

## FIRST CROSSINGS OF THE ENDS OF THE EARTH

Two of the greatest achievements in the annals of exploration marked the year 1958. They came within six months of each other, at opposite Poles of our planet. First a British Commonwealth expedition led by Dr. (now Sir) Vivian Fuchs succeeded in crossing the great white 2,000-mile-wide continent of Antarctica. Then the United States Navy's atomic submarine *Nautilus*, captained by Comdr. William R. Anderson, blazed a sea route from Pacific to Atlantic under the ice of the Arctic Ocean. For the first time by land or sea the ends of the earth had been crossed by way of the North and South Poles, a feat heretofore accomplished only by air.

Color-illustrated accounts of both expeditions are presented in this issue of the National Geographic, which over the years has published the firsthand reports of great polar explorers from Peary, Amundsen, and Shackleton to Byrd and Siple. Commander Anderson and one of his brilliant young officers, Lt. William G. Lalor, Jr., write of the *Nautilus* voyage and the Arctic as a trade route of the future, while Sir Vivian describes the crossing of the earth's most formidable continent.—The Editor.

# Submarine Through the North Pole

By LT. WILLIAM G. LALOR, JR., USN

*With photographs by Chief Petty Officer John J. Krawczyk*

**F**ROM the slender antenna of *Nautilus*, in staccato *dit's* and *dah's*, a brief, triumphant message flashed across oceans and continents:

"*Nautilus* Ninety North."

Our radioman took his hand from the sending key. Beside him, waiting, stood the captain, Comdr. William R. Anderson. In less than a minute high-pitched signals of acknowledgment came winging back from United States Navy radio operators in Japan, Hawaii, and England.

"Send the other one now, Thomas."

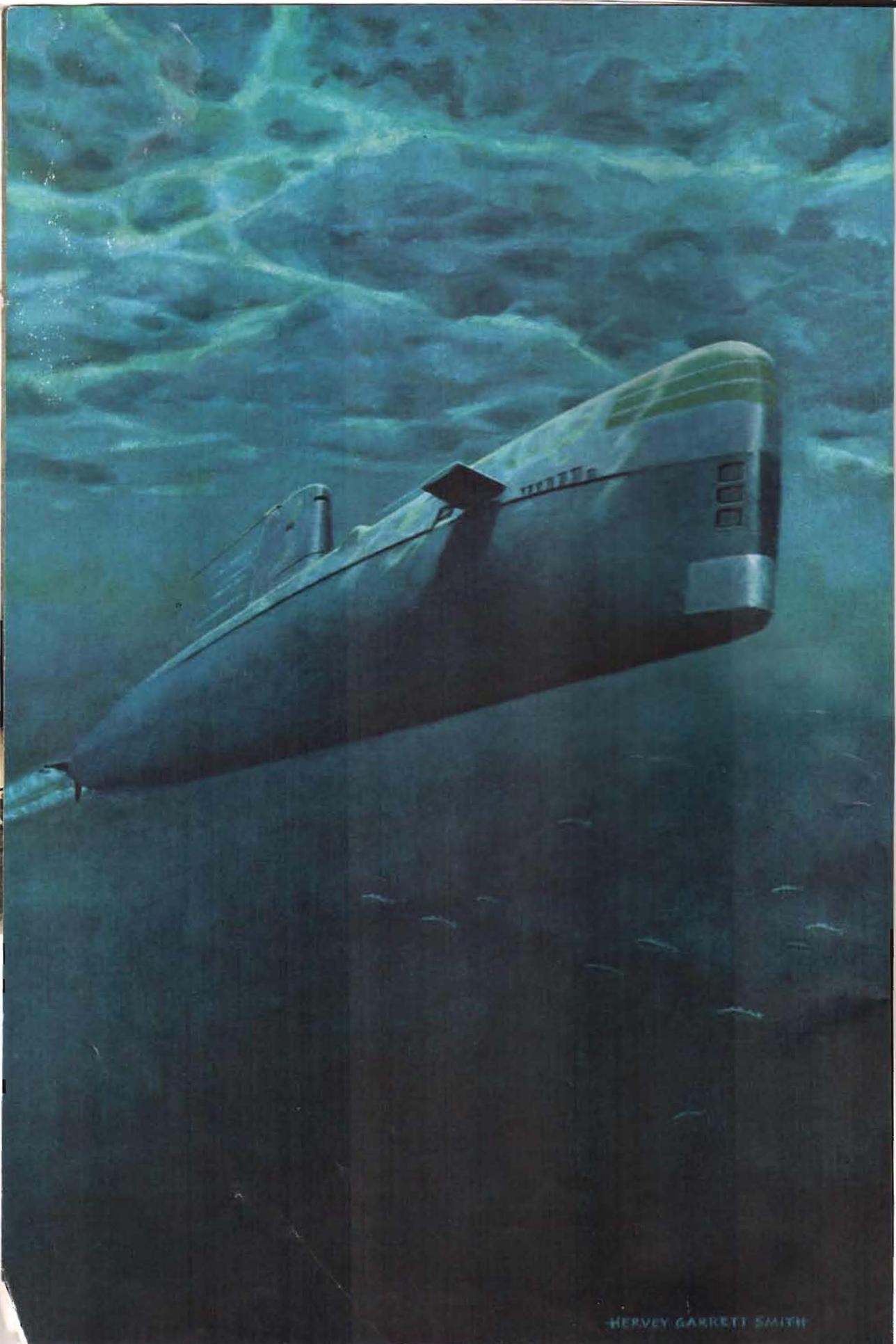
Out into the Arctic air crackled a second message, again for relay to Adm. Arleigh A. Burke, Chief of Naval Operations:

"Ninety-six hours, Point Barrow to the Greenland Sea."

Two terse reports... a scant dozen words. Yet, in essence, they told a complete and dramatic story. *Nautilus* had safely concluded a voyage without precedent, one that, within hours, would be headlined around the world.

It was the morning of August 5, 1958. On the surface and basking in unaccustomed sunlight, we cruised south in calm waters between Greenland and Spitsbergen. To north and west we could see the stark outlines of our conquered adversary, the ice pack of the Arctic.

Our nuclear-powered submarine had sped 1,839 nautical miles beneath that treacherous



mass, completing in four days the first submerged voyage across the Arctic Ocean. En route she had become the first ship in history to reach 90° north latitude—the North Pole (map, page 8).

A holiday mood prevailed throughout the ship. The jukebox blared its usual fare of everything from “Purple People Eater” to Hawaiian melodies. But, despite joking remarks and the noise of our record player, I suspected that many men, like myself, were offering silent prayers of thanksgiving for our swift and trouble-free journey.

*Nautilus*, while pioneering a new Northwest Passage, had carried 116 men in comfort that would have astounded the oak-tough individualists of past Arctic exploration. Yet the trip had not been without frustration and drama. Indeed, we had started our cruise feeling like conspirators in a mystery novel.

I began a personal log when we backed away from the pier at Pearl Harbor in the Hawaiian Islands. The first entry reads:

July 22—8 p.m. In spite of the hour, about 200 people are on the dock to see us off. Among them is Rear Admiral Grenfell, Commander Submarine Force, Pacific Fleet, one of the few here who know we are bound north. The last few days have been very frustrating. An elusive fault in our all-important master gyrocompass has kept us at the dock since Sunday on a two-hour readiness. It's pretty hard to enjoy Hawaii this way, and we are anxious to be off.

Reports from planes scouting ice above Bering Strait are encouraging. Looks like the ice is moving farther north each day.

*Nautilus* sped out the channel and turned to round Oahu Island. On deck seamen painted out the telltale white number, 571, on our sides. Our orders: Remain undetected and

conceal your identity until the trip is completed and an announcement made.

