engine room to the deck partly blinds a man and besides that night it would have been easy to take fixed stars for vessel lights and shooting stars for rockets."

The Herald examined Thomas on Gill's possible motive for fabrication and quoted Thomas: "Gill was engaged to a girl in England and I can see where the offer of a sum as large as reported in the forecandle would greatly tempt him. He could very easily set up a small shop in England or get work in America with a comfortable nest egg in addition."

Some third ship had to have stopped near the Californian while still another—a fourth ship had to have moved into sight of the Titanic.

Gill did go back to England on another ship and testified briefly with hardly any cross-examination at the British inquiry. Lord Mersey in the section of his finding accusing the *Californian*, quoted Gill. "She could not have been anything but a passenger ship. She was too large."

Gill's Motivations

It might have been survival.

In 1912 ship's crews—for their miniscule pay, were worked almost to extinction. Two men worked most 24-hour shifts. It was a hard, short life for those who would not or could not break out of it.

Ship's officers broke out through education or class. A man like Gill had no chance. Thomas said

Gill had a girl back in England. How could he afford her at six pounds a month? Could you much blame a man for seizing opportunity? Some might even admire his perception. Perhaps one or two in First Class had broken out of penury themselves by seizing the moment, too.

Captain Lord understood his own jeopardy perfectly. Hence while his ship shambled on toward Boston, he called in his officers one by one for written depositions plus the three-quarter hour conference with the quartermaster. The great exculpating statement in New York from Captain Rostron of the *Carpathia*—that Rostron, whose ship had been at the site picking up survivors since 4 a.m., first saw the *Californian* at 8 the next morning—stemmed from somewhere. Nothing comes from nothing. Captain Lord would seem the circumstantial motivator of that.

Then the hiatus in the *Californian* log about the nearby ship—the rockets. Whatever the truth—the *Californian* was a ship besmirched with repressed guilt.

And one last thought:

Remember that the *Californian* saw a ship steam up and stop five miles away at 11:30 p.m. The *Titanic* struck at 11:40—almost the same time allowing for the clock differences. But the *Titanic* lookouts saw no ships at the time of the collision nor for the next 20 to 45 minutes when they were released. Later the officers on the *Titanic*'s bridge saw a ship move up, show a sidelight. They Morsed her but she did not flash back and turned away. The ship near the *Californian* moved differently. She stayed put, ignored the *Californian*'s Morse light, then started to move off after 1:30 a.m. to disappear at 2:20.

All this means that some *Third* ship had to have stopped near the *Californian* while still another—a *Fourth* ship—had to have moved into sight of the *Titanic* and then turned away.

Does that strain credulity?

Well, *The New York Herald Tribune* listed 95 "passenger carrying steamships" on the Atlantic on April 14, 1912—not counting freighters, sealers, whalers, cable layers and sailing ships from many nations—most without wireless. The *Titanic* was steaming the great circle course—the shortest way from Belfast to New York. Besides the regular traffic, the ice had forced some ships heading for more northerly ports south to the New York track. Captain Moore of the *Mount Temple* said that as he approached the distress location he encountered two ships. He had to back to avoid one.

On his deathbed in 1940, the first mate of a Norwegian arctic sealer signed a statement that his ship, the *Samson*, had seen the *Titanic* rockets, but, thinking the rockets had been fired by the Coast Guard to warn him away from American waters, had turned away. Careful reading of his statement, though, showed his ship to be off Hatteras (possibly an error in translation or a lapse in memory) and not in the mid-Atlantic.

So, the mystery remains. Ernest Gill, after his brief appearance at the British inquiry, evaporated from public view and was not seen again.



The starboard telegraph on a docking bridge of the *Olympic*. A similar telegraph from the *Titanic* can be seen on page 28. (Photo courtesy of Blackhawk Films)

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Personalities

Captain E. J. Smith

Captain E.J. was one of the ablest Skippers on the Atlantic, and accusations of recklessness, carelessness, not taking due precautions, or driving his ship at too high a speed, were absolutely, and utterly unfounded; but the armchair complaint is a very common disease, and generally accepted as one of the necessary evils from which the seafarer is condemned to suffer. A dark night, a blinding squall, and a man who has been on the mental rack for perhaps the last forty-eight hours, is called on to make an instantaneous decision embodying the safety of his crew and his ship. If he chooses the right course, as nine times out of ten he does, all well and good, but if on the tenth time his judgment is, momentarily, in error, then he may be certain he is coming under the thumb of the armchair judge, who, a thousand to one, has never been called on to make a life and death decision in a sudden emergency.

**From *Titanic* by
Commander Charles H. Lightoller,
Second Officer on April 15, 1912**

Captain Smith had at least five different deaths, from heroic to ignominious. Seaman G.A. Hogg said, "I saw Captain Smith in the water alongside a raft. 'There's the skipper,' I yelled. 'Give him a hand.' They did, but he shook himself free and shouted to us, 'Good-bye boys, I'm going to follow the ship.' That was the last we saw of our skipper." Others remembered E.J. swimming with a child in his arms whom he managed to deliver to a lifeboat before being swept away in a wave. Another claimed that Smith had shouted, "Be British, boys, be British!" before going under with the ship. G.A. Drayton claimed that E.J. had simply been swept off the bridge when it lunged forward: "I saw him swim back onto the sinking ship. He went down with it in my sight."

Dr. J.F. Kemp, a passenger on the Carpathia, raised an ominous possibility. Kemp had spoken with a boy who had been one of the last children to have left the Titanic. The boy had seen "Captain Smith put a pistol to his head and then fall down." Others reported having seen Captain Smith commit suicide; crewmen, however, vigorously denied the possibility. Part of the momentum for E.J.'s alleged suicide may have come from the fact that six years earlier a climacteric German captain had caused considerable scandal by killing himself after accidentally beaching and injuring his ship. The story may also have arisen from passengers confusing Smith with the ship's first officer.

**From *The Titanic: End of a Dream* by
Wyn Craig Wade**

Captain Smith was the Commodore of the White Star Line, having served 38 years in its employ, and was persuaded not to retire before taking the *Titanic* on her maiden voyage. He was considered "one of the very best" by other officers and had few "incidents" on his record, although he had been at the helm of the *Titanic*'s sister ship, the *Olympic*, the year before when that liner was rammed by the British cruiser *Hawke*.

John Jacob Astor

John Jacob Astor helped his 19-year-old bride into a lifeboat, then, according to Walter Lord's *A Night to Remember*, asked if he could join her. She was, as he put it, "in delicate condition." "No, sir," Lightoller replied. "No men are allowed in these boats until the women are loaded first."

Astor asked which boat it was, and Lightoller replied "Number 4." Colonel Gracie was sure Astor merely wanted to locate his wife later. Lightoller was sure he planned to make a complaint.



John Jacob Astor (1864-1912).
Photo circa 1890. (The Bettmann Archive)

Col. Astor, the great-grandson of the first John Jacob Astor who twice escaped shipwreck, built and owned many hotels and skyscrapers in New York.

Col. Astor saw combat in the Spanish-American War and also served in the Philippines. In the Spanish-American War he formed a group known as the Astor Battery—the first such mountain unit in the U.S. Army. He organized the unit at a personal cost of \$100,000. He also was in the first boat to land at Santiago in Cuba and in the thick of the fighting on El Paso Hill.

Col. Astor was educated at St. Paul's, Concord, N.H., and thereafter went to Harvard, graduating with the Class of 1888. Three years later he married Miss Ava L. Willing of Philadelphia. They had two children, William Vincent and Alice.

Mrs. Astor was granted a divorce on Nov. 8, 1909. In September of 1911, Col. Astor was married to Miss Madeleine Talmage Force, then 18 years old, of New York. Astor's wealth at the time of his death was estimated at between \$100 million and \$200 million.

The Strauses

The Strauses came on deck with the others, and at first Mrs. Straus seemed uncertain what to do. At one point she handed some small jewelry to her maid Ellen Bird, then took it back again. Later she crossed the Boat Deck and almost entered No. 8—then turned around and rejoined Mr. Straus. Now her mind was made up: "We have been living together for many years. Where you go, I go."

Archibald Gracie, Hugh Woolner, other friends tried in vain to make her go. Then Woolner turned to Mr. Straus: "I'm sure nobody would object to an old gentleman like you getting in . . ."

"I will not go before the other men," he said, and that was that. Then he and Mrs. Straus sat down together on a pair of deck chairs.

**From *A Night to Remember*
by Walter Lord**

Isidor Straus was born in Bavaria in 1845. His family came to the United States in 1852, settling in Talbotton, Georgia. It was Straus's ambition to enter the Military Academy at West Point, New York, but the war between the North and South broke out before he finished his preparatory schooling.

At the age of 16, he volunteered for the Confederate Army, but was turned down because of his age. He became a clerk in his father's store for 2 years and then moved to England, where he worked until the close of the war.

The family moved to New York City after the war and set up the firm of L. Straus & Son, dealing in earthenware. They soon branched out into china and porcelain, taking over that department of R. H. Macy's in 1868. In 1888, they became partners in the department store.



Mr. and Mrs. Isidor Straus.
(Photo courtesy Walter Lord Collection)

Straus and his wife were supporters of almost every philanthropic and charitable institution in New York.

J. Bruce Ismay

Joseph Bruce Ismay was the president of International Mercantile Marine, which owned the White Star Line, of which Ismay was chairman. The *Titanic* and her sister ships, the *Olympic* and *Britannic*, were Ismay's dream ships and he had guided them through every stage of design and construction. They were to be the crowning achievement of the age; in the tradition of the White Star Line, which had been founded by Ismay's father in 1869, the ships were to be exceptionally comfortable and efficiently run. Ismay had been aboard the *Olympic* for her maiden voyage, and had many suggestions for improvements in the *Titanic*. He was looking forward to seeing these improvements in action on the *Titanic*.

After the collision, Ismay helped with the loading of five lifeboats on the starboard side, including collapsible boat "C." When this boat was

ready to be lowered, there were no women and children on the deck, and as the boat was being lowered Ismay climbed in. Many people looked askance at the fact the chairman of the line survived when so many others died, particularly since by his own admission he was aware that there were hundreds more people on board than there was room in the lifeboats. No less a figure than Rear Admiral A. T. Mahan (the founder of modern naval strategy), commented on Ismay's conduct in a letter to the *Evening Post*:

He is in no sense responsible for the collision; but when the collision had occurred he confronted a wholly new condition for which he was responsible and not the captain, viz., a sinking vessel without adequate provision for saving life. . . . I hold that under the conditions, so long as there was a soul that could be saved, the obligation lay upon Mr. Ismay that that one person and not he should have been in the boat.

Ismay's defenders argue that he fulfilled his responsibilities by helping to lower the boats, and point out that he did not enter collapsible "C" until it was actually being lowered. Moreover, they note that collapsible "C" was one of the last boats to leave the ship; had a more thorough search been made for other people to take Ismay's place in the lifeboat, the *Titanic* might have sunk in the meantime.

Ismay was subjected to extremely thorough and at times antagonistic questioning at both the U.S. Senate hearings on the disaster and the British Board of Trade's inquiry into it. At both of these hearings his personal conduct was cleared.

Before the *Titanic* sank, Ismay had planned to step down as President of International Mercantile Marine on 30 June 1913. After the sinking these



Mr. and Mrs. Bruce Ismay, right, arriving at British Inquiry. At left is the General Manager of the White Star Line. (The Bettmann Archive)

plans remained in effect, but Ismay requested that he be allowed to retain the chairmanship of the White Star Line. This request was refused, and Ismay retired from public life. He died on 17 October 1937, from a stroke.

Lightoller and Murdoch

No two men were more intimately familiar with the *Titanic*'s movements on the night of her sinking than these two. Charles H. Lightoller was Second Officer on board the ship, and held the watch from 6 to 10 p.m. At 10 p.m. he was relieved by First Officer William M. Murdoch, who held the watch when the fatal blow was struck.

Originally Murdoch and Lightoller were to be Chief and First officers on the *Titanic*, respectively. But, at the last minute the White Star Line transferred the Chief Officer of the *Olympic*, Henry T. Wilde, to the *Titanic* for the maiden voyage, bumping Murdoch back to First Officer, and Lightoller to Second.

The two men were old chums, and when Murdoch relieved Lightoller on the bridge that night they spoke together for a few minutes. Lightoller advised that he had ordered the crow's nest to keep a sharp lookout for ice. Then he left, and the *Titanic* continued toward a rendezvous with fate.

Some have maintained that Murdoch's actions in the moments before the crash (ordering the helm over and the engines full astern) made the collision more dire; many have noted that had the *Titanic* run head on into the iceberg, it probably would not have sunk. Others have argued that to avoid the iceberg most speedily Murdoch should have ordered the helm to port while keeping the engines full ahead, or perhaps have ordered the helm to port, astern on the port engine, and kept the starboard engine full ahead. After the sinking, Harland and Wolff, the builder of the *Titanic*, took the *Olympic* out for extensive turning trials and gave the results to the British inquiry into the sinking. These turning curves were not released with the inquiry's report.

Once the collision occurred, Murdoch and Lightoller saw little of one another. They were working to fill the lifeboats on opposite sides of the ship, 90 feet apart. Their strategies in tilling the boats

dittered radically as well. Lightoller, a strict and straightforward officer, allowed only women and children in the boats under his command. Murdoch allowed women until no more would go alone, then couples were permitted to board, then single men if there was still room.

As the ship finally dove into the sea, and the water rushed up her decks, Murdoch and Lightoller both were working to clear the two collapsible boats tied to the roof of the officer's quarters. Lightoller dove into the oncoming sea and narrowly avoided being swept down an airshaft into the hold of the ship. Half-drowned, he came up next to Collapsible B, overturned in the water. Eventually, Lightoller took command of the overturned boat, and 30 people were rescued from it.

Murdoch went down with the ship.

Benjamin Guggenheim

As the lifeboats left the ship, Benjamin Guggenheim, the millionaire president of International Steam Pump Company, returned to his cabin with his secretary and dressed in his finest black tie and dinner jacket. He then reappeared on deck in his resplendent dress, saying to a steward:

I think there is grave doubt that the men will get off. I am willing to remain and play the man's game if there are not enough boats for more than the women and children. I won't die here like a beast.

