



Eugene LaFond

Last summer, Roger Revelle, “the man who lead Scripps to sea” died at the age of 82, bringing to an end an extraordinary career in science and humanities. Long-time friend and colleague, Walter Munk, offers these notes and memories of Roger and Scripps and what they meant to each other. The material was assembled at a small lake in Austria, where 37 years earlier, Roger and Ellen visited with Walter and Judith.

Inset. Roger Revelle, c1936.

Background. Roger Revelle with Allen bottle, n.d. [1930s]

THE REVELLE YEARS

by Walter Munk

ROGER WAS APPOINTED Associate Director of Scripps in March 1948, acting director in March 1950, and director in July 1951. After July 1958 when Roger became director of the newly formed Institute of Technology and Engineering, at the then University of California at La Jolla (in addition to his Scripps duties) his attention increasingly turned to the founding of UCSD. During this decade 1948 to 1958, between the ages of 39 to 49 years, Roger transformed the Scripps Institution of Oceanography into a global, seagoing enterprise, helped set the stage for plate tectonics and global warming, and played a leading role in upping national support for oceanography by an order of magnitude.

Roger had been with Scripps for 17 years (including a service leave USN) before assuming a position of leadership. Early correspondence gives a good indication as to where he was headed¹

27 January 1936
Professor B. Helland-Hansen
Geophysical Institute
Bergen, Norway

Dear Helland-Hansen

... Revelle has had what we call at the University of California his qualifying examinations for his doctor's degree and did brilliantly. One of the members of the examining committee ... had said that Revelle made the best showing of any candidate that he ever helped to examine. His thesis, which has already been written (is entitled) "Marine bottom samples collected in the Pacific Ocean by the CARNEGIE on its seventh cruise."... (Revelle) intends to go to Europe for about a year's work at different oceanographic institutions there. ... He will go to Bergen to work for awhile with you. ... I am going to ask you to take him more or less under your wing until he gets oriented ...

T. Wayland Vaughan, Director SIO

And oriented he became! Roger describes Helland-Hansen as "brilliantly attractive, friendly - equally so to everybody, and so trusted and valued for his fairness and common sense that he had no rivals..." Helland-Hansen and Fridjof Nansen had completed 30 years of study of the northeast Atlantic (the most influential work in physical oceanography to date) aboard their sturdy research vessels *Michael Sars* and *Armauer Hansen*. At the time (in Roger's words)

SIO had one "ship," a retired purse-seine fishing vessel named *Scripps*, sixty-four feet, ten inches long, ... Her single crew member was an ex-locomotive engineer who apparently believed that the best way to keep a boat in good shape was to cover it with grease like a steam engine. With this craft we were able to leave the port of San Diego for one- or two-week expeditions to various islands off the Southern California coast ...

One of Roger's proudest moments was when he obtained a small boat operator's license and became part-time captain. A few months later

Scripps destroyed herself in an explosion, which also killed the cook (by this time the boat had acquired a crew of two) and seriously injured the engineer. I am still sick at heart about her loss ... The thing that I cannot quite become reconciled to is that our days as sailor boys are over. Henceforth we shall be merely unessential observers on board.

Years later, Roger observed:

Despite this tragedy the accident was ultimately a blessing for the Scripps Institution. It enabled Sverdrup to approach E. W. Scripps' son Robert Scripps, with a request that he provide the Institution with a real seagoing vessel. This was done, and the Institution came into possession of a beautiful topsail schooner which was renamed *E. W. Scripps*.

Roger and Ellen were still in Norway when the vessel was acquired. Sverdrup had described her as the *Armauer Hansen* in the form of a yacht. "If so," Roger responded, "she is a damn fine boat, for we both fell in love with *Armauer*."



First long cruise of R/V *E. W. Scripps* into Gulf of California in February 1939. (L to R) Eric Moberg, Roger Revelle, seaman Andrew Bollinger, Richard Fleming (with binoculars), machinist Bob MacDonald, UCLA botanist George Hale, UCLA botanist Lee Haines, engineer Walter Robinson, Martin Johnson, UCLA ornithologist Loye H. Miller.

World War II came in the midst of these activities, and Lt (j.g.) Revelle went on active duty and (among other accomplishments) helped establish the Office of Naval Research.