As far as the world and our families knew, we were making a long underwater endurance cruise to Panama. My wife Sally had listed shopping items for me to pick up in Colón, and the captain and executive officer, Lt. Comdr. Frank M. Adams, had accepted dinner dates with friends in the Canal Zone.

The reason for veiling our true mission was simple. The Navy had taken on a unique, exacting job; we must show we could do it before we talked about it. Moreover, our crew knew from rueful experience that bad luck might turn us back.

### Earlier Tries End in Defeat

From the deepwater Atlantic side, we had made three probes beneath the Arctic ice in August, 1957. On one of them we reached within 180 miles of the Pole, only to beat a reluctant retreat when an electric power failure shut down our master gyrocompass.

In June, 1958, we explored from the Pacific side, a far more difficult point of access. Layers of thick ice jam up in the narrow bottleneck between Siberia and Alaska. Running beneath that solid shroud is tricky, for water depths in the Chukchi Sea, lying between Bering Strait and the deep Arctic Ocean, average only 120 feet.

*Nautilus*, in June, had turned back after almost smashing into a deep floe—but more about that later.

Now we hopefully faced a new assault on the Arctic. The diving alarm sounded twice. With a rush of air escaping from ballast tanks, the ship tilted gently down. We were clear of Pearl Harbor and its shipping as we glided into the depths and checked for possible leaks in the thousands of valves and

### A Sleek Gray Shark Beneath Arctic Ice, *Nautilus* Heads for the North Pole

Hardly a century after Jules Verne's Captain Nemo took the fictional submarine *Nautilus* under the Antarctic ice, history's first transpolar voyage became reality with the crossing of the Arctic by another *Nautilus*, the world's first atomic submarine.

In this cod's-eye view, a luminescent wake betrays the motion of the ship as shallow water in the Chukchi Sea forces her close to the surface. “The ice,” says skipper Anderson, “looks like the inside of a fish bowl that hasn't been cleaned for three years.” Sunlight filtering through open leads weaves a web of soft green.

Little disturbs the vessel's smooth contours save the lofty “sail” that houses antennas and periscopes, the bulges of sound equipment, and two stubby fins. Torpedo ports suggest windows; sonar panels on the bow probe ahead for inverted ice peaks that extend downward as much as 85 feet. Twelve-inch tomcods share the icy Arctic waters.

This painting of *Nautilus* under the ice pack's dark and jagged curtain was done for the NATIONAL GEOGRAPHIC MAGAZINE by the noted marine artist Hervey Garrett Smith, who painted the *Mayflower II* for the November, 1957, issue.

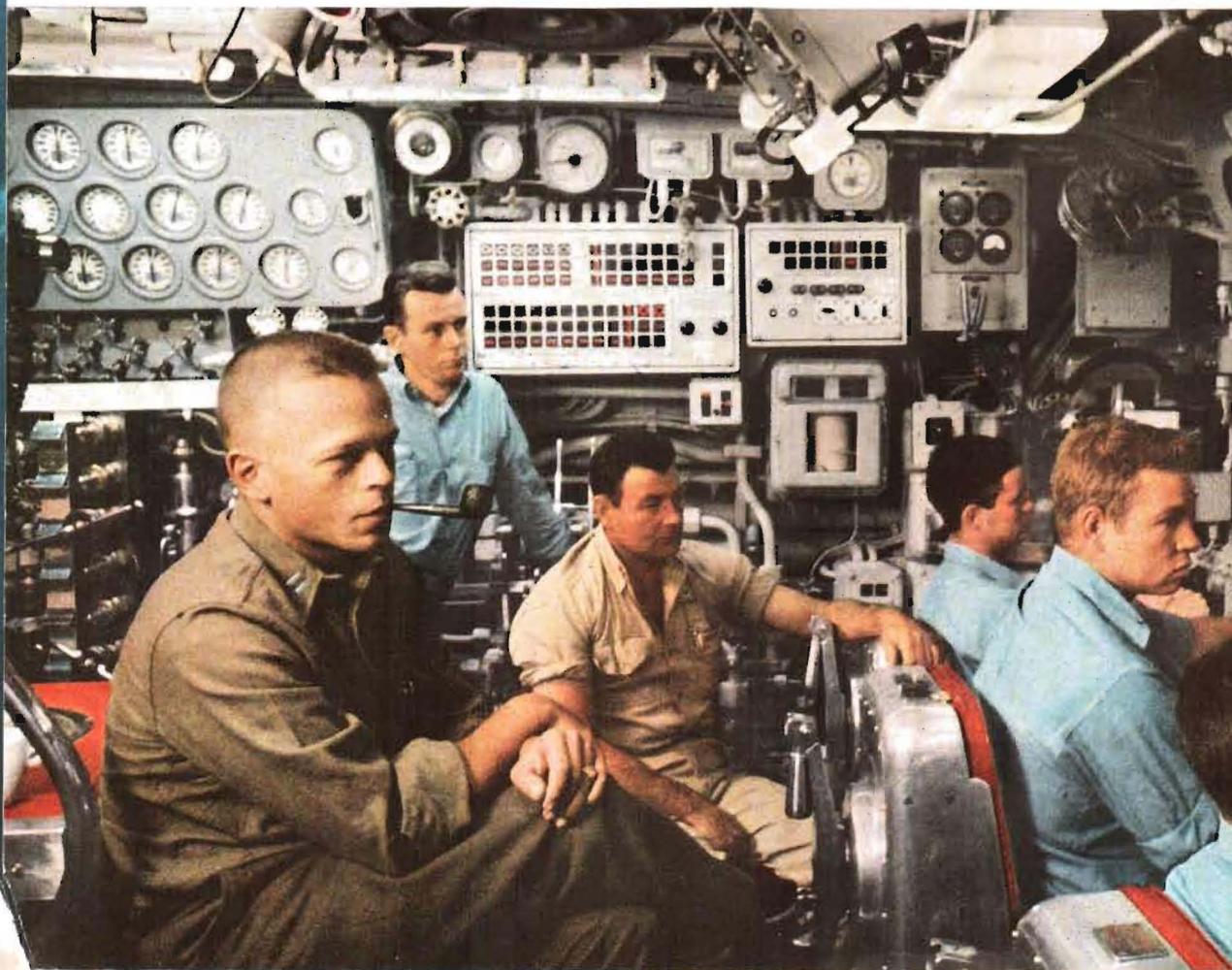
### After 4 Days Under Ice, the Submarine Surfaces

*Nautilus's* heroic exploit is safely ended, and the dramatic news has just been flashed to the world; more than 1,800 nautical miles of ice lie behind. Lookouts see nothing ahead but the open Greenland Sea.

Smooth-running beneath the water, the submarine kicks up a heavy bow wave on the surface because of her stubby prow. Fins or bow planes, so clearly seen on page 2, are folded back to protect them against the pounding waves.

Cruising at 400 feet at a speed exceeding 20 knots, *Nautilus* runs on automatic pilot while crewmen in the control room watch course, depth, and speed.

On orders from the attack center (opposite), the men swiftly change depth or course.

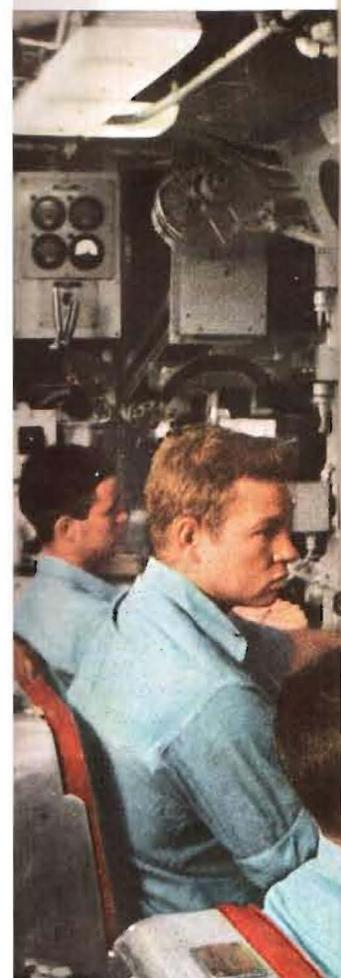




KODACHROMES BY JOHN J. KRAWCZYK © NATIONAL GEOGRAPHIC SOCIETY

In the attack center Lt. Lalor, serving as conning officer, computes the ship's position. A periscope housing shines blue behind him; sonar screens and inertial navigator are close by. After the voyage, clock at right was given to Mrs. Dwight D. Eisenhower, who christened *Nautilus*.