Tell my wife, Johnson, if it should happen that my secretary and I both go down and you are saved, tell her I played the game out straight and to the end. No woman shall be left aboard this ship because Ben Guggenheim was a coward.

When Guggenheim was 20 years old, he was sent by his father to Leadville, Colorado, to take charge of the family's mining interests—an interest that grew to be the largest and most valuable part of their holdings. In January 1900, Guggenheim owned seven refining and smelting plants in the United States and one in England, employing in excess of 10,000 men.

His brother, Simon, was a U.S. Senator at the time of the disaster. He was married and had three children.

Molly Brown

Mrs. Margaret Tobin (Molly) Brown, the flamboyant millionairess of Denver, took charge of Lifeboat No. 6 after a terrified quartermaster lost his nerve. At one point, when the panic-stricken petty officer began undermining morale with "his tirade of awful forebodings" and sought to interfere with Molly's commands, she shut him up by threatening to throw him overboard.

So high was her regard for the Carpathia's rescue mission that she had gold and silver medals struck and presented to Captain Rostron and his men. Within recent years, this indomitable lady was immortalized as the heroine of the Broadway musical, "The Unsinkable Molly Brown."

—From Foote Prints

Henry Widener

According to the Dictionary of American Biography, the 27-year-old Henry Elkins Widener, an avid bibliophile, was in London in March 1912 on a book-hunting expedition. He acquired a 1598 edition of Bacon's *Essays*, of which he said to a friend, "I think I'll take that little Bacon with me in my pocket, and if I am shipwrecked it will go with me."

It was an irony of fate that Widener, who went down with the Titanic, was the grandson of the Philadelphia mogul, Peter A. B. Widener, who had helped found and was on the board of directors of the International Mercantile Marine Company, an American corporation which owned the International Navigation Company (Ltd.) of England, which in turn owned the Oceanic Steam Navigation Company of England, owner of the White Star steamer Titanic.

—From Foote Prints

Sir Cosmo Gordon & Mr. Ismay

An attack was made in the course of the inquiry on the moral conduct of two of the passengers, namely, Sir Cosmo Duff Gordon and Mr. Bruce Ismay. It is no part of the business of the court to inquire into such matters, and I should pass them by in silence if I did not fear that my silence might be misunderstood.

The very gross charge against Sir Cosmo Duff Gordon that, having got into No. 1 boat, he bribed the men in it to row away from drowning people is unfounded. I have said that the members of the crew in that boat might have made some attempt to save the people in the water, and that such an attempt would probably have been successful; but I do not believe that the men were deterred from making the attempt by an act of Sir Cosmo Duff Gordon's.

At the same time I think that if he had encouraged the men to return to the position where the Titanic had foundered they would probably have made an effort to do so and could have saved some lives.

As to the attack on Mr. Bruce Ismay, it resolved itself into the suggestion that, occupying the position of managing director of the steamship company, some moral duty was imposed upon him to wait on board until the vessel foundered. I do not agree.

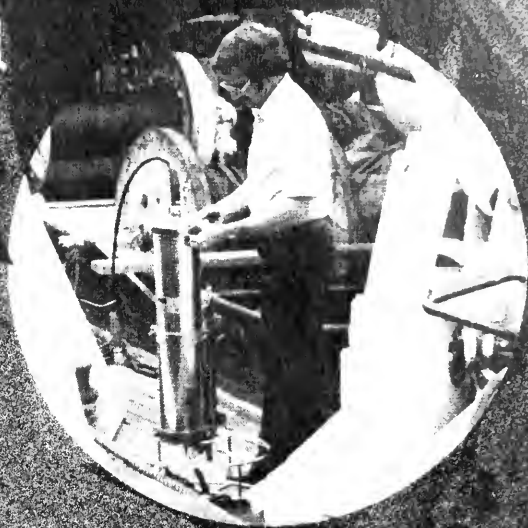
Mr. Ismay, after rendering assistance to many passengers, found C collapsible, the last boat on the starboard side, actually being lowered. No other people were there at the time. There was room for him and he jumped in. Had he not jumped in he would merely have added one more life, namely, his own, to the number of those lost.

—From the British Inquiry

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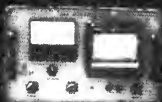
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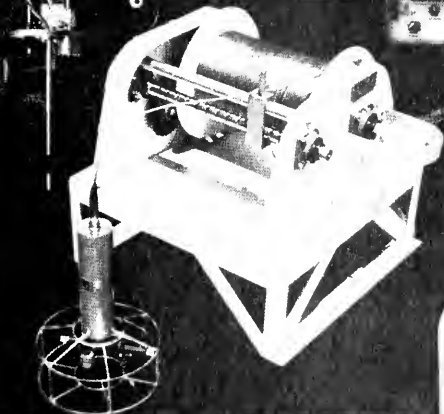


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THE LEADER IN OCEAN TECHNOLOGY

The Dead—

'A Strange Task Stranger'



A boat from the *Minia* hauling aboard a victim of the *Titanic* tragedy on April 26, 1912. (Photo courtesy Public Archives of Nova Scotia, Halifax)

by Carole Hyde

As the *S.S. Carpathia* neared the harbor of New York City with the survivors of the wrecked luxury liner *Titanic* on board, another ship steamed out of Halifax, Nova Scotia, toward the *Titanic*'s grave. Her mission—the dead.

More than 1,500 people perished in the murderous waters of the North Atlantic when the *Titanic* hurled herself at 22 knots onto an iceberg on the night of April 14, 1912. Bodies of her victims dotted the ocean after the disaster, and the *Titanic*'s owners—the White Star Line—chartered the little cable steamer *MacKay-Bennett* to recover and return the remains to Halifax for reclamation or burial in the city's cemeteries.

The search for the dead and their burial in the cemeteries of Halifax is a little-known aspect of the *Titanic* story. Some books published relatively recently state that only one body or no bodies were recovered. Overshadowed by the disaster itself, and by the stories of the *Titanic*'s survivors, the search for

the dead barely entered public consciousness. Perhaps, too, the world of 1912, Victorian in propriety, did not want to know. As inexorably as the North Atlantic pulled the *Titanic* under, a mantle of nobility enshrouded the disaster and shielded the public from the magnitude and nature of the loss in the freezing waters.

The reality of the disaster remained. Some 1,500 were lost in the sea, and on Wednesday, April 17—two days after the sinking—the *MacKay-Bennett*, stacked with coffins and packed with ice, embarked to find them.

Fog and bad weather slowed the trip. The *MacKay-Bennett* arrived in the vicinity of the disaster only on Saturday night, a week after the *Titanic* hit the iceberg. The ocean was strewn with wreckage. Growlers hid dangerously in the swells. During the middle watch, the first bodies were sighted. It was agonizing. Many of them were crushed and disfigured beyond recognition. Some women were



The staff of J. H. Snow & Co., Ltd., pose before the funeral home at 90 Argyle Street, Halifax. Snow's was placed in charge of supervising many other undertaking firms in providing funeral arrangements for the Titanic's victims. (Photo courtesy Public Archives of Nova Scotia, Halifax)

found with infants locked in their arms. Other bodies, faces distorted with terror, clung to objects they had grasped in their anguish. Still others looked calm, as if asleep.

The Sea Burials

On Sunday, the first of the bodies were dragged aboard the *MacKay-Bennett*. There were 51 of them. They were numbered and identified where possible, their property marked and stored. Some were embalmed and others were placed in ice-filled holds. That evening, the burial of the dead began.

The tolling of the bell summoned all hands to the fore-castle where thirty bodies are to be committed to the deep, each carefully weighted and carefully sewed up in canvas. It is a weird scene, this gathering. The crescent moon is shedding a faint light on us, as the ship lays wallowing in the great rollers . . . For nearly an hour the words 'For as much as it hath pleased . . . we therefore commit his body to the deep' are repeated and at each interval comes splash! as the weighted body plunges into the sea, there

to sink to a depth of about two miles. Splash, splash, splash.

—From the diary of Frederick Hamilton, engineer, the *MacKay-Bennett*

For those buried that night—the dead who could not be identified—interment in the sea was suitable and touching, for they were thought to be members of the *Titanic's* crew. In the words of the Reverend Canon Hinds, rector of All Saints' Cathedral, who conducted the service on board the *MacKay-Bennett*:

Anyone attending a burial at sea will most surely lose the common impression of the awfulness of a grave in the mighty deep. The wild Atlantic may rage and toss, the shipwrecked mariners cry for mercy, but far below in the calm untroubled depth they rest in peace.

For four more days the *MacKay-Bennett* drifted through miles and miles of the *Titanic's* wreckage, finding amidst the debris and ice some

times solitary corpses, at other times, great clusters of them, appearing strangely like seagulls as they bobbed peacefully in the swells.

When fog made operations impossible, bodies already on board were searched, tagged, and stowed away. It was hard on the men of the *MacKay-Bennett*.

Noon. Another burial service held and seventy-seven bodies follow the others. The hoarse tone of the steam whistle reverberating through the mist, the dripping rigging, and the ghostly sea, the heaps of dead, and the hard weather-beaten faces of the crew, whose harsh voices join in the hymn tunefully rendered by Canon Hind, all combine to make a strange task stranger. Cold, wet, miserable and comfortless, all hands balance themselves against the heavy rolling of the ship as she lurches to the Atlantic swell, and even the most hardened must reflect on the hopes and fears, the dismay and despair, of those whose nearest and dearest . . . have been wrenched from them by this tragedy.

—From the diary of Frederick Hamilton

Holds and decks filling with the dead, the *MacKay-Bennett* called for help and was joined by the cables ship *Minia*, also stocked, with coffins and ice. On Friday, they searched together. The *Minia* transferred bodies collected that day to the *MacKay-Bennett* and continued the search.

The *MacKay-Bennett*, with as many dead on board as she could accommodate, headed for home. She carried 190 of the *Titanic*'s dead and left 116 buried in the sea. Not all bodies badly deteriorated or without identification were left behind in the North Atlantic. It was later disclosed that all those thought to have been first-class passengers, no matter what their condition, were kept on board. As the *MacKay-Bennett* steamed home, the crew could not help but feel that most of the bodies on board would be better resting in the deep.

The Unloading

At 9:30 on the morning of April 30, the *MacKay-Bennett* approached the dockyards of Halifax. The city was prepared for her. Flags hung at half-staff, and coffins and hearses lined the piers as undertakers, reporters, police, and families of the victims crowded together in the chilly Canadian morning. Since daybreak they had awaited the arrival of the *Titanic*'s dead. Then,

. . . warned by the tolling of the bells up in the town, a hush fell upon the waiting people. The gray clouds that had overcast the sky parted and the sun shone brilliantly on the rippling water of the harbor as the MacKay-Bennett drew alongside her pier. Captain Lardner could be seen upon the bridge. The crew hung over the sides, joyously alive and glad to be home . . . But in every part of the ship the dead lay.

—From the Roster of Valor

The first bodies brought ashore were those identified as the *Titanic*'s crew. Unembalmed and unshrouded, they were shocking, and as quickly as they were unloaded, they were taken from the dockyard. Second-class and steerage victims, sewn up in canvas, were carried ashore next, followed by the embalmed and encoffined bodies of those who had afforded first-class passage on the *Titanic*.

For hours the unloading and removal proceeded. The sounds were said to be like the hum of a small factory. Crowds of onlookers, kept away from the dockyards, lined the hearses' route and silently paid their respects as the procession passed on its way to the Mayflower Curling Rink at the edge of town.

There, in the makeshift morgue, friends and relatives of the victims had begun arriving to claim their dead. The main rink, where the dead would be displayed, was draped in black. The benches adjoining the rink were curtained off for the preparation of the bodies. Undertakers and coffins from all over the Eastern Provinces of Nova Scotia had been assembled there by J. H. Snow and Sons, the prominent Halifax undertaking firm. Snow, whose son had reportedly enjoyed his work on board the *MacKay-Bennett*, was to supervise the embalming and funeral arrangements on shore, too. It was the largest operation of his career.

As the first rough coffin was carried into the body of the rink and deposited on one of the many white benches waiting to receive them, a hush fell upon all the onlookers. The first coffin was succeeded by the second, the second by the third, and now hearse after hearse was arriving, coffin after coffin was being carried in and gently laid in rows.

—From the Halifax Evening Mail

The mass display of death traumatized the living as they watched and waited while the undertakers readied the bodies for viewing and reclamation.

Many of them pace[d] around the room, impatient of delay yet dreading to see that which they hoped might reveal the identity of a loved one. Every once in a while one could be heard to murmur: 'I need fresh air,' and would go out into the bright sunshine for a while . . . The scene was too much for them to stand in the deathly atmosphere of the sepulchral building.

—From the Halifax Evening Mail

For some, the visit to the rink was mercifully brief. Those notified in advance of the recovery of their dead were assisted at once by Provincial Government and White Star Line officials in the reclamation and disposition of the bodies. Death certificates and burial permits were issued as expeditiously as possible.

The first body claimed and removed from the

NO. 121. MALE. ESTIMATED AGE, 50 LIGHT HAIR AND MOUSTACHE.

CLOTHING—Blue serge suit; blue handkerchief with "A. V."; belt with gold buckle; brown boots with red rubber soles; brown flannel shirt; "J. J. A." on back of collar.

EFFECTS—Gold watch; cuff links, gold with diamond; diamond ring with three stones; £225 in English notes; \$240 in notes; £5 in gold; 75 in silver; 5 ten franc pieces; gold pencil; pocketbook.

FIRST CLASS.

NAME—J. J. ASTOR.

The final printed listing of Titanic victims and their descriptions included this entry for John Jacob Astor. (Courtesy Public Archives of Nova Scotia, Halifax)

rink was that of John Jacob Astor. The tiny crimson death certificate, barely adequate to the task, described his tragedy:

Name of deceased—John Jacob Astor. Sex—M. Age—47. Date of death—April 15, 1912. Residence, street, etc.—840 Fifth Av., N.Y.C. Occupation—Gentleman. Married. Cause—Accidental drowning. S.S. Titanic at sea. Length of illness—Suddenly. Name of physician in attendance.

Likewise, the body of Emil Brandeis, the Omaha department store magnate, was claimed and taken away. Frank Newell, busy embalming bodies at the rink, unexpectedly encountered the body of his uncle and collapsed from the shock. Of the 209 bodies eventually brought to the rink, only 59 were claimed and shipped away for burial.