25 September 1947
Comdr. Roger Revelle
Cosmos Club
Washington, D.C.

Dear Roger

... the reason why I am so anxious for you to come back soon is that at present I am practically the only one at the SIO with any appreciable experience in work at sea. But with the larger fishery program looming on the horizon, we shall have an enormous amount of work on our hands in order to commission and equip two or three vessels. ... you have expressed a great interest in that entire program and I am confident that, regardless of the capacity in which you return here, you are the logical man to take charge ... of work at sea. ...

H.U.Sverdrup, Director SIO



John MacFall

Gustav Arrhenius and Roger Revelle, CAPRICORN expedition, 1952.

Sverdrup's words "regardless of the capacity in which you return" were a reference to the development of a fire ball of opposition to Roger as the next director, and to Sverdrup's preference for Roger as his successor. Ultimately this was to delay by three years the time when Roger assumed formal leadership. The opposition came from two sides. One was that a majority of Scripps faculty under the leadership of Carl Hubbs held that it was about time to have a biologist for director. The other had to do with some of Roger's administrative habits. My own conviction, then and now, is that the opposition was petty and ill informed. But I had better let Roger speak for himself. In a letter of 7 November 1947 to Dean M. P. O'Brien, he refers to

... my obvious and numerous weaknesses, such as a tendency to procrastinate, to take on too many obligations, not to delegate authority, and to be high-handed ...

But there is no question that Roger wanted the job. In the same letter, he writes

Sverdrup's support for me as successor is also based upon the fact that I am practically the only person available who has had extensive experience at sea, in particular in the organization and carrying out of expeditions. He feels that Scripps must be, at least in part, re-oriented towards work on the high seas rather than the inshore and laboratory type of research which is being largely done at present.

The final outcome was a compromise proposed by Roger himself in a letter of 6 January 1948 to Sverdrup:

I believe that a merger of the Marine Physical Laboratory with the Scripps Institution would be desirable and fruitful ... If such a merger took place, I believe Carl Eckart might be persuaded to assume the directorship of the combined organizations. I would be glad to serve as Associate Director under Dr. Eckart with the understanding that I would have, under his general direction, the responsibility and authority for administration of research and field work.

Carl Eckart was glad to accept this arrangement, and from the time Roger and Ellen returned from Washington D.C. in March 1948 Scripps carried the Revelle stamp. But the opposition continued until his final appointment as director in July 1951.

April 12 1950
 President Robert G. Sproul
 University of California

Dear Mr. Sproul:

We understand that the impression has been gained in some quarters that opposition is vanishing at Scripps Institution to Dr. Revelle as a candidate for Director. We assure you that whereas we have a high regard and friendship for him, we feel as strongly as before that his appointment ... would not be in the interest of the institution. His recent administrative actions confirmed our conviction ...

Dennis Fox, Carl Hubbs, G. F. McEwen, Francis Shepard, Claude ZoBell.

A note in President Sproul's files dated June 9, 1950 quotes a discussion with Shepard, who "... feels that it would be an injustice to Revelle and to the Institution if he were reappointed, since he has little or no administrative skill." But many years later, Shepard was to refer to Roger's "brilliant Directorship."

With the clarion call: the Pacific is our oyster, Roger led a timid faculty into the blue water of the deep Pacific. The CalCOFI studies (California Cooperative Oceanic Fisheries Investigations) planned by Sverdrup were getting under way. One of Roger's first tasks as associate director was assemble enough instruments and trained personnel to support the required three ships. At the same time he permanently marked this program with an environmental approach to fisheries biology. This work is still continuing and constitutes an unequalled record of the physical environment and its biological consequences in a large ocean area.



Edward Sheldon Barr

John Isaacs, Roger Revelle, and H. William Menard discuss plan for the day, MIDPAC expedition, 1950.



Fritz Goro

Clockwise from Roger (12 o'clock) Walter Munk, Gustav Arrhenius, Willard Bascom, John Steinbeck, Josh Tracey, Jr., Unidentified and William Riedel, (examining specimen.)

The era opened in 1950 with the MID-PACIFIC expedition into the equatorial waters and to the Marshall Islands in the Central Pacific. This was followed in 1952-1953 by an extended voyage to the South Pacific which was called the CAPRICORN expedition. Both expeditions were led personally by Roger. In his words,

they resulted in a set of remarkable discoveries about the ocean floor and what lies beneath it, and were the first of a long series of expeditions, extending further and further from San Diego until Scripps ships literally operated in all oceans throughout the world.