5



fittings crammed into the 27-foot-diameter hull of *Nautilus*.

We were in our natural element. Down below, the water is always calm. Storms, seasickness, or fog never interfere. There was practically no vibration to disturb my pen, though we moved at more than 20 knots.

Temperature aboard *Nautilus* is 72°, winter and summer, Arctic Ocean or the Caribbean. She carries tons of air conditioning. The humidity remains always below 50 percent.

Now, as we cruised northward, automatic devices kept our blunt bow on course and our hull at exactly 300 feet. Teams began a careful final inspection of the ship for fire hazards—serious on any submarine, of course, but doubly so under ice, where finding a hole big enough in which to surface or raise our air-intake snorkel to clear smoke might be hard.

#### Aircraft Scout the Arctic Ice

We traveled deep most of the next day, July 23, before coming up near the surface to copy radio traffic. Low-frequency waves from powerful Navy shore stations penetrate water, but not down to 300 feet. We received another message about ice conditions.

Early in July Lt. Shepherd M. Jenks, our navigator, had flown to Alaska to set up ice-reconnaissance flights to Point Barrow and west along the pack boundary. Our naval aviator friends didn't know whom they were helping. Their latest relayed report said the ice still receded, although the Alaskan shore just west of Point Barrow was cluttered.

The next night our daily paper, whimsically named the *Panama-Arctic-Pearl-Arctic Shuttle Boat News*, featured Engineman 1/c Harry D. Hedin's eight-pound baby girl—number three. The radio had told Hedin of her birth.

In the crew's mess I watched *The Lieutenant Wore Skirts*. Friends at the movie exchange in Pearl had been kind to us—38 movies on board. Fifty men lounged in our spacious—by submarine standards—recreation center, with its hi-fi, tape recorder, library, and magazine racks (page 15).

July 25—We are moving along at a very fast clip for the Aleutians, now only 400 miles away. Everything is working smoothly. Even our balky master compass performs perfectly, and the propulsion plant purrs like a fine watch.

I had turned over the job of navigator to Shep Jenks in January; since then I had been in charge of propulsion-plant machinery: tur-

bines, condensers, pumps, piping, valves, steam system, and the mechanical components of the reactor plant. After three and a half years of operation, our nuclear power plant still seemed a marvel. It had propelled *Nautilus* more than 120,000 miles.

In the reactor compartment upper level, shielded from the lower level by a deck covered with lead and polyethylene, we cannot even hear the sealed pumps. They move primary water in a closed loop through the reactor and two heat exchangers. The primary water picks up the heat of controlled nuclear fission and transfers it to unpressurized secondary water, which boils into steam. Pipes carry the steam to two turbines driving nine-foot propellers and to four turbogenerators. These generators furnish electricity for lights, motors, cooking—everything, in fact.\*

A four-hourly report comes to the conning officer and the engineer officer from our ship's doctor, Comdr. Richard F. Dobbins: "Oxygen 20.3 percent, carbon dioxide 1 percent, carbon monoxide 10-20 parts per million."

This tells us that our sealed atmosphere is healthful—almost as good as the air outside. Oxygen is kept at a uniform level by "bleeding" it into the ship from bottled stowage in tanks around the hull. Machines called burners and scrubbers hold carbon monoxide and carbon dioxide at very low levels.

To keep any possible radioactivity in the ship at a minimum, Dr. Dobbins has stored all radium-dialed wrist watches in a sealed can. Each day a voice solemnly intones over the speaker, "Now Doctor Dobbins, wind all watches in your care."

July 26—We are approaching the Aleutian island chain. At 3 p.m. we crossed the Aleutian Trench, a 40-mile-wide 25,000-foot foredeep running east and west parallel to the Aleutians for almost 1,000 miles. We're able to check our latitude very closely by Fathometer.

The Fathometer, a sonar device, measures distance to the bottom by computing the time required for a sound signal, moving at 4,800 feet per second, to travel from ship to ocean floor and back. Since the trench had been accurately charted, its recognition on the Fathometer confirmed our position.

*Nautilus* also now carried half a dozen echo sounders topside. They would show distance

\* See "You and the Obedient Atom." by Allan C. Fisher, Jr., NATIONAL GEOGRAPHIC MAGAZINE, September, 1938.



### Captain Anderson Briefs His Officers on Ice Conditions Ahead

In the officers' wardroom, the 37-year-old skipper sketches a route in the Navy's Ice Atlas, a month-by-month chart showing the changing ice pattern.

Surrounding him, from left: Lt. John W. Harvey, reactor control officer; Lt. Comdr. Frank M. Adams, executive officer; Lt. Steven A. White, diving officer; Lt. Kenneth M. Carr, electrical officer; author Lalor; Capt. Jack L. Kinsey, a medical observer; Dr. Waldo K. Lyon, naval ice expert; and Lt. William S. Cole, Jr., electronics and supply officer.

Mail from the Pole is stamped with the *Nautilus* cachet. Some 1,500 friends, relatives, and distinguished persons received the coveted covers. The red-and-black cachet required two stamps. That at left, resembling the ice pack, outlines Oahu, where the voyage began.