For the rest of the bereaved, the ordeal stretched into the days that followed, and desperation surrounded their visits to the rink as bodies found by the *Minia* were displayed in diminishing numbers. Many never found their kin. And many of the dead lying in the rink were never claimed. They lay in their caskets, unknown yet lovingly adorned with flowers. Following services beginning on May 3, they were buried according to their presumed religion in the cemeteries of Halifax.

The Catholic dead were interred in Mt. Olivet Cemetery, the Jewish dead in Baron von Hirsch Cemetery, and the many Protestant dead in Fairview Cemetery, where they were lowered into long trenches and marked with the numbers given them when they were pulled from the sea. Fairview Cemetery received, too, the body of an "unknown child," commemorated on May 4 and buried in its tiny coffin by the crew of the *MacKay-Bennett*.

For another week, the *Mayflower* Curling Rink stood open for the reclamation of the *Titanic*'s dead. On that Friday, May 10, 32 unidentified bodies were taken from the rink and interred in Fairview Cemetery. The unclaimed effects were removed to the Provincial Treasurer's office and arrangements made for the last four bodies lying in the rink. As the day came to a close, the government officials, the White Star Line people and the last of the

undertakers packed their things, turned out the lights and left for home.

Watch and a Handkerchief

The search at sea for the *Titanic*'s dead stretched into June, and the burials in Halifax continued, as ships crossing the North Atlantic reported wreckage and bodies floating in their paths. The *Montmagny* relieved the *Minia*. Between them 21 more bodies were found and three of these were buried at sea. The *Algerine* completed the quest with a single recovery: The body, that of *Titanic* Saloon Steward James McGrady, was taken to Nova Scotia for burial on June 12 and was the last of the *Titanic*'s 150 victims interred in the cemeteries of Halifax.



The MacKay-Bennett recovered 306 bodies, of which 190 were brought to Halifax. (Photo courtesy Public Archives of Nova Scotia, Halifax)

The search was over. It had encompassed six weeks, involved four ships, and yielded 328 dead, 119 of them interred at sea. It had taxed the funerary resources of Nova Scotia and the courage of those who awaited word of loved ones they had lost.

One of the hundreds lost when the *Titanic* tumbled was Herbert Jupe, whose body was found and buried at sea by the *MacKay-Bennett*. As third assistant electrician, he was one of the many crew who labored deep in the *Titanic* to keep the ship running to the end. Particularly poignant was his death, for it allowed many on the decks above to escape. The loss of Herbert Jupe was a microcosm of the loss of the *Titanic*. As his father wrote in a letter to the Provincial Government in Nova Scotia:

Dear Sir: I have been informed by Mr. F. Blake Superintendent Engineer of the White Star Line Trafalgar Chambers on the 10th that the body of my Beloved Son Herbert Jupe who was Electrical Engineer No. 3 on the Ill-fated Titanic has been recovered and Buried at Sea by the Cable Steamer "MacKay-Bennett" and that his Silver Watch and Handkerchief marked H.J. is in your possession. We are extremely obliged for all

your kindness to my Precious Boy. He was not married and was the love of our Hearts and he loved his home. But God gave him and God has taken him. Blessed be the name of the Lord. He has left an aching void in our Home which cannot be filled. Please send along the Watch and the Handkerchief marked H.J. Yours, Truly, C. Jupe.

Carole Hyde was a Fall Intern at Oceanus. She has since returned to Stanford University where she is completing her graduate training and editing Estes Tiempos for the Chicano community.

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The Ravages of Time

The Woods Hole Oceanographic Institution has received many inquiries concerning the possible presence of human remains on the Titanic. Although exceptions might be possible under unusual conditions, it can generally be assumed that no trace of the Titanic's victims, even of those entombed in her hull, will ever be found. Given the immediate effects of scavengers and the long period of time elapsed since the ship's sinking, the decomposition of the bodies can be expected to be complete.

A related question concerns the state of degradation of food carried by the Titanic. If kept from scavengers, as might occur in the ship's refrigerators, the microbial decomposition of vegetables, meats, and other foodstuffs will proceed at a pace dictated by the immediate environmental conditions. In all likelihood, most organic materials are long gone. This prediction is based on experiments in which solid organic materials were placed on the seafloor, protected from scavengers, and their degradation studied.

Some foodstuffs, such as cheese, however, are protected from decay by the very microbial activity that starts the degradation process. If kept in boxes, it may have changed little over the extended time period. The microbes that turn milk or whey into cheese produce either highly acidic or highly alkaline conditions, both of which protect these highly proteinaceous foodstuffs from further spoiling.

Wine is another product of microorganisms with alcohol acting as the preservative. Here the interesting question is: what happened to those wine bottles that can be seen in some of the Argo photographs? Glass

can withstand very high pressures, so the corks probably were pushed in before breaking could occur. If the air space in the bottle had been large, the cork will have been pushed all the way in, allowing seawater to enter and equalize the pressure. If, on the other hand, the air space had been small, the cork may have moved just a little bit, still keeping a tight seal between wine and seawater. This wine may still be drinkable and possibly of excellent quality, the normal aging process being slowed down during the 73 years of deep-sea storage at about 36°F. A cheap wine (not to be expected on the Titanic) commonly retains much microbial activity because of its high sugar content. In time, the results are vinegar and carbon dioxide, the latter being dissolved in the wine because of the high pressure. On retrieval, the corks of such bottles will blow out as from an unsecured champagne bottle.

Is there any scientific value in looking at the foodstuffs that might be found on the Titanic? Hardly. There are no data points between the time of sinking and now, and the exact original composition and condition of the materials are unknown. The cost of retrieving and studying such materials from the Titanic would be much greater than the cost of a well-planned and scientifically sound experimental study on the decomposition of various organic materials under deep-sea conditions.

Holger W. Jannasch,
Senior Scientist,
Biology Department,
Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts.

The Olympic and Britannic

The Titanic was not an only child. She had two sisters, one older and one younger. The Olympic completed her maiden voyage exactly 10 months before the Titanic went down. She was a great success, as J. Bruce Ismay, president of International Mercantile Marine wrote:

Everything on board the ship worked most satisfactorily and the passengers were loud in their praises of the accommodation and table.

During World War I, she served as a troop transport, carrying more than 200,000 troops in the course of the war. She also had the distinction of sinking a German submarine by ramming it.

After the war she was converted to oil-fired propulsion, and was able to cross the Atlantic at better than 27 knots. She remained quite popular, crisscrossing the Atlantic uneventfully until May of 1934.

The Nantucket Lightship Incident

The Nantucket lightship, number 117, had an all steel hull and an immense pilot house forward. Her

lamps were 1,000 watt and her beacon was 16,000 candle power. . . Diesel engines generated her power, light, refrigeration and heat. Her fog whistle was an electric aero-oscillator, which carried up to 12 miles.

On the morning of May 15, 1934, while a heavy blanket of fog shrouded the northeastern part of the United States, the crewmen on the Nantucket went about their usual duties. . . Eleven men stationed on a ship going nowhere, sending out a radio beam and hearing the fog whistle every few minutes. . . Although not a very exciting pastime, the lightship's function was a very important one.

At 4:30 a.m., ship's time, some 130 miles away from the Nantucket's position, the R.M.S. Olympic, en route from England to New York, steamed ahead—her screws turning over at 70 revolutions or 19-20 knots. The liner had left Southampton six days prior with Captain J. W. Binks in command. Captain Binks was serving out the final year of his career and looked forward to his retirement in six months. This was the fifth voyage of the year for the Olympic and Binks had been with the ship since 1932. At 4:55 a.m., a

cross bearing was taken on Seal Island and by 9:51 the liner was less than 25 miles from the Nantucket lightship. Her speed remained the same.

At 10:56 a.m., while the Olympic was still two miles distant from the Nantucket's position, things began to happen. The White Star Liner's speed was cut down to 60 revolutions (16 knots) and in the distance, the fog signal from the lightship could be heard. The Olympic's heading was changed 10° to port. It would be later noted in a memorandum by a lighthouse superintendent that "... the construction of the SS Olympic's bridge with houses, wind breaks, et cetera, is such that it would appear to be a very poor location from which to determine the location of sound, especially if the sound was faint." The ship steamed onward, with her own fog horn sounding off with its heavy throaty voice.

Suddenly there was a call to the Olympic's bridge. "Lightship, dead ahead!", screamed the lookout in the crow's nest. In a scene that might cause one to recall a similarity to that which took place on the Titanic in April of 1912, the liner's engines were immediately reversed, and watertight doors were closed. It was 11:04 a.m. and precious seconds would slip by before the liner's progress through the water would be arrested. The distance to the lightship was too close and the inevitable was about to happen.

Aboard the lightship, action was already taking place as alarms were sounded, including the ringing of the large bell on the forepeak and officers and crew scampered to don life-jackets and rushed pell-mell to launch the lifeboat—but it was too late. There was a tremendous crash and all 46,000 tons of the Olympic smashed the side of the small lightship, moored helplessly to its position. The giant liner's bows sliced through the engine room of the smaller vessel and parted the ship in two—the stern sliding below the waves instantly with its heavy engines, generators, etc., weighing it down. At 11:06, the Olympic, having covered nearly two miles since first hearing of the Nantucket's fog horn, came at last, to a standstill on the calm, fog-shrouded Atlantic.

The Olympic's crew rescued four survivors from the Nantucket, Captain Braithwaite, First Officer Mosher, the radio operator, J. F. Perry and one oiler, L. V. Roberts. Three bodies of other crew members of the lightship were also recovered by the Olympic.

—reprinted from *The Titanic Commutator*

After this disaster, the Olympic faced another trial. Before she had smashed into the Nantucket lightship, she had developed a crack in her machinery requiring a new crankshaft. Repairs would have been prohibitively costly, and on October 11, 1935, she set out on her final voyage, for the scrapyards.

The Britannic

Like her famous sister, the Britannic had a short and tragic life. Although she incorporated improvements similar to those of the Olympic (she could float with any 6 compartments flooded), the Britannic sank in a similar manner to the Titanic.

The ship never saw the passenger trade. When World War I broke out she was still being fitted out, and she was commandeered in 1915 as a hospital ship. Her hull was painted white, and large red crosses were painted on her side. At night a red cross composed of 300 electric lightbulbs was hung between the first and second funnels. So equipped, her route took her between the Dardanelles and England, tending wounded from the disastrous campaign at Gallipoli. In her first five voyages, she carried 15,000 wounded men home.

On 21 November 1916, the Britannic either hit a mine or was torpedoed off Athens. Struck on the starboard side near the bow, she went down in 55 minutes. The captain tried unsuccessfully to drive the ship into shallow water, thus grounding her. Nonetheless, most passengers and crew survived, the majority of the casualties occurring when lifeboats were swept back into the propellers, which rose out of the water as the bow sank.

In December of 1975, Captain Jacques Cousteau located the Britannic and visited her by submarine.

—FL



The Titanic (left) and Olympic in the fitting-out basin of the builder, Harland and Wolff. (Harland and Wolff photo courtesy Charles Ira Sachs/JONRS)

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Who Owns the *Titanic*?

by Dean E. Cycon

The first images of the *Titanic* in her deep resting place had hardly faded from the evening news on 2 September 1985, when task forces throughout Europe and America began mobilizing for an assault of a different kind on the doomed luxury liner. Their mission was nearly as daunting as that of the joint U.S./French expedition that located the remains of the great ship—to dive deeply into murky, poorly charted realms of jurisprudence, and explore old and long forgotten treatises hoping to unlock yet another mystery—who owns the *Titanic*?

If the site of the world's greatest maritime disaster is to be protected from incursion and disarray by private salvage companies, the international community will have to act quickly and decisively to declare the site a marine memorial. Until that time, the United States or another concerned nation could step in and provide interim protection within the framework of the existing international maritime regime. For under present international law, the wreck of the *Titanic* is fair game on the high seas.

The laws of ownership and control over objects lost at sea have not changed significantly since they were first formulated on the Isle of Rhodes and refined by the legislators of Rome and Greece centuries ago. There are three general classes of potential claimants to the remains of the *Titanic*: (1) the original owners, (2) the successors-in-interest, and (3) modern finders and salvors.

The original owner of the ship itself was the White Star Line, a British steamship company. The company went out of business (as an independent entity) in 1934, and was eventually taken over by the Cunard Line, which still operates. Thus, if the original owner retained any claim to the *Titanic*, it would have passed to the Cunard Line. Some press reports have stated that Cunard representatives deny that the company has any claim to the *Titanic*.

Under admiralty law, the original owner of a vessel damaged or lost at sea retains title to the ship until it is passed to another party (called a successor-in-interest), unless the vessel is deemed abandoned. Like all commercial vessels, the *Titanic* carried hull and protection and indemnity (P&I) insurance policies that covered all maritime risks. Standard contracts of marine insurance from the time of the catastrophe allow an underwriter to claim ownership of a sunken vessel on full payment of the insured value of the hull. Assuming the hull policies were paid and the underwriters executed this option, title to the vessel most probably passed

to the insurance consortia or "clubs" that held the policies on the *Titanic*.*

The apparent successor-in-interest to these insurance consortia is Commercial Union Assurance Society, a British company. The company claims that soon after the accident its predecessor paid the White Star Line a million pounds sterling (almost \$4 million at the time) to cover the claim.

The largest unanswered question in this regard is whether the original owner (White Star, now Cunard Line) or its successor-in-interest (Commercial Union) retains any legal interest in the *Titanic*, or whether the ship can be deemed abandoned.

Lost and Abandoned?

Abandonment, in law, is a relinquishing of control over property, without any intention of returning to the property or without performing any acts that indicate an intention to reassert control. In this case, evidence of abandonment would include failure to attempt to locate the vessel since the sinking, and lack of advertised requests for salvage bids. More technical evidence of abandonment by an insurance company might be the failure to include the hull as an asset on the company's balance sheet after payment of the hull policy. Although there are no formal time requirements for abandonment (since it is the intention, not the time that is determinative), it appears reasonable to assume that a 73-year hiatus would suffice for this purpose. The insurance company will, in all likelihood, argue that there was never any intention to abandon control over the vessel, but that it was technologically impossible to locate and retrieve it until recently.