Some of the expeditions have become household words in oceanographic literature: NORTHERN HOLIDAY, SHELLBACK, TRANS-PAC, NORPAC, EASTROPIC, EQUAPAC, DOWNWIND; a generation of expedition leaders rose through the ranks, among them Bill Menard, Warren Wooster, Bob Fisher, Fred Spiess, and George Shor.

Among the discoveries of MIDPAC and CAPRICORN was the demonstration by Russell Raitt that only a thin layer of sediments overlies the solid rock, and by Edwin Hamilton that the flattopped seamounts at a depth of 2,000 m had been volcanic islands less than 100 million years ago. This spoke for great mobility of the "solid" Earth. On MIDPAC Arthur Maxwell found the heat flow through the sea floor to be "normal," suggesting to him, Roger, and Sir Edward Bullard that slow convective movements were occurring in the Earth's mantle. When Roger and his associates tried to core and dredge the Tonga Trench, the instruments came up battered and bent, and empty. If there were any sediments, they were sparse and thin. The observations could best be explained if the rocky sea floor was disappearing into the Earth along the axis of the trench (this is now called subduction). On CAPRICORN Ronald Mason towed a magnetometer behind the vessel and recorded a complicated set of wiggles that no one could understand. Later Mason produced a map of the magnetic field under the sea floor showing stripes of normal and reverse magnetization.

On hindsight, the evidence was all there for proclaiming the doctrine of plate tectonics, but it was a decade before others pieced the puzzle together. In Roger's words:

In those heady days of the 1950's one could hardly go to sea without making an important, unanticipated discovery. Our small ships didn't cost very much to operate and many SIO expeditions were led by graduate students. John Knauss obtained his Ph.D. on the basis of expeditions to study the equatorial undercurrent in the Pacific. Warren Wooster was a graduate student when he led several expeditions to study currents and water masses of the Central North Pacific.

Even as he led the exploration of the Pacific, Roger looked beyond the oceans. It had been suggested, beginning with Svante Arrhenius in 1898, that the activity of mankind must be leading to an increase in CO_2 . Because the oceans contain about sixty times as much CO_2 as the atmosphere, there was a general belief that CO_2 from fossil fuels would be partitioned in this ratio. Computations by Revelle and Suess in 1956 showed that about half the fossil CO_2 would remain in the air. This led to the continuous CO_2 measurements started by Keeling in 1957, perhaps the most widely known of Scripps's activities.

Again in 1957 Roger was among a group that promoted an attempt to drill through the ocean floor into the Earth's mantle. This MOHOLE project was ill-fated, but a forerunner to a subsequent program of deep-sea drilling at the Scripps Institution.

But by then Roger was deeply involved in the formation of what is now UCSD. Oceanographer Henry Charnock quotes Roger that an oceanographic institution that was not linked to a university would only survive one generation. So there was no conflict between his continuing activity as SIO Director. There were other conflicts; with