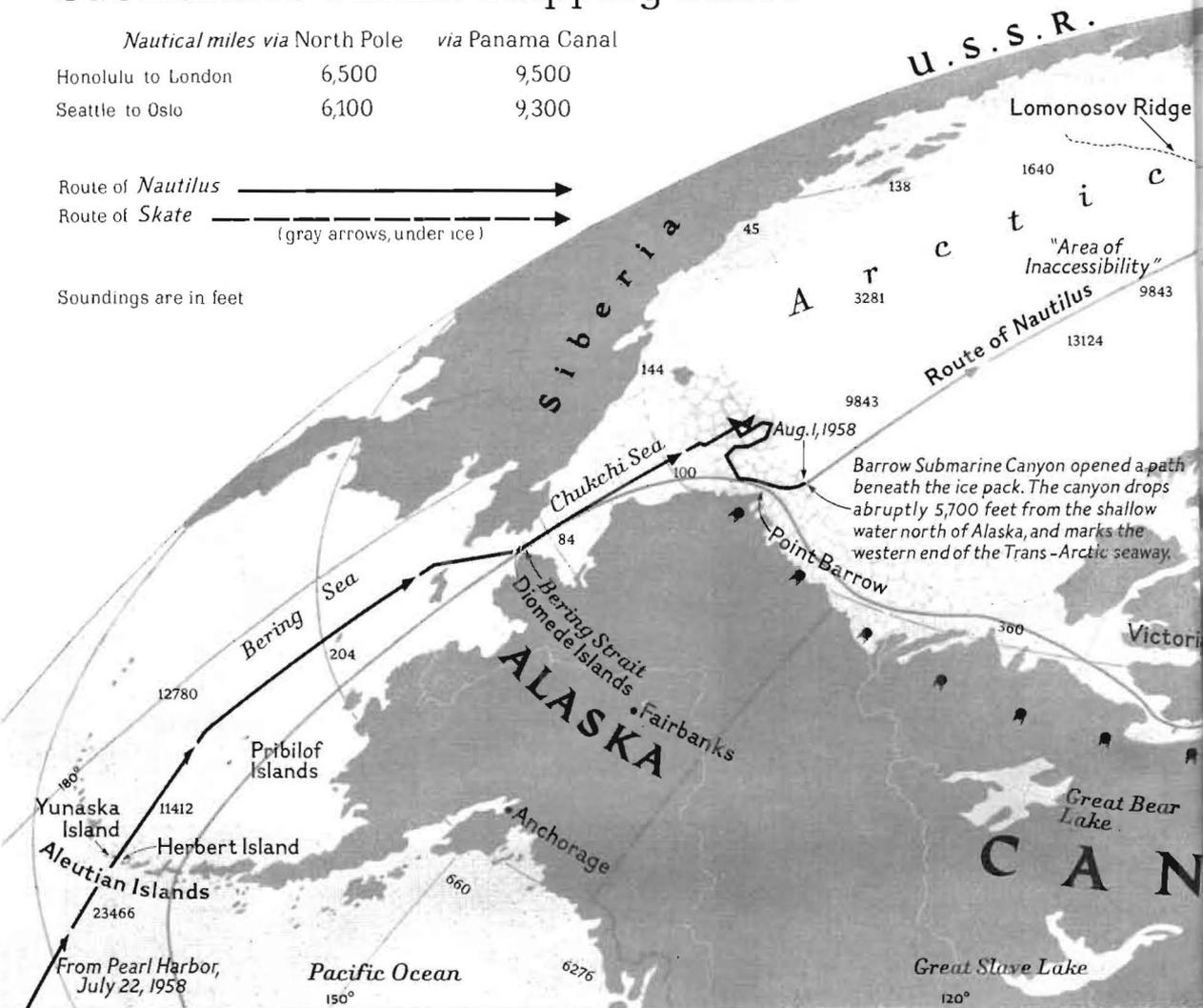


# Submarines Shrink Shipping Lanes

	<i>Nautical miles via North Pole</i>	<i>via Panama Canal</i>
Honolulu to London	6,500	9,500
Seattle to Oslo	6,100	9,300

Route of *Nautilus* →  
 Route of *Skate* →  
 (gray arrows, under ice)

Soundings are in feet



Barrow Submarine Canyon opened a path beneath the ice pack. The canyon drops abruptly 5,700 feet from the shallow water north of Alaska, and marks the western end of the Trans-Arctic seaway.

## *Nautilus* Recorded Water Depths and Ice Thicknesses Across the Forbidding Arctic,

to the ice above by sending signals straight up. In addition, a television camera would eye the ice and relay to our monitor screens pictures of ice formations scudding by like clouds. This battery of vital gear was the special charge of Dr. Waldo K. Lyon, distinguished Navy scientist, ice expert, and veteran of 13 Arctic expeditions.

By 9 p.m. on the 26th we were between Herbert and Yunaska Islands in a pass little used by other ships. The periscope confirmed our position; we slipped through into the Bering Sea and returned to high speed.

In the wardroom a group of officers prepared to give promotion examinations to some of the enlisted men. They would do well, as always. We have had 55 men advanced to officer status in 3½ years.

July 27—Still in deep water just north of the Aleutians. The Pribilof Islands, with their huge seal fisheries, lie well to the east. Finally at 4 p.m. we are forced to slow

down... came up from 300 feet to 150 feet. Soundings continuously now instead of every 15 minutes. We've crossed the 100-fathom mark and the deepwater honeymoon is over.

Our North Pole celebration committee, headed by Capt. Jack L. Kinsey, a medical observer from the Navy's Polaris submarine missile program, met behind closed doors. Meanwhile, many men spent their spare time working on two contests, one for design of a ship's flag to commemorate the crossing, and another for an appropriate name to give those who made the transpolar voyage. Some of the interest in these contests may not have been entirely due to the celebration; the prizes were three days of liberty in Europe.

At 11:30 p.m. on the 27th, the quartermaster awakened me and handed me a pair of red goggles. Time for my watch again. As conning officer, I had to wear the goggles until I had a cup of coffee and went back to the



### Opening a Submerged Northwest Passage for the Atomic Cargo Fleets of the Future

darkened attack center. We keep the center lighted only by red lights between sunset and sunrise, so that our eyes are always adapted for night vision should we have to come up during darkness and use the periscope.

Down the ladder in control, the diving officer reported to me that depth and course held well, the compasses checked with each other, and the sounding showed 300 feet. I relieved the watch and made another careful check of positions plotted on the chart.

While doing so, I reflected on the navigational complications we would face when we were under the ice pack. Beneath that massive canopy we could not confirm our position by observational fixes or by radar. Success or failure would hinge upon how well we used five sensitive navigational aids.

*Nautilus* carried two magnetic compasses. Errors would creep into their readings, of course, for this type of compass is not wholly reliable so near the North Magnetic Pole. It

tends to wander and finally, at the Magnetic Pole itself, to spin erratically.

We also had on board two fine gyrocompasses, one of them the master. You can point a gyrocompass at north and it will cling there, provided you compensate periodically for changes in the speed of the earth's rotation. This speed lessens as you journey north.

Our ace in the hole, however, was an amazing instrument called an inertial navigator, an aid we had lacked in 1957. Its stable platform points always at earth's center. Two instruments on the platform sense changes in acceleration, and hence changes in direction and speed, somewhat as a blindfolded person in a car can interpret movement by sensing how his body reacts against the seat as the car speeds up, brakes, or turns.

A computer records the machine's signals and disgorges information for us. In effect, this brainy navigator shows where it is by remembering where it has been.



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A circled cross on sea ice marks earth's northern apex. *Nautilus's* voyage came almost half a century after that historic day in April, 1909, when Comdr. Robert E. Peary and five companions became the first to stand atop the world. This photograph, the first to pinpoint the Pole from the air, was made in 1953 by Gilbert Grosvenor, then President of the National Geographic Society. He and Thomas W. McKnew, The Society's Secretary, retraced Peary's route by plane on an Air Force polar flight; they described their trip in the October, 1953, issue of the NATIONAL GEOGRAPHIC MAGAZINE.

Frosting on a cake baked for the celebration on reaching 90° N. reproduces *Nautilus's* polar flag.



3:20 a.m. Sounding 130 feet.

I had slowed *Nautilus* to 10 knots. She measures 50 feet from keel to the top of her "sail," the streamlined tower housing periscopes and antennas. Therefore, at this shallow depth, we had only 80 feet of water for maneuvering.

Later, just before turning in, I commented to Doc Lyon how quiet the ship had become at 10 knots. He had noticed it, too. There was absolutely no vibration or sense of motion, no sound of water rushing by along the hull. I felt suspended, as one might in space.

July 29—By 1 a.m. we were well into Bering Strait. Visibility was very poor, but we got a quick radar position from the Diomedes and Fairway.

Our radar fix also had given us a good check on the inertial navigator. It was performing like a champion—testimony to the hard work of Tom Curtis and George Bristow. These two gifted engineers had been assigned to us by North American Aviation, Inc., builders of the inertial system. Its mechanism was designed to guide the Navaho missile on a three-hour 1,500-knot flight, but we had had it working now for weeks in a submarine.

At 6:25 a.m. on the 29th, everyone on board became Bluenoses again as we crossed latitude 66°33' N.—the Arctic Circle. We were making good progress. Our spirits rose when, later that day in the Chukchi Sea, we safely passed the point of our near disaster of the previous June.

With the exception of the captain himself, perhaps I had more reason than the others to recall vividly that harrowing ordeal. I had been the conning officer, responsible for the safe maneuvering of the ship. At that time the Chukchi ice stretched farther south, and *Nautilus* had ducked beneath the pack.

The Fathometer showed only 160 feet of water. Yet it seemed unlikely that the congealed mass overhead would reach down to us. Instruments tracing the ice contour revealed underwater ridges averaging only 10 feet deep.