This "technological impossibility" argument is novel and presents one of the most interesting legal challenges to salvage law since the Rhodians codified it 900 years before the Christian era. In essence, the argument will be that it is unfair to dictate abandonment (an intentional act) where there is no known means of recovering possession and control over the lost property. Neither Commercial Union nor its predecessors funded research into new salvage techniques or organized expeditions to locate and reclaim the *Titanic*, however. Thus it will probably be determined that no original owner or successor-in-interest has a valid claim.

* A parallel situation exists with regard to the cargo aboard the vessel.

Government Actions

Another potential successor-in-interest could be a government claiming jurisdiction over the area in which the *Titanic* now rests. Many nations claim ownership of abandoned objects lost at sea, or of objects of historic or archaeological significance on the seabed within territorial waters. The *Titanic*, of course, was lost in international waters where no such national ownership claim could exist. The United States House of Representatives is currently considering legislation (H. R. 3272—see page 44) to designate the *Titanic* an international maritime memorial; to develop guidelines to govern research, exploration, and (if appropriate) salvage activities on the vessel; and to enter into international negotiations for the same purposes. The government explicitly disclaims sovereignty or jurisdiction over the vessel and its cargo, unless otherwise subject to its jurisdiction. Although the legislation could be binding on United States citizens engaged in exploration or salvage of the *Titanic*, or on other persons or organizations that might choose the federal courts of the United States to litigate a salvage claim, it would have no effect on nationals of other countries.

An international memorial would require a treaty, signed and ratified by a majority (or other percentage) of nations having an interest in international maritime activity. Such a treaty would probably take several years to make the ratification rounds. Even if a treaty could be signed and ratified it would not necessarily bind non-signatories, as is the case with the United States and the current Law of the Sea treaty.

The Law of the Sea treaty contains a provision (Article 149) calling for the preservation or disposal of objects of an archaeological or historical nature “for the benefit of mankind as a whole,” where those objects are located in international waters beyond the jurisdiction of any nation. Thus, the framework for an internationally-recognized marine memorial is already in place.

Until an internationally protected area is set up, the *Titanic* is fair game to whomever has the ability to locate and salvage her. Under ancient and undisputed rules of admiralty, the first person to do so will gain exclusive rights to salvage, provided that party has the capacity (funding, knowledge, equipment, and so on) to prudently and effectively perform salvage operations. A number of salvors and adventurers have stated their intention to do this. The most persistent would-be salvor is Jack Grimm, a Texas oil millionaire who has organized three expeditions in recent years to find the *Titanic*. Grimm claims that in 1981, his expedition “photographed” one of the *Titanic*’s giant propellers. In this author’s opinion, since he neither took possession of the vessel nor began active salvage on her, Grimm presently does not have any claim to the *Titanic*.

Finders Keepers?

What about the Woods Hole Oceanographic

Institution and the French Institute for Research and Exploration of the Sea (IFREMER)? These two institutions, working together, actually located the *Titanic*. There is no indication that they intend to salvage the site or claim ownership. Under salvage law, the occasional or temporary visitor to a site has no claim to salvage. On its face, therefore, it would appear that neither the French nor the American organization has any claim on the wreck.

However, where a party makes a substantial contribution to a salvage, that party is entitled to a percentage of the ultimate salvage award. An award for salvage is generally a varying percentage of the total value of the recovery, depending on such factors as the skill of the salvor, the danger involved, and the time and energy taken in the successful effort. The award can be made by any federal district court in the United States or by national courts in other jurisdictions (depending on the nationality of the salvor or the nation in which the salvaged goods are brought ashore).

If it can be demonstrated that the ultimate salvor (if any) of the *Titanic* obtained the location of the vessel either directly or indirectly from the American/French expedition, a claim for a salvage share could be made by WHOI/IFREMER on the basis of their substantial contribution to the salvage. Further, under another accepted salvage principle, the owners of the vessels and equipment used in a charter operation that inadvertently leads to a salvage situation are entitled to share in the salvage award given to the contributor. Therefore, the U.S. Navy and the French government would be entitled to participate with WHOI/IFREMER in any salvage share awarded thereto.

As a practical matter, there is only one way for the United States or any other concerned body to protect the *Titanic* pending the institution of international measures to declare a marine memorial. The United States or other concerned organization must take possession and effective control over the site by stationing a naval or research vessel above the vessel, and by performing some activity that will evidence ongoing control. As an active “salvor” that government or organization would be entitled to an exclusive right to occupy and work the site. When the international community could effectively exercise jurisdiction over the *Titanic*, the guardian could relinquish its control of the site to the international regime.

Dean E. Cycon is a Research Fellow at the Marine Policy and Ocean Management Center of the Woods Hole Oceanographic Institution. He also is an attorney specializing in coastal zone and natural resource management and maritime law.

The opinions expressed in this article are those of the author and do not necessarily represent those of the Woods Hole Oceanographic Institution.

Salvaging the *Titanic*: An Impossible Dream?

by Eleanore Scavotto

EDITOR'S NOTE: The *Titanic* should remain an undisturbed memorial to those who perished when she sank in 1912. This is the position of Jean-Louis Michel of France and Robert D. Ballard of the United States, co-chief scientists on the research vessel *Knorr* at the time of the discovery. They oppose any commercial salvage attempts. Representative Walter B. Jones (D-NC) has introduced a bill in Congress (see page 44) to designate the *Titanic* site a maritime memorial. Thus the following discussion of salvage techniques does not imply that the *Titanic* should be raised, but rather serves to inform the reader of various schemes that have been hatched over the years to raise her and her artifacts.

Ever since the *Titanic* disappeared beneath a cold, starlit April night, people have dreamed of salvaging her. In fact, shortly after the survivors reached New York, the Astors, Guggenheims, and Wideners, still convinced that money could transcend the sea, contracted the Merritt and Chapman Wrecking Company to raise the *Titanic*. The salvage company quickly calculated that the depth of the ocean and the limitations of their technology made the task impossible, but considered raising the bodies with dynamite before abandoning both salvage ideas.

The depth of the *Titanic* still discourages most salvagers, and many have already ruled out raising her. As Captain Andrew Marshall, an official of the British Salvage Association, puts it, any salvage operation below 400–600 feet, the operating threshold for experienced divers, is “fraught with extreme technical difficulties.”

Nonetheless, many treasure hunters and salvage experts have talked of finding and raising the ship. Perhaps feasible only in theory, raising the *Titanic* could take years, and the enormous expense would surpass any previous salvage operation. The necessary underwater equipment could cost anywhere from \$10 million to \$15 million; in addition, the typical operating expenses of a surface ship like the one used to locate the *Titanic* would range between \$13,000 and \$15,000 a day. Refloating a wrecked ship is rarely simple, usually difficult, and sometimes impossible. Still, numerous people, hoping that the impossible might, in fact, be possible, have devised schemes to salvage the *Titanic*. For, as people continue to dream the impossible, technology continues to achieve it.

Unsuccessful Salvage Attempts

In 1966, Douglas Woolley, founder of the Titanic Salvage Co., in Hertfordshire, England, developed a \$3 million scheme together with some wealthy *Titanic* enthusiasts and two Hungarian scientists, Ambros Balas and Laszlo Szaszko. Woolley's plan would have used a bathysphere with mechanical arms to wrap hundreds of plastic containers around the *Titanic*'s hull. Woolley hypothesized that passing an electric current through water inside the containers would cause electrolysis to occur thereby breaking the water up into oxygen and hydrogen. These gases would then buoy the ship gently to the surface. Although Woolley never obtained the necessary funding, if he had (and had succeeded in raising the ship), he would have towed the *Titanic* back to Liverpool. Once there, he planned to refit the famous luxury liner and dry dock her as a maritime museum.

Another salvage scheme was Jack Grimm's three-year, multimillion dollar search for the *Titanic*. A geologist and Texas oilman, Grimm collaborated with Mike Harris, a documentary filmmaker from Florida; William Ryan, a geophysicist from Columbia University; Fred Spiess, director of the marine physical laboratory at the Scripps Institution of Oceanography in California; and a team of underwater experts.

Grimm hoped to spend the summer of 1980 locating and photographing the *Titanic*, and then return in 1981 to salvage the ship. Grimm did not locate the ship in 1980; but, after the 1981 search, he claimed his videotapes revealed the ship's propeller. Since the pictures were murky, however, critics were skeptical, and Grimm unsuccessfully explored the site again in 1983.

If Grimm had located the *Titanic*, the expedition planned to make a 4-hour descent in the *Aluminaut*, a deep-diving submersible owned by Reynolds International, Inc. With a supply ship above, the *Aluminaut*'s crew was to have maneuvered alongside the *Titanic* and used blowtorch-equipped robots to cut through the starboard side of the hull. Grimm's crew wanted to retrieve the ship's log, her bell, the jeweled edition of “The Rubaiyat,” any possible jewels and other artifacts. After Grimm heard that the *Titanic* had been found in September 1985, he told the *Washington Post* that he planned to try again to salvage the wreck either next year or in 1987.

Treasures or Fantasies

By then, the *Titanic* may have government protection that would prevent salvagers from touching it. Even without protection, experts say that treasure seekers who want to salvage valuables from the ship may be disappointed. "The stories of great wealth are fantasies," said John P. Eaton of the Titanic Historical Society. "There were no claims for large amounts of jewelry, just the standard express-liner cargo: most of them were personal claims, \$13 million, both for loss of life as well as property. I believe the only value of the wreck is scientific. There's probably little that is salvagable."

Eaton, another advocate for protecting the *Titanic* as a memorial to those who died on her, feels that her "location should be approximately designated on maps and charts and the area itself declared an international zone to be administrated by some United Nations organization, perhaps by a U.S., British, and Canadian commission."

Recent Salvage Schemes

And although Ballard states that any attempt to raise the *Titanic* would be ridiculous, many unique ideas for raising her have surfaced since he found her. Tony Wakefield, a salvage engineer in Stamford, Connecticut, devised a "Vaseline scheme." Wakefield claims his plan would bring the *Titanic* within 200 feet of the surface where she could be towed to port while still submerged to prevent corrosion. Wakefield proposes packing 180,000 tons of petroleum jelly in polyester bags into the hull of the *Titanic*. Assuming Wakefield solved the problem of stuffing these bags into the ship's cavity, he maintains that the Vaseline would harden and cause the *Titanic* to become buoyant and float to the top.

Another salvage plan, even more elaborate than the "Vaseline scheme," is the brainchild of John Pierce, a British salvager who helped recover artifacts three years ago from the *Lusitania*. His plan, the "giant iceberg" scheme, involves freezing the *Titanic* within a huge iceberg. Pierce theorizes, somewhat ironically, that the iceberg would buoy the ship up near the spot where the great iceberg of 1912 sank her. To do this, Pierce envisions first wrapping the wreck in a wire net, and then pumping liquid nitrogen through the net and around the ship. Neither Pierce's nor Wakefield's plans have gotten beyond the "thinking cap" stage.

Clive Cussler, the one man who was successful in raising the *Titanic*, at least in his novel, *Raise the Titanic*, describes some of the problems of salvaging her. The book states that hidden structural cracks may split the hull when it breaks from the seafloor; or then again, suction from the seafloor may refuse to release its captive of 73 years. If the ship does break free of the ocean floor and begins rising to the surface, any air that has been pumped into her interior would expand as the pressure of the sea lessens, and could crack the hull if not carefully bled. Even if this did not happen, towing the *Titanic* back to port presents innumerable difficulties. Despite such problems, some techniques have been successful on other ships, though not on any as deep as the *Titanic*.



The *Titanic* as seen in the film version of Clive Cussler's *Raise the Titanic*. (Photo courtesy of John Hollis Collection)

Ideas Successful on Other Ships

One successful salvage technique involves the use of compressed air. When the interior of the ship is "de-watered" by pumping air in and thereby forcing water out, the wreck should begin to rise. Since the risk of the hull fracturing as a vessel like the *Titanic* rises is great, another method, the pontoon plan, might be more feasible. In this plan, pontoons are flooded, sunk, and then pinned on both sides of the wreck. When securely positioned, the pontoons are blown up with compressed air, and, at least theoretically, buoy the ship to the surface. However, the difficulty of tying pontoons onto the *Titanic* could seriously hinder this plan.

Another salvage theory, used successfully in 1964 to raise the seagoing barge *Lumberjack* from Humboldt Bay in California, is injection of polyurethane foam. With a surface ship anchored over the *Titanic*, salvagers could shoot the two basic urethane components through a long, long hose into the ship's superstructure. When pressurized polyurethane comes out of the hose, the sudden decrease in pressure creates a froth of millions of tiny bubbles of urethane which fill the empty hull. Finally, the urethane foam cures into a rigid, cellular material, each cubic foot of which weighs 2 pounds and displaces 64 pounds of seawater. An advantage of this theory is that the foam seals small openings in the wreck's structure.

Although the polyurethane foam technique is feasible for a ship thousands of feet closer to the surface than the *Titanic*, the problem of attaching the hose from a surface ship to a dispensing unit 13,000 feet below on the seafloor, and then aiming it strategically into the *Titanic* diminishes its feasibility. Other traditional salvage ideas, such as tide and mechanical lifts along with water ballast, are surely too sedate to raise a ship as arrogant as the *Titanic*.

The Future of the *Titanic*

The sinking of the unsinkable *Titanic* showed that the impossible is sometimes possible; assuming,

then, that it *might* be possible to salvage the *Titanic*, either with one of the mentioned techniques or with a technique not yet conceived, the moral question of whether she should be salvaged remains.

Perhaps those people with the most technically advanced or tartetched salvage ideas, or those with the most money, will not decide whether or not the *Titanic* should or can be salvaged. The decision may be left to the ocean, with its capricious

storms and infinite power. For as the *Titanic* taught us, even the best technology is no match for the dark depths of the ocean.

Hleanore Scavotto is Editorial Assistant at Oceanus, published by the Woods Hole Oceanographic Institution.

'Cap, They Got Her'

by Captain R. J. Bowen

To be master of the ship that found the R.M.S. *Titanic* was quite a privilege, and I doubt that I will have such an adventure again. The long days of little sleep, delicate shiphandling, radio traffic, fog, and rough seas made *Knorr's* voyage 115-3 perhaps the most difficult and demanding one yet for me. Being a "shipdriver" was the easy part; it's the other hats I wore—hotel manager, diplomat, tour guide, and psychologist—that wore me down. I'm lucky that the *Knorr* has the best ship's crew on any research vessel, and they are the people who really keep the ship at sea, voyage after voyage.