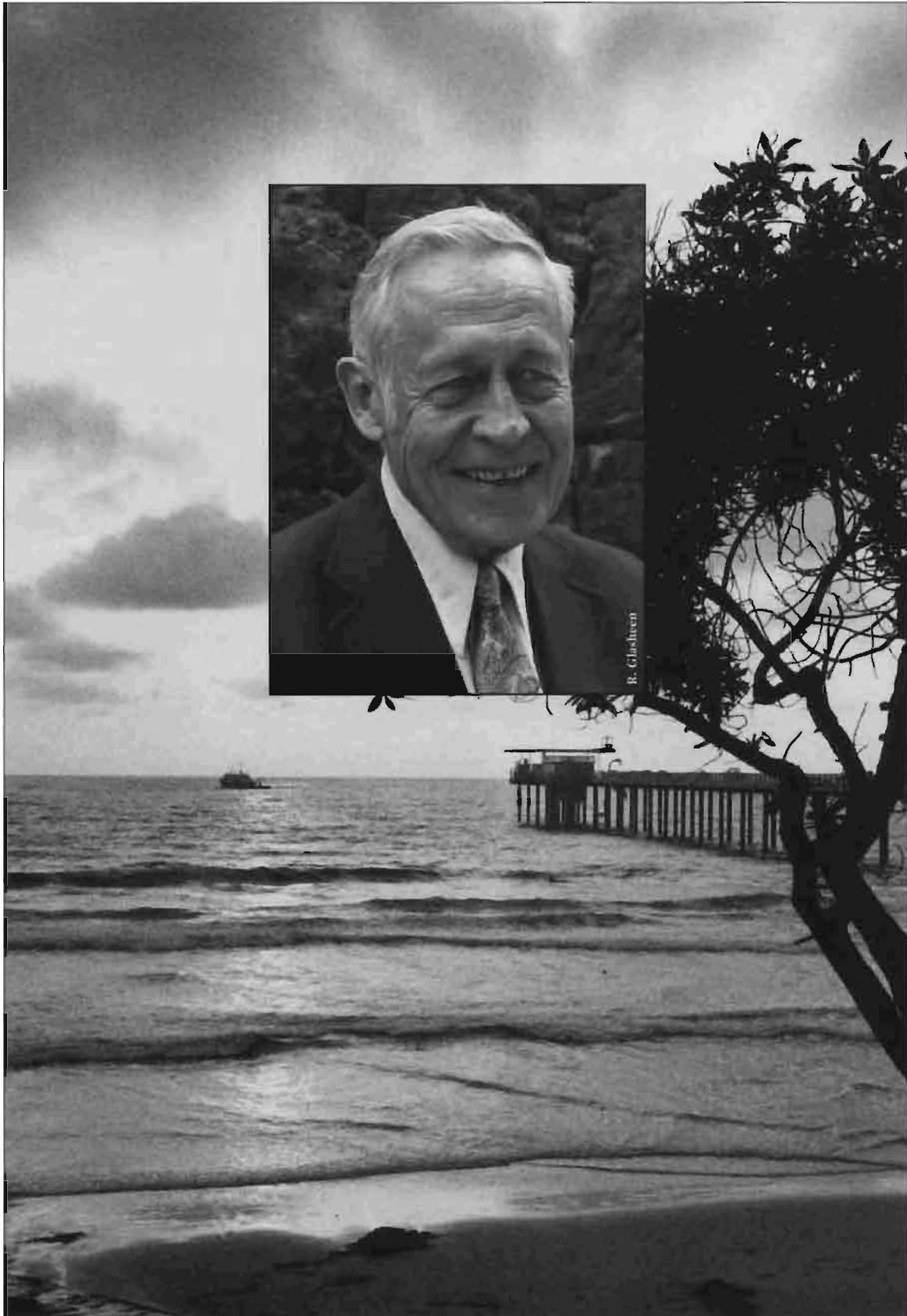
Roger Revelle, c1958.

Regent Edwin Pauley who advocated Balboa Park for a site of the new university; with UCLA who wanted us to start teaching only freshman and sophomore courses (what does a bunch of sailors know about higher education?); and with the Salk Institute concerning the appropriation of San Diego Pueblo Land. Roger won most of them, but as it happened to Pyrrus of Epirus, he won one too many. In 1961, when it came time to appoint the first chancellor, Roger was passed over. It was his second great disappointment; the first one had happened in 1947 when he did not become Scripps's Director upon leaving the Navy.

In 1975 Roger returned from exile at Harvard University, where he had held the Richard Saltonstall Professor of Population Study to UCSD where he became Professor of Science and Public Policy. What an exile it had been, but this is another story. The circle was completed when in September 1990 he moved to an office next to the Director of the Scripps Institution. Throughout his career, when questioned about his profession, Roger would reply "I am an oceanographer." But this was hardly restrictive; on more than one occasion I have heard him define the profession of oceanography: whatever anyone at Scripps does.

Walter Munk
Alt-Aussee, Austria, August 1991.

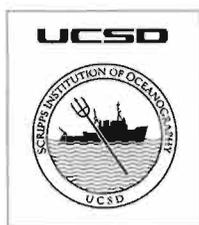
¹ These and other quotes are from Roger Revelle papers in the SIO Archives. I am greatly indebted to Deborah Day for assembling much of the material used here.



Marge Bradner

Inset. Roger Revelle, 1976.

Background. Farewell to Revelle - Roger's last expedition, July 19, 1991.



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