But sonar soon picked up deep ice ahead. With much inner apprehension, I watched the ink recorder draw the profile of a jagged tongue 62 feet down, a depth we had never before experienced. It cleared our sail by eight feet. Quickly I slowed the ship and called Commander Anderson.

Without hesitation, he ordered me to turn around and ease down to 140 feet, only 20 feet off the bottom. *Nautilus* was still in her

turn when sonar reported a massive ice ridge stretching more than two miles across our path. It could not be dodged. Instinctively, while staring hypnotically at the swooping pen of the recorder, we ducked our heads.

The ridge cleared us by a mere five feet; its depth: an incredible 85 feet. As Commander Anderson remarked to me later, "God's hand was on my shoulder when I said make your depth 140 feet instead of 130 feet." Ice has the consistency of a poor grade of concrete, and the ridge would have damaged our sail severely. There had been no sense in continuing, for 300 miles of shallow water lay ahead. We had set course for Hawaii.

But now, late in July, that incident was only a haunting memory. Again we dared the Arctic, and we sailed a lucky ship.

July 30—1 a.m. At periscope depth, 15 knots, visibility poor to fair.

When I took over the watch from Paul Early, he pointed out our first ice of the trip through the periscope. It was a lone floe, about 100 yards long, which we easily dodged. It looked like a beautiful sailing ship moving majestically by, reflecting a rainbow of colors.

An hour later I sighted a two-foot transparent chunk of ice ahead. In a few minutes, scores of these pesky blocks surrounded us, and the captain reluctantly decided to surface and get a better look at the situation.

Pack in sight to the west. One ice cube on deck recovered and preserved in the freezebox.

Nearly a month later, in New York, we presented that chunk as a souvenir to Rear Adm. (now Vice Adm.) Hyman G. Rickover, whose ingenuity and tireless drive had been so largely responsible for construction of *Nautilus*, world's first atomic submarine (page 19).

Cruising slowly south, we began a disheartening routine that held for the next 24 hours. Since ice loomed to the west and the sea that way was shallow, we turned east and then north again, hoping that the pack boundary would be closer to deep water along the new approach. Our object was to reach at least 300 feet of ice-free water before diving.

My log shows the way it went:

July 30—3 a.m. Clear of ice . . . 4 a.m. Turned north after running east 15 miles. Visibility changing from 10 miles to 300 yards. Complete overcast . . . 1:20 p.m. Pack edge at 72°24' N. Close but no cigar . . . 6 p.m. Five miles farther east. Pack

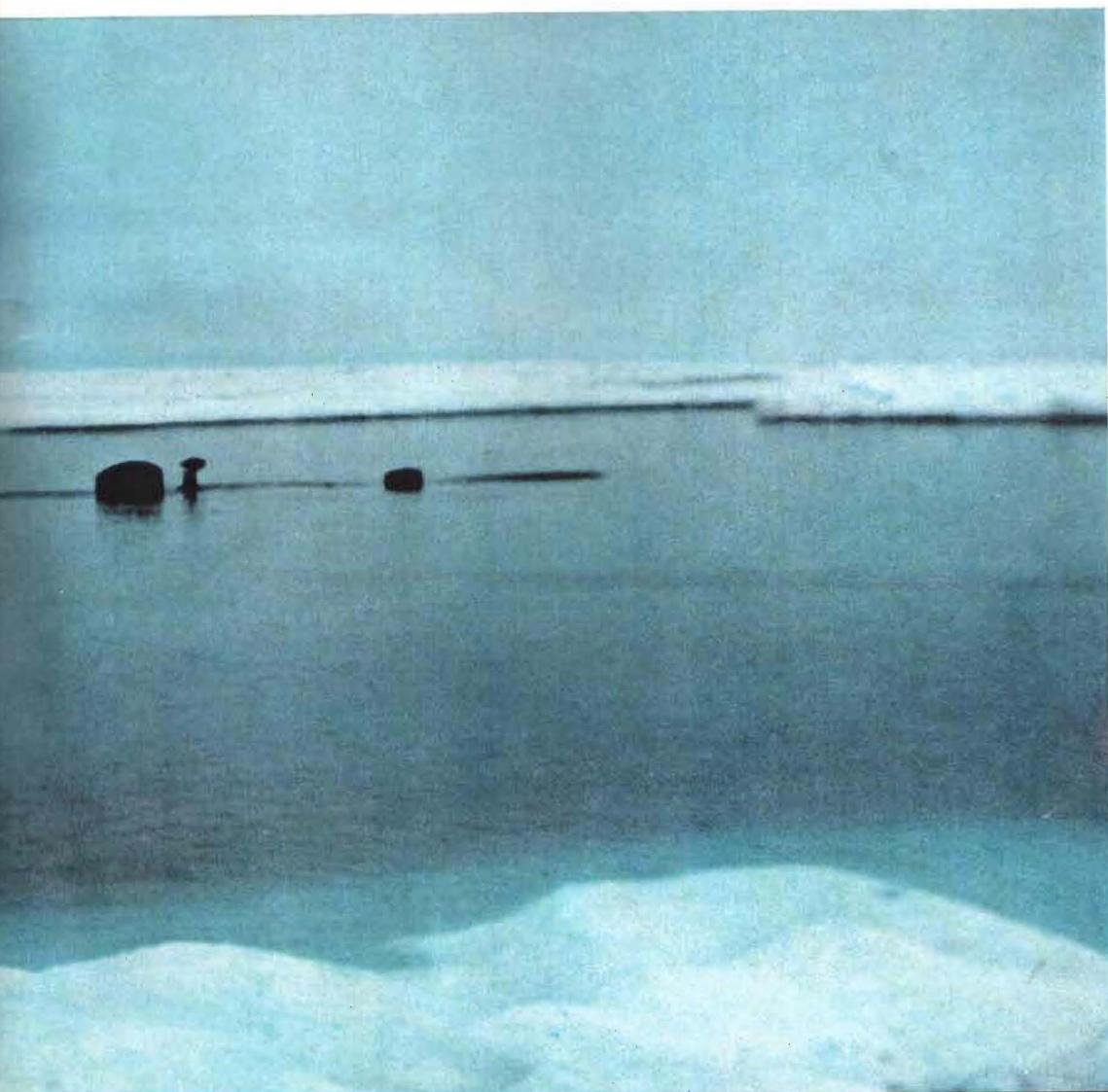


Going . . . going . . . A few days after *Nautilus* crossed the top of the world, the Navy's third nuclear submarine, *Skate*, followed to make under-ice studies. During 10 days beneath the pack, *Skate* reached the Pole twice and frequently surfaced in open leads. Here, in a blue Arctic gloom, she begins to submerge after visiting Station Alpha, a United States IGY post on sea ice 300 miles south of the Pole.

KODACHROMES BY KENNETH HUNKINS © NATIONAL GEOGRAPHIC SOCIETY



Gone . . . Only the periscope remains as *Skate*, with infinite caution, drops straight down. Submersion took 15 minutes. Seven-eighths of each floe lies threateningly below water. 13



edge at 72°15'... 12 p.m. Fifteen miles more to the east. Pack in sight all along to the west...

July 31—1 a.m. Turned on our radar and picked up ice ahead at about 30 miles. We may make it. Visibility and speed variable. Captain up almost continuously now. Going to catch cold on the bridge. It's between 35° and 45° but raw. Sea is flat calm. Many walruses in sight...

2 a.m. 72°45' N. 165° W. End of the line. Solid ice to west and north, also 15 miles to the east. Moved into pack but deepest water only 180 feet. We couldn't make it this way. At 4 a.m. the captain ordered course set for Point Barrow.

Now we would try to find a deepwater lead by moving in toward the Alaskan shore.

Quartermaster Richard Williamson came up on the bridge and took a long look at the dirty, heavily ridged ice.

"Do you mean to say that men ever ran dog sleds over that? Some of those ridges are 30 feet high," he said.