Finding the *Titanic* tested the combined talents of all hands: the deck gang's ability to launch and recover delicate equipment in rough weather; the stewards' ability to feed and service 46 personnel; and the engineers' ability to keep the "lights burning and the gears turning" day after day.

Geology and Titanic Legs of the Trip

Voyage 115 began in Woods Hole on 17 June 1985 with Mike Purdy directing the first two legs for the Geology and Geophysics (G & G) department. The first 22-day leg was an expedition working with OBH buoys, deep explosive sound sources, and the strata array, from Woods Hole to San Juan, Puerto Rico. The second leg continued the G & G's work from San Juan to Ponta Delgada, Azores. At Ponta Delgada, the G & G group disembarked and 23 personnel in Bob Ballard's Deep Submergence Laboratory (DSL) group joined the ship. The third leg 115-3, departed Ponta Delgada on 17 July 1985 on the heels of a tropical storm.

The ship proceeded west-northwest to the site of the R.M.S. *Titanic*, which founded approximately 41.8 degrees North, 50.2 degrees West. Discussion on the messdecks began to get more lively, as everyone offered their opinion of the probability of finding the wreck, and what condition it would be in. Every deep-sea seaman has at one

time or another read about the disaster, and speculated on the chances of ever finding the wreck. Over the 73 years since she went down, the *Titanic* has probably become the most famous ship to ever sink. She was truly a "titanic" ship, 882 feet long, 45,000 tons, with a speed of 25 knots—a vessel any shipmaster would give his eye teeth to command. The sinking of the *Titanic* held all the drama of a classic sea story, and the mystery of her location perpetuated her fame. Whether or not her discovery will diminish the mystery and awe that surrounds her is uncertain.

The Search Begins

Upon arriving at the search site, a network of acoustic transponders used to navigate *Argo* and *ANGUS* was dropped in place, and the difficult work of precisely maneuvering the *Knorr* began. Weather conditions were very good the first few days, and did not really worsen until we actually found the wreck. Based on previous targets picked up by the French research vessel *Le Suroit*, the *Argo* television/side scan sonar sled was towed back and forth over selected parts of the search area. We towed the *Argo* camera for several days, "mowing the lawn" of the search area with little result. A TV monitor was rigged in the ship's library for the off-duty crew to watch, and night after night we watched mud, sand, and an occasional fish. We were still quite fascinated by the TV images, and, at times, would watch for 3 or 4 hours hoping to see some debris pop up on the screen.

The Control Operation

During the *Argo* operations, we maneuvered the *Knorr* from the van on the main deck which served as the main control area. By pushing a button on the bridge, we transferred actual joystick control of the ship's cycloidal propulsion to the van. A duplicate set of joysticks and associated instruments were in

the van, and one person could maneuver the ship there, aided by a science party navigator who monitored data reception from the bottom transponders in the navigation net.

After several hours on the controls, a pilot's concentration can diminish with tedium, and, for this reason, several of the deck officers and M. Bernard Pillaud of the French IFREMER group took turns at the controls. This system of control worked superbly, with navigation, control, and communications perfectly integrated throughout the operation. Many of our old shipmates from past voyages were in the scientific party, and this made for a very efficient, yet casual, working relationship. One of WHOI's great strengths in sea-going operations is the excellent cooperation of the ship's crew and scientific party in working toward a specific task.

The Discovery

About the fifth night of towing the *Argo*, I was off-duty and had spent around 4 hours watching the library TV monitor. Around midnight, I made my rounds of the ship and decided to turn in for the night. After dabbling with paperwork for a few minutes, I turned in at 0045 hours. I had just got to sleep when the ship's cook, John Bartolomei, banged on my cabin door with the words, "Cap, they got her!" As I awoke, I thought, "Now it starts, dammit, shouldn't have sacked in. It's gonna be an all nighter tonight!" When the camera hovered over that first piece of debris, one of the *Titanic's* boilers, the work was really just starting.

We worked non-stop for the next several days. Our weather window was deteriorating, problems with the traction winch cropped up, and all hands were getting a bit worn out. However, the pictures coming up the wire were getting better by the minute. When *Argo* passed the scattered debris on the seabed and flew over the *Titanic's* hull, excitement mounted. Tension also increased since a wrong maneuver of the ship or *Argo* would mean disaster. The worst fear was that we would foul the *Argo* sled in the tangled mass of rigging and funnels on the *Titanic*. If this had happened, the *Knorr* would, in effect, have been anchored to the wreck; and we would have had to decide whether to risk losing *Argo* by hauling back on its winch or whether to slack away in hopes that *Argo* would disentangle itself.

Observing the decks, bridge, and empty lifeboat davits on the television monitor, I tried to imagine what it was like the night of April 14/15—the disappointment and sorrow that the ship's Master, Capt. E. J. Smith, must have felt when his officers reported that the lower holds and firerooms were flooding. He knew then that the ship would go down. Such pride in one's ship doesn't exist in the American merchant marine today. We tend to view our ships as merely money-making vehicles, highly automated and impersonal. Perhaps because ships today aren't quite so "salty"—with woodwork, brass fittings, masts and booms, signal flags and steam whistles—American seamen do not have many emotional ties to their ships. They serve a few months aboard one and go on to another bare and sterile seagoing "plant." Few Americans go to sea

nowadays, and only a few of those who do have much enthusiasm for what seems a dying profession. Tankers, containerships, and supply boats don't quite have the aura about them as the old passenger liners did.

Preparing To Leave the *Titanic* Site

The weather remained poor during the final *Argo/ANGUS* surveys with rough seas, 35 knot winds, and frequent rain squalls. On the morning of September 5th, we retrieved the last *ANGUS* deployment, and the control van group emerged after 8 hours in the van to a bright and calm dawn. The last day on station was spent recovering the transponder net, and preparing to go home.

On the four days transit to Woods Hole, the radio traffic never ceased (see page 52). Butch Smith, *R/V Knorr's* radio officer, was on the air almost constantly handling calls from various WHOI, IFREMER, and Navy officers, not to mention the endless media traffic. The airwaves, which are normally filled with merchant ship traffic, would become oddly quiet as other ships held their traffic and listened to ours. On ships around the world, officers and seamen must have said, "Somebody finally found the *Titanic*; heard 'em on the radio."

Four generations of mariners have grown up hearing of the *Titanic*, and now the mystery of her location is finally solved. The pictures of the wreck and debris are fascinating, remarkable, amazing, whatever you want. To me, though, the best pictures are still of the *Titanic* steaming out to sea on her maiden voyage as the biggest, and most majestic ship of her day. I hope she remains in peace.

Richard J. Bowen is Master of the R/V Knorr.

Argo: Capabilities for Deep Ocean Exploration

by Stewart E. Harris
and Katie Albers

To satisfy the needs of the oceanographic and military communities, the Deep Submergence Laboratory (DSL) of the Woods Hole Oceanographic Institution has developed an unmanned search and survey vehicle named *Argo* [Figure 1]. *Argo* is

equipped with a complement of superior sensors for deep-ocean survey and inspection and is capable of remaining submerged for days, which dramatically increases our "bottom-staying power" from that provided by previous manned and unmanned vehicles.

Argo is a towed sled capable of operating to 6,000 meters depth. Its tether is a steel armored, coaxial cable .68 inches in diameter. Designed to tow in a manner similar to DSL's Acoustically-Navigated Geophysical Underwater Survey (ANGUS) vehicle (see *Oceanus* Vol. 25, No. 1), Argo weighs more than 4,000 pounds and operates at altitudes of 20 to 40 meters. When Argo is towed at speeds of approximately 1 knot, it flies about 100 meters astern of the ship, achieving a nearly vertical wire angle. When the vehicle is operated from a versatile ship, such as the *R/V Knorr*, we are able to position it very precisely using only the ship's propulsion system to maneuver the vehicle on the bottom. Argo has no independent propulsion capabilities.

While providing mechanical support for the vehicle, Argo's tether also carries power to the vehicle and a variety of signals from the sensors on board the vehicle which are modular subsystems. This modularity provides flexibility for growth and ease of maintenance and development. A wide area TV imaging system is integrated with side-looking sonar using this technique. This provides simultaneous broad swath acoustic and optical images that overlap in coverage and resolution.

Cable Design

Argo's tether is the standard for the oceanographic community. Its armor package and internal structure represent a compromise among the requirements for ruggedness, low rotation, maximum strength, and long flexure lifetime. This cable has a tensile strength in excess of 36,000 pounds and provides a usable bandwidth of 5 megahertz over a 6,000-meter length. In this case, "usable" means that signal attenuation is less than a factor of 10,000. A sophisticated telemetry system allows us to multiplex the video, sonar, and power into this severely limited bandwidth.

Imaging Systems

Argo presently carries one forward-looking camera, one down-looking, and a down-looking telephoto. These are all carried on the forward end of the vehicle, as shown in Figure 2. The strobes and incandescent lights which Argo uses to illuminate the ocean floor are carried in the after end of the vehicle. This arrangement is intended to maximize the horizontal separation between the cameras and the light sources. Computer simulations have shown that by increasing this separation, the amount of backscatter can be significantly decreased. This in turn increases the altitude from which high-quality pictures can be obtained. Tests have shown that this geometry makes it possible to get high-quality images from an altitude of 35 meters in clear water using the strobe lights for illumination.

The shape of the imaged area achieved by Argo's cameras is shown in Figure 3. By using low-

light-level Silicon Intensified Target (SIT) cameras, our swath capability extends 56 meters at 35-meter altitudes.

The very high quality of video images obtained using the horizontal separation of cameras and light sources was verified during tests of the Argo conducted in the North Atlantic during September of 1985. During these tests good quality images were obtained in very murky water from altitudes of 15 meters. Figure 4 is an example of one of these images. This figure is a photographic still of a video image, so the resolution is lower than that available with film, and there is some blurring due to noise. The latter is emphasized when the video is frozen into a still image.

In addition, a simultaneous side-looking sonar provides a lower resolution image of the surrounding terrain for a distance of 350 meters on each side. The optical and acoustic images complement one another: the sonar provides the large geographical picture while the video provides detail which facilitates the interpretation of the sonar images.

Surface Support

The real-time image processing system developed by DSL for use in the Argo system takes advantage of state-of-the-art digital techniques for image enhancement to provide improved images, increasing user and operator understanding.

As each image is transmitted up the wire and displayed, the user describes the terrain he sees using a 10,000-frame imaging library to assist him in standardizing his observations. This library is stored as still frames on video discs which provide random access and the potential for mosaic production. On board video editing capabilities allow production of hourly, daily, and mission summary tapes in an effort to reduce the amount of TV data to manageable proportions.

Equipment for real-time processing and viewing, as well as for recording for post-mission processing and archiving, is located in the control center, which is containerized for easy transportation and installation on oceanographic vessels.

Three operators are responsible for the operation of Argo, the winch system, and navigation. Video, sonar and navigation data are available for use in the guidance of the ship. Eventually, we hope to integrate dynamic positioning of the ship, and finally global positioning navigation into the Argo control system. Operators also will have access to a wide variety of other information, including three-dimensional imaging of Seabeam (a commercial, highly sophisticated topographical mapping system) data, real-time displays of vehicle orientation, and a summary of observations along the track of the vehicle. In the future, other sensing systems and a small, tethered, remotely-operated vehicle, *Jason*, will be integrated into Argo, which will increase its ability to project man's senses to the bottom of the sea.

Stewart E. Harris is a Research Specialist with DSL. Katie Albers is a Technical Writing Consultant with DSL.

The Argo Technology



Figure 1. Photo of Argo during tests at the WHOI dock. The vehicle weighs 2 tons and is 15 feet long, 3.5 feet tall, and 3.5 feet wide. (Photo by William Lange, WHOI).

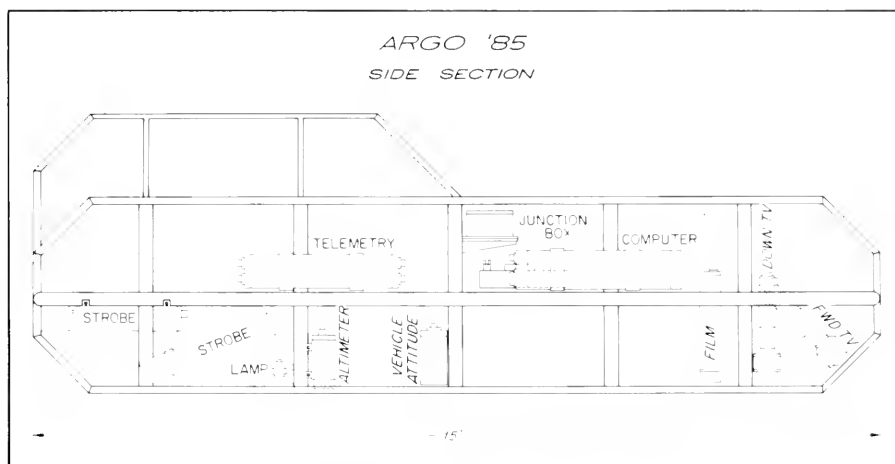


Figure 2. Schematic of Argo showing the placement of the various components.

Figure 3. Below, footprint of Argo's three TV cameras showing the area seen on the bottom from a 20 meter altitude.

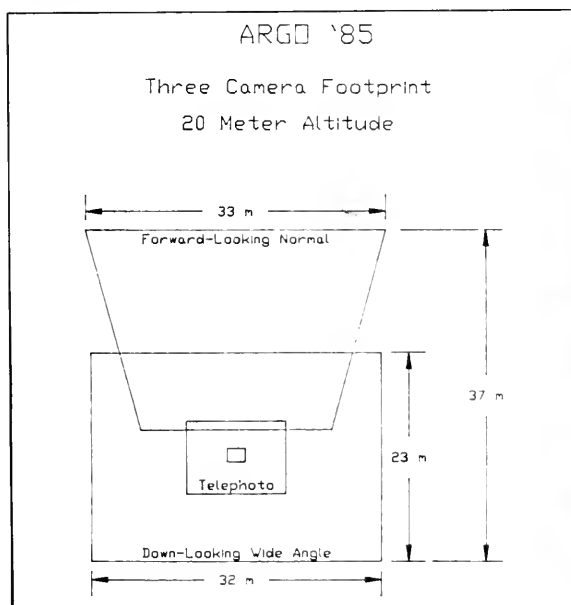


Figure 4. A video still of an Argo TV image taken during the Titanic survey.