I, too, wondered how they did it. We owed a great deal to those men—Peary, Nansen, Sverdrup, and many others. Without the information they obtained so heroically, *Nautilus* would not be venturing into the Arctic.

At 4:37 a.m. on August 1, we cruised north of Point Barrow, invisible just over the horizon. The Fathometer, whose moving arm had been monotonously showing 160 to 180 feet of water, now suddenly indicated 420 feet. There was jubilation in the voice of Chief of the Watch John J. Krawczyk as he called the bridge on the intercom. We were there—in a tongue of the deep Barrow Submarine Canyon, which should lead us north to the even deeper Arctic Ocean. This tongue had been discovered previously by icebreakers.

The captain, in the attack center, spoke to Lt. Robert Kassel on the bridge. "When you are ready, clear the bridge and submerge."

The diving alarm honked twice; in a minute *Nautilus* slipped beneath the sea. The ship eased down to 200 feet, 300, then deeper, as we followed the ever-deepening bottom. Hereafter we would be measuring depth of water in hundreds of fathoms rather than feet.

The captain, exec, navigator, and others plot our position with extreme care. Compasses are watched constantly, checked one against the other. The inertial navigator, with sleepless Tom Curtis watching it like a worried mother, clicks cheerfully. Our major problem now: navigation.

Men on watch—those by the shiny stainless-steel reactor cylinder, those carefully checking temperatures near the humming turbines, and the men in the control center—do exactly what they do any time at sea. Their job is the same, surfaced, submerged, under ice, or in clear water: answer the bell. Telegraphs read "Ahead Full" now, and they won't change for four days.

Our undersea "ears," the echo sounders, give out a cacophony of sounds. From the control room I can hear one instrument bouncing signals off ice or open water above us. It chirps when an echo returns from open water but sounds a dull thud when the echo returns from ice. I can also hear a Fathometer sounding the bottom, and the bow-mounted sonar probing ahead for submerged mountain peaks or ice in our path.

By 4:30 p.m. we had reached 74° N. with things looking good. Went up slightly to blow sanitary tanks and eject garbage. When we eased back down the captain watched the ice again for a while. We went to 20 knots, one degree of latitude every three hours.

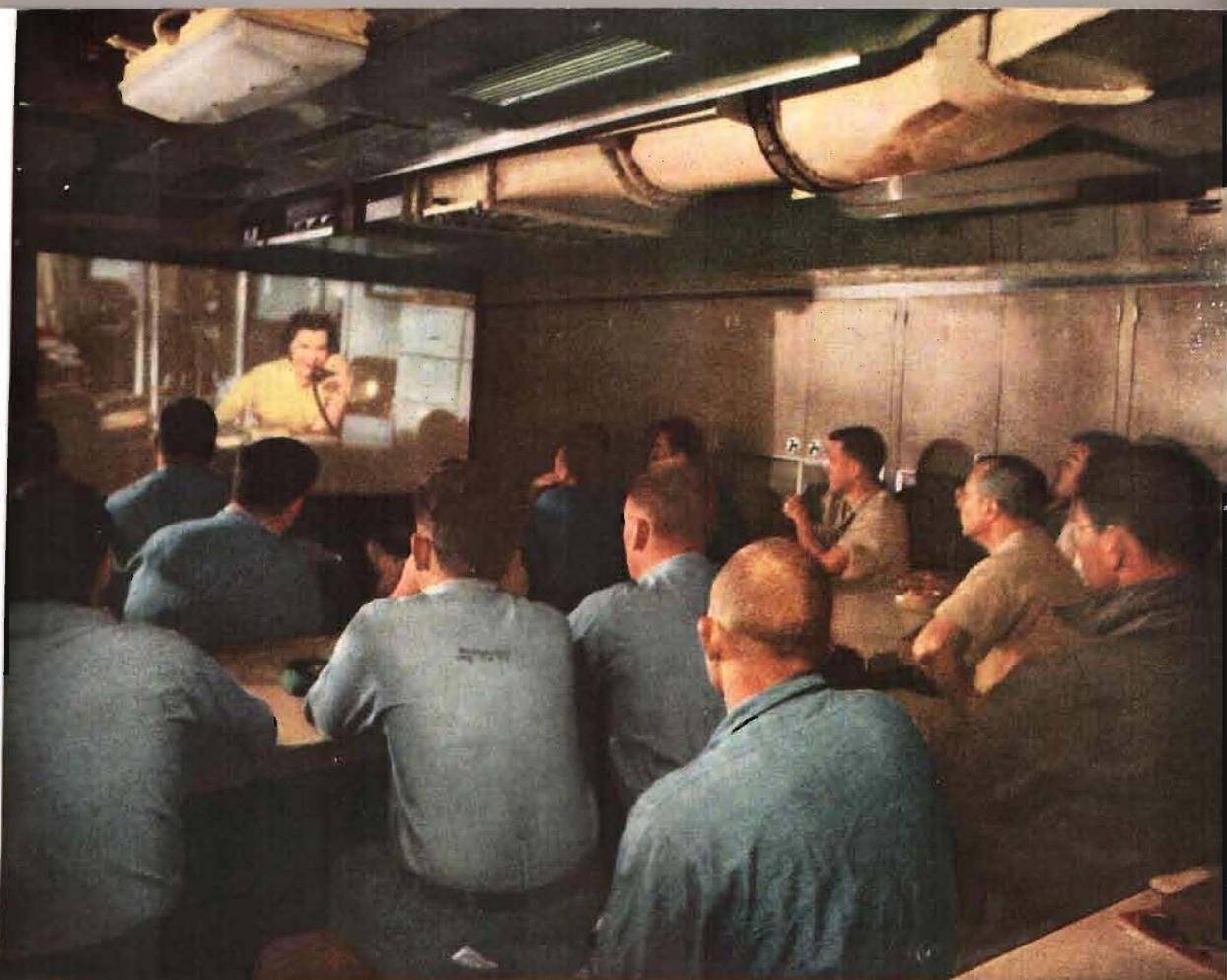
The ice seemed meaner to us than it did in 1957, much more rough and jagged. Dr. Lyon thought it was because his equipment was better, more sensitive than before.

Watching the ice trace coming from our sonic recorder, I felt glad for Sir Hubert Wilkins's sake that his old submarine, also named the *Nautilus*, did not get under the ice pack in 1931. A stern-plane failure balked the attempt. He was certainly ahead in his idea of using a sub under the Arctic ice, but the runners he was going to use to slide along under the floes would just not have worked. Too many ridges! Moreover, only an atomic sub, its propulsion plant independent of the atmosphere, could traverse the Pole safely.

August 2—At Lat. 76°22', soundings went from about 2,000 fathoms to 500 fathoms very abruptly. We were crossing a 9,000-foot submerged mountain range, uncharted and unknown. This feature continued for 70 miles, when the soundings just as abruptly smoothed out again, about 2,000 fathoms...

80° N.—600 miles from the Pole, and 1,200 miles from the ice edge in the Atlantic. Just past noon we shifted our master compass to a high latitude mode. Everything checks perfectly...

Big news! Lt. Wes Harvey announced the



### Men Off Duty Watch Movies Under Polar Ice

This mess room holds 32 men at a meal, 50 at a movie. It may be converted into an operating room.

Night and day are indistinguishable during long submerged runs. To relieve monotony, *Nautilus* shows films twice a day and maintains jukebox, tape recorder, library, soda vendor, and an icebox that may be raided at will.

Lockers along the wall store 90 days' provisions.

The *National Geographic* shows Quartermaster 1/c Ronald L. Kloch what he may see when *Nautilus* reaches England. He looks at Westminster Palace in the July, 1958, issue.



winners of the flag-design contest, Electronics Technician 1/c James P. Knotts, Chief John Krawczyk, the photographer for this article, and Electrician's Mate 2/c James A. Morley.

Chief Sonarman James R. Norris was declared winner of the second contest. His name for transpolar veterans: PANOPO (Pacific to Atlantic via the North Pole).

A paper blizzard engulfed the wardroom. Letters were being prepared, for signature at the Pole, to families, friends, and others most closely connected with *Nautilus* and this voyage. Yeoman 1/c Charles A. Payne groaned when he saw the work piling up.

These letters would go out later with our North Pole cachet and postmark. Engineman 1/c Ernest F. Holland carved the postmark from a sheet of rubber. A commercial firm in Hawaii made the cachet for us with the words "Pearl Harbor" in the center. We substituted "North Pole," and Oahu Island became the ice pack (page 7).

Passing through fairly light ice now—six-tenths coverage with many large water openings suitable for surfacing as we near the Pole of Inaccessibility.

This imaginary area is supposed to be the hardest to reach in the Arctic, almost the geographic center of the ice pack. It was located by taking all the points reached in the Far North by ship or sledge and then marking the center of the unexplored region. I found it hard to imagine the grinding floes and bitter cold overhead as I sat in my shirt sleeves, smoking my pipe and writing to my wife and my small sons Billy and Michael.

August 3—10 a.m. Latitude 87° N.  
Passing history's, and our, farthest point north by ship.

Soon the bottom rose up again as we crossed the Lomonosov Ridge. This 9,000-foot mountain range is named for the Russian scientist who first predicted its existence from geophysical studies of the earth's crust.

I had hoped we would reach the Pole on my watch, but it was not to be. Close, but still some 75 miles to go when I went off duty.

Dinner was delayed to allow party preparations to go on in the crew's mess. Leading cook Jack L. Baird put the finishing touches on his North Pole cake, with the replica of our



*Skate* Moors to the Ice  
Near the Huts of Station Alpha

Said the IGY station commander: "Watching *Skate's* periscope come slowly up in our little lake was the eeriest experience of my life."

polar flag as icing (page 10). Ship's cameramen set up floodlights; another group prepared a tape recorder.

I sat with the captain in the wardroom as he signed letters and put the finishing touches on those to the President and to the ship's sponsor, Mrs. Eisenhower. Frank Adams came in.

"Two miles to go, captain." The jukebox was turned off, and the captain spoke briefly and movingly over the intercom:

"With continued good fortune, *Nautilus* will soon accomplish two goals long sought by those who sail the seas.

"First, the opening of a route for rapid voyages between the great Pacific and Atlantic Oceans.

"Second, the attainment of the North Pole by ship.

"Thus our remarkable ship has been blessed with her greatest opportunity—the discovery of the only truly practicable Northwest Passage. On this historic Sunday, August 3, 1958, let us offer our thanks to Him who has blessed us with this opportunity and who has guided us so truly...."

We observed a moment of silent prayer. As *Nautilus* approached the Pole, the captain began a countdown: "8...6...4...2...1...Mark! August 3, 1958. Time, 2315 (11:15 p.m.) Eastern Daylight Saving Time. For the United States and the United States Navy, the North Pole."

A dream had become reality. We had arrived. Sounding, 13,410 feet, a lot of water.

As we watched in awe, our gyrocompasses swung, finally to point back to where we had been. Tom Curtis was manipulating his slide rule beside the inertial navigator. I asked how close we had come to the exact Pole.

"We pierced it, Bill."

In the crew's mess, Electrician's Mate 1/c James R. Sordelet came forward, and the captain swore him in for another six years in the Navy, the first man to re-enlist at the Pole. Eleven others received the captain's congratulations for completing their qualification in nuclear submarines. Behind them was up to a year of making drawings, checking pipes, switches, valves—everything in our 320-foot-long ship.

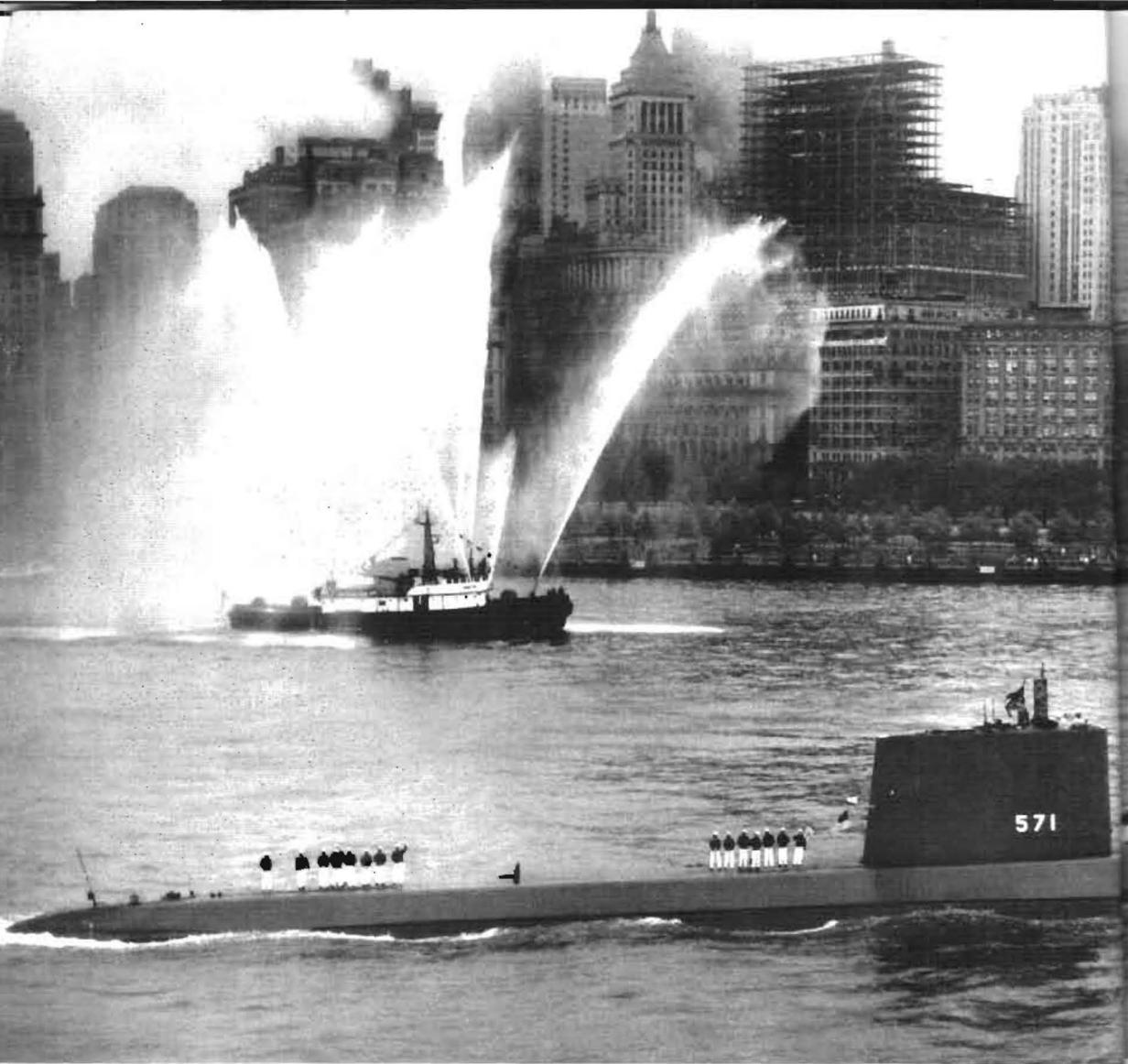
"What are you doing dropping garbage



U. S. NAVY, OFFICIAL

Quonset-type huts of insulated canvas sheltered the 29 Air Force men and civilian scientists of Alpha. Drifting one to three miles a day on their

half-square-mile ice floe, they studied weather, oceanography, and geophysics, until severe polar storms forced abandonment last November.



all over my front lawn? Merry Christmas!"