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profile

Robert D. Ballard



Portrait by Charles Kerins

Deep Wilderness Man

by Paul R. Ryan

The Punic Wars. Robert Ballard is thinking specifically about the Second Punic War and the great

storm that rose up off Sicily in 255 B.C., in which 400 Roman ships returning from a victorious

battle with the Carthaginians off Cape Bon sank in 1,600 meters of water. Think of the historical

value; think of the scientific value; what a triumph for underwater technology it would be to find this long lost fleet. Wouldn't it be spectacular to fly *Argo/Jason* over that deep graveyard and film these wrecks, which likely would be largely intact. These are some of Ballard's thoughts after his spectacular discovery of the *Titanic*.

Ballard is a distant relative of "Bat" Masterson, the Wichita marshal and gunfighter, and like this famous ancestor he is something of a loner, and not afraid of taking risks. When I first met him in the late 1970s, he was hurrying to a Falmouth law office to make out his will, acting on a premonition of impending danger. On a dive shortly afterwards, Ballard and two others crashed into a mountain 20,000 feet beneath the surface of the ocean in *Trieste II*, a U.S. Navy submersible. "We ruptured the float assembly and were leaking aviation gas," Ballard recalled. "We dropped our weights and started up, our eyes fixed on the digital computer to see if the numbers were getting any smaller. All three of us in the submersible knew what was going on—and the damn computer had the jitters with the numbers jumping around. We sweated for about a half hour, not knowing whether we were going up, or down, just listening to the humming and pinging inside our sphere—it was like being inside a wrist watch where you've lost the stem and the instrument is winding down." Despite this close call and another in the French bathyscape *Archimède* (a fire), Ballard has continued to take the plunge into the deep on many occasions.

These same characteristics, a willingness to take risks and to go it alone, were crucial to Ballard's success in finding the *Titanic*. Few scientists would embark on a search of limited scientific interest with unknown odds against success. Indeed it was Ballard's personal dream that motivated the search, and his exploring spirit—he is much like an astronaut, Captain Nemo, and

Lewis and Clark rolled into one. But his exploits in finding the *Titanic* were not without controversy. His detractors fault him for the way in which information and pictures have been selected for public release.

Home and Away

Between time at sea and running an active, inventive lab ashore, this deep wilderness explorer is always in a hurry—except perhaps when crafting wooden cabinets for the modest-sized century old farmhouse he owns in Hatchville, a quiet, rural area of Falmouth, Massachusetts, a 25 minute drive from the Deep Submergence Laboratory at the Woods Hole Oceanographic Institution (WHOI).

Once inside his house—with its beamed ceilings, cast iron stoves, and heavy wooden tables—a visitor feels as though he is on a ranch in Montana. But the pictures on the walls give Ballard's occupation away. One might expect gothic landscapes, or portraits (perhaps of his grandfather, the last marshal of Wichita to be wounded in a gunfight), but not . . . submarines. But at 43, Ballard (his colleagues call him Bob) has descended into the abyss in more deep-diving submersibles than any other person in the world, including the 75-year-old Jacques Cousteau.

Historical Interlude

"Like a free balloon on a windless day, indifferent to the almost 200,000 tons of water pressing in on the cabin from all sides . . . slowly, surely, in the name of science and humanity, the Trieste took possession of the abyss, the last extreme on our earth that remained unconquered." These words of Swiss scientist Jacques Piccard followed his dive on January 30, 1960, to the deepest spot in the ocean—35,800 feet down in the Challenger Deep of the Mariana Trench.

Only the frequent ring of the telephone in the farmhouse gives any clue as to the

whirlwind activities of this ocean scientist. Even before the *Titanic* find, his commitments included television appearances, writing articles, lectures, and conducting other major oceanographic expeditions, not to mention work with Marjorie, his wife of 19 years, on the house (she stains the cabinets and other furniture Bob builds), and keeping tabs on his two teenage, hockey-playing sons. He is not unlike a circus juggler, and is the first to admit to being "something of a ham."

How To Catch A Porpoise

The performer in Ballard can be traced back to his days as a porpoise trainer at Sealife Park in Hawaii, where he gave 5 shows a day, 6 days a week, for audiences of 5,000 or more. "I had to do a lot of acting and improvisation to keep the shows from being dull." He quickly rose to being chief porpoise trainer, an activity he now finds useful in raising his children. "Have you ever tried to catch a porpoise and spank it? They jump in the water and run circles around you. You have to use voice, eye contact, and love if you want to work with a porpoise. And love is the most effective way." He also feels that it was his Sealife experience that helped him develop his writing talents (see the December, 1985, issue of *National Geographic*).

Ballard first went to Hawaii to do graduate work in oceanography after getting his B.S. degree from the University of California. "A Summer of '42" baby, né Robert Duane Ballard in Wichita, Kansas, the family (mother, father, older brother and younger sister) moved while Bob was still young to the West Coast. His father soon became one of the chief engineers in the Minuteman program.

"It was my father who taught me to take charge of my life. I really believe that a person can be what he wants to be. Although I was brought up as a Lutheran, I became an existentialist. As an undergraduate, I was very goal oriented. I still am. You had to make it on the football and basketball team; you had to get that girl to like you; later, you

had to get the Ph.D.”

To gain the goals was a matter of discipline, a word that Ballard likes. “I respect discipline. It boils down to predictive behavior. In my business, you have to rely on the discipline of others. I got my early indoctrination to discipline in sports, later in the military.”

Ballard, who went through the R.O.T.C. program at the University of California, was first commissioned as a lieutenant in the Army, serving in intelligence. But when the Vietnam war came, he transferred to the Navy. In the early sixties, while still an undergraduate, his father (then a high official in North American Aviation) got him a job in the Ocean Technology Section, where he worked on designing submersibles.

From 1967 to 1970, while still in the Navy, Bob continued to pursue his graduate education, but was abruptly assigned to the Office of Naval Research in Boston as Oceanographic Liaison Officer.

“My wife and I drove from the West Coast with a check for \$1,000 taped under the dashboard,” he recalled. Part of his duties was to come periodically to Woods Hole, where he established a link with the *Alvin* group, a tie that soon exposed him to the twin pressures of celebrity and the ocean depths. Bob is the first to stress, however, that he is just one representative of many people involved in the development of submersibles, both manned and unmanned.

Early Dives

Although Ballard has traveled with his family to the far reaches of Vermont and New Hampshire, his main acquaintance with the New England landscape is uniquely different. Many of his early dives were in the Gulf of Maine, and later he explored extinct volcanoes along the New England Seamounts, a chain of ancient submarine mountains extending 960 miles southeast from the coast. There are more than 30 major peaks along the chain, some of them rising two and a half miles above the sea floor—twice the height of Mt.

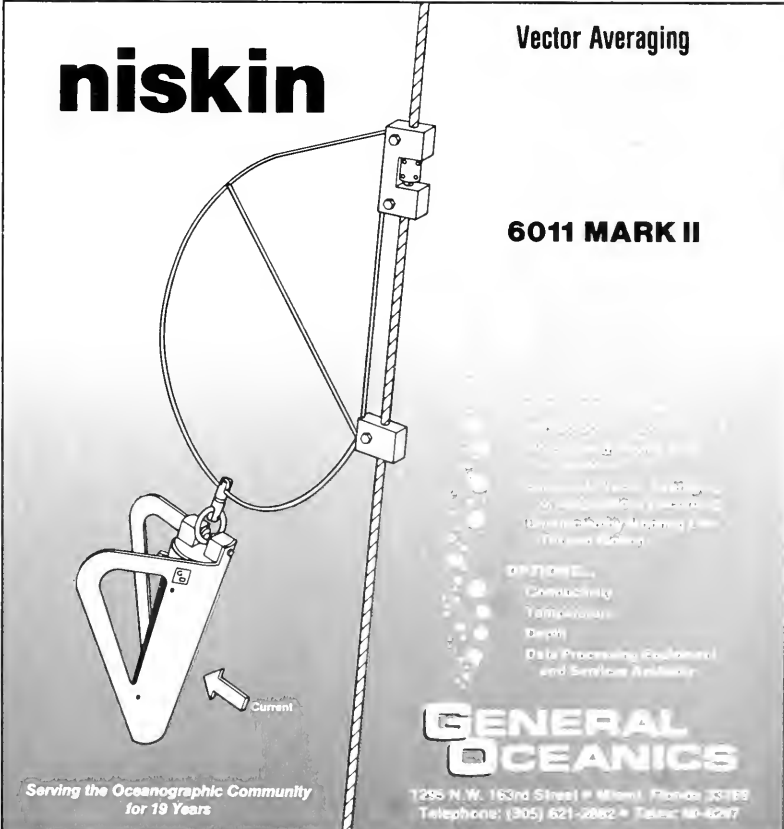
Washington (the highest peak in the White Mountains of New Hampshire) and comparable to major peaks in the Alps. None of the seamounts, however, come within a half-mile of the sea surface. Bob tells of one warm, clear and bright New England afternoon when he and Larry Shumaker, then head of the *Alvin* group, cast off the mooring lines:

“As we slipped below the surface, I glimpsed a translucent jellyfish drifting past the view port, its stinging tentacles dangling down several feet. It was the first living organism in the column of water we would descend through to the bottom. That column, illuminated by the glow of *Alvin*'s lights, holds a diversity of species, and each individual creature contributes to the nutrients that eventually fall to the bottom. Waste material and the very tissues of the animals and plants when they die all drift downward. It is estimated that at least 30 percent of the ooze making up much of the

ocean bottom is skeletal material—the remains of creatures that lived at higher levels. A white tip shark, another inhabitant of the column of water, materialized outside the view port, silently scouting *Alvin* for a few moments before swimming away.”

Ballard has compared the view from a submersible to standing with your toes against a tree, viewing in detail the nature of its bark. The observations only have significance if you have determined beforehand the type of tree you are looking at and its relationship to the rest of the forest.

“*Alvin* dropped quickly through the water, soon reaching a descent rate of a hundred feet per minute. The light outside faded gradually into deeper and deeper blues; the water pressure doubled and then doubled again. Just 15 minutes into the descent, Shumaker switched on the glowing red cabin lights because the darkness had become absolute.



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"As Larry and I descended deeper through our column of water, we began to encounter more creatures of the deep sea. The animals of the middle depths and the ocean bottom often look like monsters, but many are only a few inches in length. Because of the cold and lack of food, most animals remain small. Bottom dwellers generally grow slowly and live to older ages than do animals in other parts of the oceans. Some flexible corals, for instance, may take a score or more years to grow only a couple of inches.

"The echo on our sonar indicated that we were approaching bottom, at a little more than 12,000 feet. Larry released one of the heavy weights on the side of *Alvin*, and our descent slowed. Soon, in the spray of lights under the submersible, I could see the ocean floor slowly coming closer, seeming to rise toward us, rather than our sinking to it. Pumping ballast in final adjustments, Larry settled us softly down on the

bottom—more than two miles below the surface. A cloud of sediment stirred by our landing swirled past the view port and slowly dissipated, pushed by a gentle bottom current running down the slight slope we were on. When the silt had finally settled, I looked out on a typical panorama of a floor in the ocean depths.

"In all directions stretched fine bottom sediment, a loose mud composed of materials that have drifted down from the surface for millions of years. Most of the seafloor worldwide is composed of similar materials, but its accumulation is slow—only about an inch every thousand years. It is far from being a dead layer, however. In fact, the upper few feet of bottom ooze support a surprising amount of life. As I looked through the view port, I saw several purple holothurians, or sea cucumbers, inching along the bottom. These primitive creatures vacuum the ocean floor, drawing sediment into their eight-inch-long bodies and gaining nourishment from the nutrients there. They leave long meandering trails in their wake, redepositing the sediment on the floor.

"Larry and I then began to cross the floor of the Atlantic Ocean on our way to explore the soaring undersea mountain that was our goal. As we began to climb the steep slope of the mountain, we passed a jumble of large, round boulders that seemed completely out of place. Larry asked me how they had gotten there and I explained that during the last Ice Age—some 12,000 years ago—huge glaciers bulldozed the land, scouring the earth and picking up rocks and other debris. The powerful grinding action of the glaciers gradually smoothed and rounded the rocks, and carried them eventually to the sea. There, great icebergs broke off from the glaciers—just as they do now in Greenland and Antarctica—and drifted on the surface. Eventually they melted and dropped their load of boulders. The rocks we were viewing might have come from various parts of North

America that were covered with ice.




"Larry and I were now nearing the top of the volcano we had been climbing. Its flanks were composed of lava probably tens of millions of years old. At the top of the volcano, Larry spotted a massive outcrop that was covered with manganese. Using *Alvin's* mechanical arm, he reached over and rubbed off the black coating, revealing a light-colored substance that turned out to be stony coral. Obviously, at some point, perhaps 150 million years ago, this volcano was much closer to the surface, where coral reefs could flourish. But the volcano eventually subsided to a level where sunlight no longer stimulated the coral growth, and so it died out. We had reached the topmost pinnacle of the mountain, and decided to return to the surface. Quickly, the rumpled top of the volcano receded, and soon we were surrounded again by black

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water. Slowly, imperceptibly, black yielded to blue as we left the realm of the deep and, cramped and cold, I suddenly longed for the warmth and brightness of that New England afternoon."

The World Series

That was a "routine" dive for Ballard, not one of what he calls his "World Series dives," such as those made during Project FAMOUS (French-American Mid-Ocean Undersea Study) in 1973 and 1974. "Then the whole world was looking on, and I was terrified." Not about the dives, although there is always a risk, but about the science. "We had finally convinced the scientific community that the deep-diving submersible was a creditable tool and the National Science Foundation had subsequently laid out several million dollars to explore the antics of the live earth along the Mid-Atlantic Ridge rift valley. We had to prove our contentions. Up to this point, many scientists thought that the use of deep submersibles would never amount to anything scientifically in relation to the cost expended. We were diving on the axis of the Mid-Ocean Ridge, thought to be the origin of the seafloor."

What was it like during those World Series dives? Ballard reports that he switched "into a machine mode. All my training just took over and I reported what I saw. Not unlike a robot."

The results of those successful dives are now history. Ballard, in addition to participating in many of the dives (he made the first two) also gained his Ph.D. from the University of Rhode Island in June of 1974. "It was like turning on a light switch. People who hardly noticed me before suddenly began paying attention to what I had to say." His thesis (on "The Behavior of the Margin of North America During Continental Separation") was based on information gleaned from 40 dives in *Alvin* in the Gulf of Maine. Dr. Ballard was soon transferred from the *Alvin* group to the Department of Geology and Geophysics at Woods Hole,

where he came under the wing of two friends from his California days, Dr. K. O. Emery and Dr. Elazar Uchupi.

Soon he was Chief Scientist on many diving cruises. "This is the greatest excitement of all. You are like a symphony conductor, orchestrating ships, submarine, some 250 people. All the machinery and people are tuned to do something. There's the brass section, the woodwinds—they all have to do it right. And you have to make them do it."

Another of Ballard's World Series dives came in the Spring of 1977 in the Galápagos Rift area of the Pacific. The rift, some 220 miles northeast of the Galápagos Islands, evokes the memory of Darwin's *The Origin of Species*. There, colonies of marine animals were found thriving around warm-water geysers on what was thought to be a barren ocean floor. This significant discovery is still being investigated by oceanographers who have determined that specialized bacteria are probably

performing what in surface waters would be the function of green plants, chemically interacting with elements in the sea and with hydrogen sulfide dissolved in the volcanic water. These bacteria, combined with the life-encouraging warmth of the water itself, support a unique food web.

In 1979, Ballard was part of the group that discovered the "black smokers"—spires of sulfide minerals venting hot (350 degree Centigrade), black fluids, and has since developed a theory to predict the location of such vents (see *Oceanus*, Vol. 27, No. 3).

According to the theory developed by Ballard and Jean Francheteau, a scientist at the *Institute de Physique du Globe de Paris*, in Paris, France, the Mid-Ocean Ridge is not a simple seam in the Earth's surface, with new seafloor spreading out evenly along its length. Rather, the ridge is made up of a number of "spreading cells," each of which has varying amounts of activity along its

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length and is set off by faults running across the axis of the ridge.

The hydrothermal and volcanic activity that take place at the ridge are believed to be driven by magma chambers 2 to 3 kilometers beneath the seafloor—much nearer the surface than in other regions. Ballard and Francheteau hypothesize that the magma chamber under a given spreading cell cools and closes off as it approaches the faults that bound the cell. Thus, near the center of the spreading cell magma will be nearer the surface than at the edges.

Consequently, the crust thins and tends to bow upward at the center of the spreading cell, allowing for easier escape of lava and increasing the flow of heat that drives the hydrothermal vents. Thus, the greatest concentration of hydrothermal vents and volcanic activity would be expected where the ridge bows upward—that is, at the highest point along the length of the spreading cell. Similar theories have been proposed by other scientists to explain changes in activity as one looks across the ridge, but Ballard's and Francheteau's emphasis on topographic high points and spreading cells along the ridge represents a major advance in scientific thinking about Mid-Ocean Ridge geology. Although many of the discoveries leading up to this theory were made with *Alvin*, Ballard hopes to test it this winter by using *Argo* to examine a lengthy, continuous portion of the ridge—a feat not readily accomplished using *Alvin*. Whether unmanned submersibles like *Argo/Jason* eventually replace *Alvin* and other manned submersibles completely is a matter of conjecture. At this point *Alvin* is still the workhorse of the scientific community, and Ballard hopes to use it to explore the *Titanic* next summer.

In July of 1985, Ballard was one of four distinguished scientists to receive a Secretary of the Navy Research Chair in Oceanography, carrying a stipend of \$800,000 for research.

His *Titanic* discovery brought Ballard and his wife an invitation from the President of the United States to attend a gala dinner in November of 1985 for Prince Charles and Princess Diana.

As we have seen, Ballard is a man who wears many hats. He also is something of an entrepreneur, having established a business (with the Navy's blessing) in 1983 to market *Argo/Jason*-like vehicles to government-approved clients.

Historical Interlude

"The only other place comparable to these nether regions must surely be naked space itself, far beyond the atmosphere, between the stars, where sunlight has no grip upon the dust and rubbish of planetary air. In the blackness of space, the shining planets, comets, suns, and stars must be closely akin to the world of life as it appears to the eyes

of an awed human being in the open ocean half a mile down." These the words of William Beebe, a naturalist, after his record dive in 1934 in a steel bathysphere that was lowered to a depth of 3,028 feet off Bermuda.

Many people compare the deep-submersible expeditions with the space program. And Ballard does feel that he hurls himself into another world. "The *Alvin* is our space module, just like *Eagle* was Neil Armstrong's, but, in many ways, the ocean floor is more hostile and stranger than the moon. You can walk around and explore the moon's surface directly. Down in the ocean it's totally dark. The temperature is nearly freezing, and the pressure outside the *Alvin* is tremendous. So, in a way, when we dive into inner space we travel to another planet."

In the years ahead, Ballard does not visualize people inhabiting the ocean floor: "Who would want to live in that hostile, sparse desert?" But he does feel that one day we will conduct a Lewis-and-Clark-type expedition across the deep ocean floor in a vehicle such as *Argo/Jason*. "I want to lead that expedition," he says, his eyes sparkling with a Captain Nemo intensity. And then there are all those ancient wrecks of the Punic Wars to visit.

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A look inside the *Titanic's* larder and beverage rooms. Food for passengers and crew for a week.

Fresh meat	75,000 pounds
Poultry	25,000 pounds
Fresh eggs	35,000
Cereals	10,000 pounds
Flour	250 barrels
Tea	1,000 pounds
Fresh milk	1,500 gallons
Fresh cream	1,200 quarts
Sugar	5 tons
Potatoes	40 tons
Ale and stout	15,000 bottles
Minerals	1,200 bottles
Wines	1,000 bottles
Fresh fish	11,000 pounds
Salt and dried fish	4,000 pounds
Bacon and ham	7,500 pounds
Fresh butter	6,000 pounds
Sweetbreads	1,000
Ice cream	1,750 quarts
Coffee	2,200 pounds
Jams	1,120 pounds
Apples	180 boxes
Oranges	180 boxes (36,000)
Lemons	50 boxes (16,000)
Hothouse grapes	1,000 pounds
Condensed milk	600 gallons
Grapefruit	50 boxes
Lettuce	7,000 heads
Fresh asparagus	800 bundles
Onions	3,500
Fresh green peas	1¼ tons
Tomatoes	1¾ tons
Spirits	850 bottles
Sausages	2,500 pounds
Cigars	8,000



RMS "TITANIC"

APRIL 14, 1912

LUNCHEON.

CONDOMME FERMIER COCKIE LEEKIE

FILLETS OF BRILL

EGG A L'ARGENTEUIL
CHICKEN A LA MARYLAND

CORNED BEEF, VEGETABLES, DUMPLINGS

FROM THE GRILL.

GRILLED MUTTON CHOPS

MASHED, FRIED & BAKED JACKET POTATOES

CUSTARD PUDDING

APPLE MERINGUE PASTRY

BUFFET.

SALMON MAYONNAISE POTTED SHRIMPS

NORWEGIAN ANCHOVIES SOUBED HERRINGS

PLAIN & SMOKED SARDINES

ROAST BEEF

ROUND OF SPICED BEEF

VEAL & HAM PIE

VIRGINIA & CUMBERLAND HAM

BOLOGNA SAUSAGE BRAUN

GALANTINE OF CHICKEN

CORNED OX TONGUE

LETTUCE BEETROOT TOMATOES

CHEESE.

CHESHIRE, STILTON, GORONZOLA, EDAM,

CAMEMBERT, ROQUEFORT, ST IVEL,

CHEDDAR

Iced draught Munich Lager Beer 3d. & 6d. a Tankard.

The crockery, silver, glasses and cutlery. Electrically-driven machinery on board the *Titanic* spared the crew the drudgery of washing and drying them all by hand.

Breakfast cups	4,500	Tea pots	1,200
Tea cups	3,000	Breakfast saucers	4,500
Coffee cups	1,500	Tea saucers	3,000
Beef tea cups	3,000	Coffee saucers	1,500
Cream jugs	1,000	Soufflé dishes	1,500
Breakfast plates	2,500	Wine glasses	2,000
Dessert plates	2,000	Champagne glasses	1,500
Soup plates	4,500	Cocktail glasses	1,500
Pie dishes	1,200	Liquor glasses	1,200
Beef tea dishes	3,000	Salt shakers	2,000
Cut tumblers	8,000	Salad bowls	500
Water bottles	2,500	Pudding dishes	1,200
Crystal dishes	1,500	Finger bowls	1,000
Ice cream plates	5,500	Butter dishes	400
Dinner plates	12,000	Dinner forks	8,000
Coffee pots	1,200	Fruit forks	1,500

Cargo Manifest R.M.S. Titanic

PORTS OF LOADING: Southampton/Cherbourg/Queenstown.

PORT OF DISCHARGE: New York

SAILING DATE: 10 April 1912. ARRIVAL DATE: 17 April 1912.

cse = case, cs = cases, bls = bales, bgs = bags, bndf = bundle,
 bbl = barrel, hhd = hogshead
 Tulle = Silk/Nylon netting for veils or scarfs.

CONSIGNEE	DESCRIPTION OF GOODS
Wakem & McLaughlin.	1 cse Wine.
Thorer & Praetorius.	3 bls Skins.
Carter W. E.	1 cse Auto.
Fuchs & Lang Mtg. Co.	4 cs Printers Blankets.
Spaulding, A. G. & Bros.	34 cs Athletic Goods (golt clubs)
Park & Tildord.	1 cse toothpaste, 5 cs Drug sundries, 1 cse Brushware.
Maltus & Ware.	8 cs Orchids.
Spencerian Pen Co.	4 cs Pens.
Sherman Sons & Co.	7 cs Cottons.
Clatlin & Co.	12 cs cotton laces.
Muser Bros.	3 cs Tissues.
Isler & Guve.	4 bls Straw.
Hydeman & Lassner.	1 cse Tulle.
Petry, P. H. & Co.	1 cse Tulle.
Metzger, A. S.	2 cse Tulle.
Mills & Gibbs.	29 cs Cottons, 1 cse Gloves.
Field, Marshall & Co.	1 cse Gloves.
N.Y. Motion Picture Co.	1 cse Films.
Thorburn, J. M., & Co.	8 cs Bulbs.
Rawstick & H. Trad. Co.	28 bgs Sticks.
Dujardin & Ladnuck.	10 bxs Melons.
Amer. Exp. Co.	25 cs Mds.
Tiffany Co.	1 cask China, 1 cse Silver Goods.
Lustig Bros.	4 cs Straw Hats.
Kuyper P. C. & Co.	1 cse Elastic Cords, 1 cse Leather
Cohen, M. Bros.	5 Pkgs Skins.
Gross, Engel Co.	1 cse Skins.
Wilson, P. K. & Son.	61 cs Tulle
Gallia Textile Co.	1 cse Lace Goods.
Calhoun Robbins & Co.	1 cse Cotton Laces, ½ cse Brushware.
Victor & Achilles.	1 cse Brushware.
Baugarten, Wm. & Co.	3 cs Furniture.
Speilman Co.	3 cs Silk Crape.
Nottingham Lace Works.	2 cs Cottons.
Naday & Fleischer.	1 cse Laces.
Rosenthal, Leo J., Co.	4 cs Cottons.
Waken & McLaughlin.	25 cs Biscuits, 42 cs Wines.
Leeming T., & Co.	7 cse Biscuits.
Crown Perfume Co.	3 cs Soap Perfumes.
Meadows, T., & Co.	5 cs Books, 3 bxs Samples, 1 cse Parchments.
Thomas & Pierson.	2 cs Hardware, 2 cs Books, 2 cs Furniture.
Amer. Exp. Co.	1 cse Elastics, 1 cse Gramophone, 4 cs Hosiery, 5 cs Books, 1 cse Canvas, 3 cs Prints, 1 cse Rubber Goods, 5 cs Films, 1 cse Tweed, 1 cse Sero Fittings (Svringes), A quantity of Oak Beams, 1 cse Plants, 1 cse Speedometer, 1 pkg Effects, 2 cs Samples, 8 cs Paste, 4 cs Books, 2 cs Camera and Stand. 1 cse Machinery.
Sheldon, G. W. & Co.	15 cs Alarm Apparatus, 4 cs Orchids.
Maltus & Ware.	30 cs Plants.
Hempstead & Sons.	2 cs Lace Collars, 2 cs Books.
Brasch & Rothenstein.	53 pkgs Straw.
Isler & Guve.	68 cs Rubber.
Baring Brothers & Co.	10 bags Galls(suspenders?) 1 cse Cottons.
Altman, B. & Co.	60 cs Salt Powder
Stern S.	6 cs Soap.
Arnold, F. R. & Co.	17 pkgs Wool Fat.
Schieltelin & Co.	1 pkg Candles.
American Motor Co.	75 bls Fish.
Strohmeier & Arpe.	11 bls Rubber.
National City Bank N.Y.	5 cs Shells.
Kronteld, Saunders & Co.	1 cse Films.
Richard C. B.	2 cs Hat Leather, & c
Corbel, M. J. & Co.	2 cs Books.
Snow's Express Co.	1 cse Woolens.
Van Ingen, E. H. & Co.	10 cs Books.
Lippincot, J. B. & Co.	1 bale Skins.
Lazard Freres.	1 crate Machinery.
Aero Club of America	1 cse Printed Matter.
Whitcombe, McGeachum & Co.	386 rolls Linoleum
Wright & Graham.	437 casks Tea.
Ullmann, J.	4 bales Skins