Engineman 2/c William J. McNally, Jr., as Santa Claus, appeared in a costume the quartermasters made from some red flag material and cotton. He had "a message for the children," and then it was time for our steak dinner and North Pole cake.

Now that the Pole lay behind us, however, we had another goal and job to do. We had to reach the Atlantic, completing our transit of the Arctic Ocean safely.

Actually, all of us knew that we were now playing a game of longitude roulette for very high stakes. At the North Pole all directions are south, and an error in navigation could head us for the U.S.S.R., Alaska, or Canada instead of for our planned exit into the Greenland Sea. Concentration on our instruments never flagged for a moment.

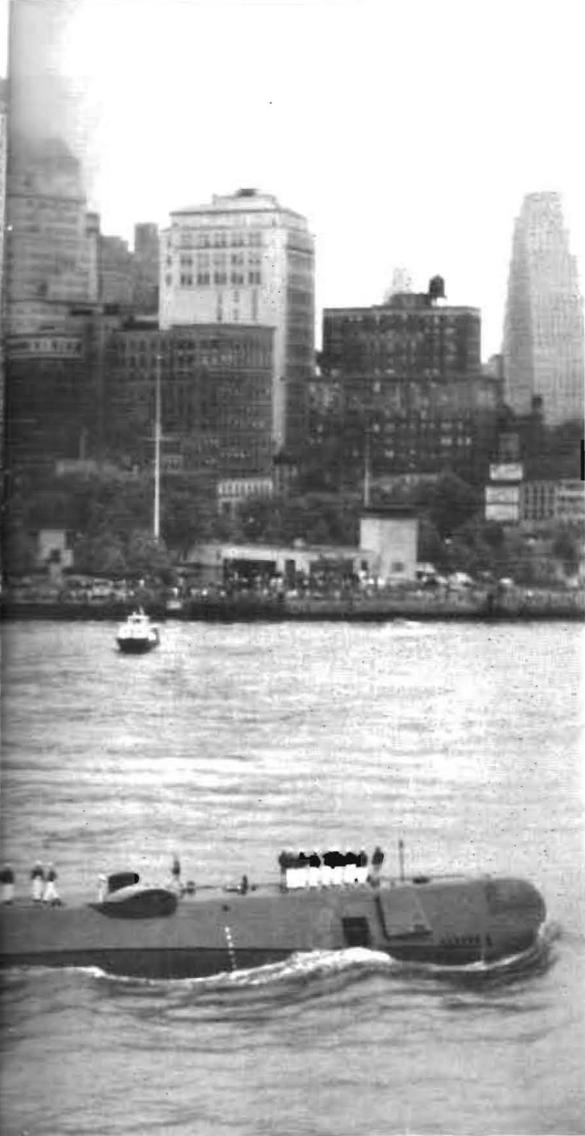
We steered for our old stamping grounds, a deepwater opening between Greenland and

Spitsbergen. There an arm of the Gulf Stream curved north, and we hoped to reach open water little more than 600 miles from the Pole.

I was sleeping when it happened, but at almost the same spot as in 1957, we lost the power supply to the master compass. Experience pays off, though. We had installed an emergency supply, and it took over without skipping a beat.

#### Ice Overhead Watched by Television

By noon of August 4, when my watch began, we were feeling so good that we decided to divert ourselves with television—"Polar TV network, Channel 571," we dubbed our underwater ice observation hookup. It had been installed primarily for finding small ice in otherwise open pools. In 1957 one bent and one ruined periscope had taught us the danger of being in a hurry when surfacing in ice, and the limitations of our sonar.



U. S. NAVY, OFFICIAL

Fireboats cascade greetings as *Nautilus* traverses New York Harbor after her 6½-day Atlantic crossing. Crewmen on deck eye lower Manhattan, their first glimpse of the United States east coast in four months.

A heroes' welcome met Commander Anderson and his men during the confetti-strewn ride up Broadway. The captain acknowledges a noisy ovation. Rear Adm. (now Vice Adm.) Hyman G. Rickover, father of the nuclear submarine, shares the glory. Their host is Richard C. Patterson, Jr., New York City's Commissioner of Commerce and Public Events.

The television received enough light to outline clearly the edges of floes; we watched the screen avidly.

August 5—In the hours past midnight, almost everyone is up waiting for us to clear the ice. The inertial system and our navigator's best plotted position from compasses and distance indicator are only 15 miles apart. Sea-water temperature is up to 38°, indicating we are in the right slot and running into the Gulf Stream branch. Soundings decreasing gradually, up to 700 fathoms, indicating we are passing over Nansens Rise between Greenland and Spitsbergen. Even the ice says we are approaching the edge. Many 400-yard holes, and a lot of 1- and 2-foot new ice.

By 2:30 a.m. soundings read 1,000 fathoms. Our position: 80°20' N., 2° E. We still had about 60 miles to go.

At 3 a.m. the bottom dropped suddenly to 2,500 fathoms. There was nothing like that on the chart, and we were in a fairly well-known area. In fact, we had explored this area ourselves in 1957 and had observed nothing over 1,500 fathoms. To add to the confusion, we found ourselves under a giant floe that seemed never to end, more than 10 miles long, 12 feet thick on the average, and with many 50-foot ridges.

All our confidence suddenly evaporated. Were we really in the right ocean? Nothing to do but go on. But, about 4 a.m., we had the expected signs again—water temperature up, 1,000 fathoms, thin ice.

At 5:12 a.m., quite suddenly, we ran into



NATIONAL GEOGRAPHIC PHOTOGRAPHER W. D. VAUGHAN



### Back from the White House, a Happy Skipper Returns to His Ship

A helicopter picked up Anderson at sea, and a plane carried him from Iceland to Washington, D. C. President Eisenhower decorated him with the Legion of Merit. The ship received the Presidential Unit Citation, first ever given in peacetime. The captain rejoined *Nautilus* just before her triumphal arrival at Portland, England.

open water. All sonars and the television gave negative ice reports. We slowed and eased upward to check.

*Nautilus* stopped dead and got a perfect neutral trim. Commander Anderson ordered the diving officer. "Bring me up. Make it about 10 feet a minute."

5:39 a.m. Hooray! Open water all around, ice visible to the north and west, but two-foot waves say this is the Greenland Sea.

In a short while our messages went out. Washington, New London, and Pearl Harbor could relax. And so could we, as *Nautilus* submerged again and barreled south toward Iceland. I turned in.

#### 1,500 Letters Mailed from Pole

The next two and a half days seemed one continuous, frenetic scramble as the crew prepared for the captain's departure. A helicopter was to pick him up off Iceland for a flying trip to Washington. We began to doubt that a helicopter would hold him and his luggage. He would carry some 1,500 letters from the Pole, reams of technical data, still and motion pictures, a chart and clock

for Mrs. Eisenhower. The paper flew as we passed lonely, volcanic Jan Mayen Island.

But very early on the 8th we were ready. Two seabags, two suitcases, a briefcase, and chart had been stacked in the wardroom. *Nautilus* lurked submerged 10 miles off the coast of Iceland; meanwhile, the captain took a nap, his last sleep for quite a while.

Right on schedule the helicopter appeared, we surfaced, and crewmen boosted the skipper into the hovering 'copter. *Nautilus* submerged again and loafed along toward Europe.

In the next weeks and months we would receive overwhelming receptions in England, New York, and Groton; honors, luncheons, speeches, letters, telegrams—enough to amaze us all. The first and most meaningful message, though, came that early morning off Iceland in a plain white envelope handed down from the helicopter. It was addressed to the "Acting Commanding Officer." Inside we found a letter that said:

"To the officers and men of the *Nautilus*. Congratulations on a magnificent achievement. Well done.

Dwight D. Eisenhower."