Arnold & Zess	134 cs Rubber	Brown Bros. & Co	15 cs Rabbit Hair
Brown Brothers & Co	76 cs Dragons Blood, 2 cs Gum	Goldner, Morris	11 cs Feathers.
American Shipping Co	3 cs Books	Cobb, G. H.	1 cs Tissue
Adams Express Co	95 cs Books	Andattren Ret. Mach. Co	11 cs Refrigerating Machinery
Lasker & Bernstein	117 cs Sponges	Sutar, Alfred (Sutar?)	18 cs Machinery:
Oelrichs & Co	2 cs Pictures & c	Amer. Express Co.	1 cs Packed Packages,
Stachert, G. H. & Co	12 pkgs Periodicals		3 cs Tissue, 2 bbls Mercury,
Milbank Teasman & Co	3 cs Woolens		1 bbl Earth, 2 bbls Glassware,
Vandergriff, F. B. & Co	53 cs Champagne		3 cs Printed Matter,
Downing, R. F. & Co	1 cs Felt, 1 do Meal		1 cs Straw Braids,
	8 do Tennis balls,		1 cs Straw Hats, 1 cs Cheese,
	1 do Engine Packing		3 cs Hosiery.
Dublin, Morris & Kornbluth	2 pkgs Skins	Meadows, Thos. & Co	3 cs Silk Goods
Hersog, Simon & Sons	4 pkgs Skins	Ulrichs & Hegnoer	1 cs Brushware,
International Trading Co	1 cs Surgical Goods,	Cauvigny Brush Co	2 cs Ribbons,
	1 cs Ironware,	Johnson, J. C. & Co	2 cs Flowers,
	4 cs Printed Matter,	Judkins & McCormick	1 cs Gloves
	1 cs Cloth	Spelman Co	18 cs Merchandise.
	4 cs Printer Matter,	American Express Co.	6 bales Cork
	1 cs Machinery, 1 do Picture,	Wakem & McLaughlin.	75 cs Anchovies, 1 cs Liqueur,
	1 cs Books, 1 do Mdse.	Acker, Merrell & Condit.	225 cs Mustard
	1 do Notions, 1 do Photo		190 cs Liqueur, 25 cs Syrups,
	1 cs Elastics, 2 cs Books,	Engs, P. W. & Sons	25 cs Preserves,
	1 box Golf Balls,	Schall & Co.	12 cs Butter, 18 cs Oil,
	5 cs Instruments	N. Y. & Cuba Mail S.S. Co	2 hhds Vinegar, 6 cs Preserves,
	2 parcels Merchandise		19 cs Vinegar, 8 cs Dry Fruit,
	1 case Merchandise.		10 bnds of 2 cs Wine.
	1 parcel Merchandise.		16 hhds Wine.
	1 parcel Merchandise.	DuBois, Geo. C	185 cs Wine, 110 cs Brandy.
	1 cs Merchandise.	Hollander, H	10 hhds Wine, 15 cs Cognac.
	1 cs Merchandise.	Van Renssaler, C. A	100 cs Shelled Walnuts.
	4 rolls Linoleum, 1 cs Hats,	Brown Bros. & Co	70 bbls Cheese.
	3 bales Leather, 5 cs Books,	Bernard, Judas & Co.	20 bbls Cheese, 2 cs Cognac
	6 cs Confectionery,	American Express Co	1 cs Liqueur, 38 cs Oil.
	1 cs Tin Tubes, 2 cs Soap,	Mouquin Wine Co.	107 cs Mushrooms,
	2 cs Boots	Kanuth, Nachod & Kuhne.	1 cs Pamphlets.
	3 cs Books, 2 cs Furniture,		25 cs Sardines, 8 cs Preserves
	1 cs Pamphlets, 1 do Paints,	Lazard Freres.	50 cs Wine.
	1 cs Eggs, 1 do Whiskey	Acker, Merrell & Condit	6 casks Vermouth, 4 cs Wine.
	10 pkgs Periodicals	DuBois, Geo. F.	11 cs Shelled Walnuts.
	1 Parcel.	Heidelbach, Ickelheimer & Co	100 hls Shelled Walnuts.
	1 cs Cretonne (fabric for curtains/ slipcovers) Silk	Brown Bros. & Co	300 cs Shelled Walnuts.
	1 cs Iron Jacks, 1 do Bulbs.	1st Nat'l Bank of Chicago.	35 bags Rough Wood.
	1 cs Hosiery	Bischoff, H. & Co.	50 bbls Cheese.
	1 cs Clothing.	Baumert, F. X. & Co	5 bbls Cheese.
	8 cs Hairnets	Erne Despatch Co.	50 bbls Cheese.
	1 cs Silk Goods.	Galle, B. & Co.	190 bbls Cheese.
	1 cs Tissues	Rathenberger & Co	50 bbls Cheese.
	1 cs Hairnets.	Haupt & Burg	10 bbls Cheese.
	2 cs Silk Goods.	Sheldon & Co	50 bbls Cheese.
	3 cs Silk Goods.	Percival, C.	30 bbls Cheese.
	1 cs Silk Goods.	Stone, C. D. & Co	30 bbls Cheese.
	1 cs Gloves.	Phoenix Cheese Co	10 bbls Cheese.
	30 pkgs Tea.	Petry, P. H. & Co	15 bbls Cheese.
	2 cs Books and Lace.	Reynolds & Dronig,	41 cs Filter Paper
	5 cs Books, 1 bag Frames.	Fougere, A	22 cs Mushrooms, 15 cs Peas,
	1 cs Cotton, 2 cs Stationery	Munroe, J. & Co	8 cs Beans, 13 cs Peas.
	1 cs Scientific Instruments		10 cs Mixed Vegetables.
	1 cs Sundries.		25 cs Olives, 12 bbls Capers.
	3 cs Test Cords,		10 cs Fish, 20 cs Mdse
	1 cs Briar Pipes,		25 cs Olive Oil.
	1 cs Sundries,		14 cs Mushrooms
	2 cs Printed Matter		
Papa, Chas. & Co	1196 bags Potatoes	Austin, Nichols & Co	
Bauer, J. P. & Co. (Sauer?)	318 bags Potatoes		Order - 14 cs Lactic, 18 do Gum, 14 casks Gum, 225 casks Tea, 3 bbls Skins,
Rusch & Co	1 cs Velvets		4 cs Opium, 3 cs Window Frames, 8 bbls Skins, 8 pkgs Skins, 1 cs Skins,
Mallouk, H	1 cs Laces.		2 cs Horse Hair, 2 cs Silk Goods, 8 bbls Raw Silk, 6 pkgs Hair Nets, 200 pkgs Tea,
Bardwell Bros	8 cs Laces		246 cs Sardines, 30 rolls Jute Bagging, 1961 bags Potatoes, 7 cs Raw Feathers, 10
Heyliger, A. V.	1 cs Velvet		cs Hatters Fur, 3 cs Tissue, 1 cs Rabbit Hair, 31 pkgs Crude Rubber, 7 cs
Peabody, H. W. & Co	18 bales Straw Goods		Vegetables, 5 cs Fish, 10 cs Syrups, 2 cs Liqueurs, 150 cs Shelled Walnuts, 15 bbls
Simon, A. I. & Co	1 cs Raw Feathers.		Cheese, 8 bbls Buchu, 2 cs Grandfathers Clocks, 2 cs Leather
Wilson, P. K. & Sons	2 cs Timers	Holder's original Bill of Lading	
Manhattan Shirt Co	3 cs Tissue	19 bbls Goat Skins, 15 cs Calabashes, 5 bbls Buchu, 4 cs Calabash Bowls,	
Broadway Trust Co	3 cs Coney Skins (rabbit)	3 bbls Sheep Skins, 2 cs Embroiders, 8 oct(?) Wine, 22 cs Ostrich Feathers,	
Prost, G.	1 cs Auto Parts	3 bbls Skins, 33 bags Argols, 3 bbls Sheep Skins.	
Young Bros	1 cs Feathers		
Wimpthelmer, A. Co	3 cs Leather		

This copy of the *Titanic's* manifest was delivered via Registered Mail on the Cunard Steamship Lines *Mauretania* in New York on Friday 19 April 1912

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| Bauer, J. P. & Co. (Sauer?) | 1 cse Briar Pipes. | | 14 cs Mushrooms. |
| Rusch & Co. | 1 cse Sundries. | Order | 14 cs Lattice, 18 do Gum, 14 casks Gum, 225 casks Tea, 3 bls Skins, 4 cs Opium, 3 cs Window Frames, 8 bls Skins, 8 pkgs Skins, 1 cse Skins. |
| Malloch, H. | 2 cs Printed Matter | | 2 cs Horse Hair, 2 cs Silk Goods, 8 bls Raw Silk, 6 pkgs Hair Nets, 200 pkgs Tea, 246 cs Sardines, 30 rolls Lute Bagging, 1961 bags Potatoes, 7 cs Raw Feathers, 10 cs Hatters Fur, 3 cs Tissue, 1 cs Rabbit Hair, 31 pkgs Crude Rubber, 7 cs |
| Bardswill Bros | 1196 bags Potatoes | | Vegetables, 5 cs Fish, 10 cs Syrups, 2 cs Liquors, 150 cs Shelled Walnuts, 15 bds Cheese, 8 bls Buchu, 2 cs Grandfathers Clocks, 2 cs Leather |
| Heslinger, A. V. | 318 bags Potatoes | 1 cse Raw Feathers. | 19 bls Goat Skins, 15 cs Calabashes, 5 bls Buchu, 4 cs Calabash Bowls, 3 bls Sheep Skins, 2 cs Embroidery, 8 oct(?) Wine, 22 cs Ostrich Feathers, 3 bls Skins, 33 bags Argols, 3 bls Sheep Skins |
| Peabody, H. W. & Co. | 1 cse Velvets | 2 cs Linens. | |
| Simon, A. L. & Co. | 1 cse Laces | 3 cs Tissue | |
| Wilson, P. K. & Sons | 8 cs Laces | 3 cs Coney Skins (rabbit) | |
| Manhattan Shirt Co. | 1 cse Velvet | 18 bales Straw Goods. | |
| Broadway Trust Co. | 1 cse Raw Feathers. | 1 cse Auto Parts | |
| Prost, G. | 2 cs Feathers. | 1 cse Feathers | |
| Young Bros | 3 cs Leather | 3 cs Leather | |
| Wimpfheimer, A. Co. | | | |

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Issues not listed here, including those published prior to Spring 1977, are out of print. They are available on microfilm through University Microfilm International, 300 North Zeeb Road, Ann Arbor, MI 48106.

- **Beaches, Bioluminescence, Pollution & Reefs**, Vol. 28:3, Fall 1985—A diverse collection covering marine science in Cuba, a new wind powered propulsion system for ships, and an interdisciplinary oceanographic think tank, as well as the subjects mentioned in the title.
- **The Oceans and National Security**, Vol. 28:2, Summer 1985—The task of the U.S. Navy, research and national security, issues surrounding specific weapons and regions, the role of the Coast Guard, and Soviet naval strength.
- **Marine Archaeology**, Vol. 28:1, Spring 1985—Details of a rapidly expanding discipline, with articles on pre-historic man on the continental shelf, Atlantis and catastrophe theory, marine archaeology in Israel, and legal and technical issues.
- **The Exclusive Economic Zone**, Vol. 27:4, Winter 1984/85—An assessment of the options open to the United States in developing its new Exclusive Economic Zone.
- **Deep-Sea Hot Springs and Cold Seeps**, Vol. 27:3, Fall 1984—The biology, geology, and chemistry of hydrothermal vents and sulfide seeps. Other articles on the exploration of vent sites and the funding of oceanographic research.
- **El Niño**, Vol. 27:2, Summer, 1984—A comprehensive exploration of the El Niño phenomenon, the oceanic temperature anomaly blamed for abnormal weather worldwide during 1982 and 1983.
- **Industry and the Oceans**, Vol. 27:1, Spring, 1984—Positive uses of the oceans, including genetic engineering and salmon ranching. Also, an article on marine science in China, and a history of the Naples Zoological Station.
- **Oceanography in China**, Vol. 26:4, Winter 1983/84—Comprehensive overview of the history of marine studies in China, including present U.S.-China collaboration, tectonic evolution, aquaculture, pollution studies, seaweed-distribution analysis, the changing role of the Yangtze River, and the administrative structure of oceanographic programs.
- **Offshore Oil & Gas**, Vol. 26:3, Fall 1983—Historical accounts of exploration methods and techniques, highlighting the development of seismic theory, deep-sea capability, and estimation models. Also covers environmental concerns, domestic energy alternatives, and natural petroleum seeps.
- **Summer Issue**, Vol. 26:2, Summer 1983—Articles cover the effects of carbon dioxide buildup on the oceans, the use of mussels in pollution assessments, a study of warm-core rings, neurobiological research that relies on marine models, the marginal ice zone experiment, career opportunities in oceanography, and concerns about the U.S. Exclusive Economic Zone.
- **Summer Issue**, Vol. 25:2, Summer 1982—How Reagan Administration policies will affect coastal resource management, an acoustic technique for measuring ocean processes, ocean hot springs research, planning aquaculture projects in the Third World, public response to a plan to bury high-level radioactive waste in the seabed, and a toxic marine organism that could prove useful in medical research.
- **Summer Issue**, Vol. 24:2, Summer 1981—The U.S. oceanographic experience in China, ventilation of aquatic plants, seabirds at sea, the origin of petroleum, the Panamanian sea-level canal, oil and gas exploration in the Gulf of Mexico, and the links between oceanography and prehistoric archaeology.
- **The Oceans As Waste Space**, Vol. 24:1, Spring 1981—A debate over the appropriateness of ocean disposal.
- **Senses of the Sea**, Vol. 23:3, Fall 1980—A look at the complex sensory systems of marine animals.
- **Summer Issue**, Vol. 23:2, Summer, 1980—Plankton distribution, El Niño and African fisheries, hot springs in the Pacific, Georges Bank, and more.
- **A Decade of Big Ocean Science**, Vol. 23:1, Spring 1980—As it has in other major branches of research, the team approach has become a powerful force in oceanography.
- **Ocean Energy**, Vol. 22:4, Winter 1979/80—How much new energy can the oceans supply?
- **Ocean/Continent Boundaries**, Vol. 22:3, Fall 1979—Continental margins are being studied for oil and gas prospects as well as for plate tectonics data.
- **The Deep Sea**, Vol. 21:1, Winter 1978—Over the last decade, scientists have become increasingly interested in the deep waters and sediments of the abyss.
- **Sound in the Sea**, Vol. 20:2, Spring 1977—The use of acoustics in navigation and oceanography.

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