

MEMORIES OF THE SCRIPPS INSTITUTION OF OCEANOGRAPHY 8/39-6/42

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I first heard about SIO from Dr. Roger Revelle during an interview at UCLA in July, 1939. I had just graduated as a Chemistry major, and had put my name on the department employment list. I and two other grads (whose names also started with A) were scheduled for an interview in the department office. Two weeks later I received a letter from Roger informing me that I was chosen. It was to last for six months, because Roger had received a grant from the American Petroleum Institute to analyse sea-bottom sediments.

When I reported for duty in mid-August, I checked in with Tillie Genter, who was the secretary of the Director, Dr. Harald U. Sverdrup. She said that Roger was returning from a cruise to the Gulf of California on the research ship E.W. Scripps, collecting bottom cores. She assigned me to a room in the batchelor's quarters, which was a large house located on the hillside just north of the pier and about 150 feet above sea level. The house had a large kitchen at the rear entrance and a wide sitting room facing south. There was a fire place on the north wall, as well as doors to several bedrooms, At the time I moved in, Walter Munk and Bob MacMillan and Ken Emery were the other residents. Under the main floor was a bath room and a laundry room. There was also a gas water heater, which you lit in advance, if you wanted hot water. You were also responsible for turning the heater off when done. There was a narrow footbridge over a gully separating the house from the main road up the hill. On the same hillside were located numerous other houses occupied by staff members and their families.

At that time there were three main buildings on the campus: Scripps Hall had two floors. Along the south side of the bottom floor was the Sediments lab--my domain. On the north side was a lab occupied by a group that was developing anti-fouling paint for the Navy. On the second floor, Dr. Sverdrup's office was in front on the south side and there were other offices among the north side. One of them was for Dr. Richard Fleming, a physical oceanographer. Behind the directors office was a large seminar room where, on Tuesday afternoons there was a tea-and-cookies reception put on by the faculty wives, followed by a talk by one of the grad students or a visiting scientist. In the rear of the bottom floor was the fish-biology lab run by Peter Duderov.

There was an enclosed walkway from the upper floor of Scripps Hall to the top floor of the Library Building, which housed a very complete scientific collection. I even found Darwin's "Origin of Species" there. The bottom floor housed the museum, which was open to the public at no charge. The curator was also a folk-singer, who played the guitar and sang at picnics.

The other building was Ritter Hall, which had three floors. The front of the ground floor had the store room where the samples from cruises were stored. There was also a photo dark-room, a machine shop and the office of Carl Johnson, the Superintendent of Grounds and Buildings. Carl was a very affable guy. Whenever we met he always asked me "when are you going to go to work?" The second floor had the bio-chemistry lab of Dr. Denis Fox, who had a very British accent. I learned about chromatograms and spectrophotometry of marine pigments from him. Behind his lab was the Bacteriology lab of Dr. ClaudeZoBell, whose assistant was Dr. Sidney Rittenberg, who had been my quiz-section leader when I took freshman Chemistry at UCLA. Along the south side were the offices of Drs Martin Johnson and Marston Sargent, both biologists. The upper floor housed the mathematics department in front. There was an elderly professor (whose name I cannot recall) as well as the offices of Bob MacMillan and Walter Munk. I recall the latter two having a heated discussion about the Coriolis force, which at that time was a mystery to me.

The rest of the top floor contained the Chemistry Department run by Mr. Eric Moberg, whose assistant was John Lyman. Their routine job was to titrate sea water samples to determine their chlorinity. This involved adding silver nitrate until the Potassium chromate indicator just turned red. The lab hired technicians to do the work, overseen by Lyman. The silver chloride precipitate was dumped into a large crock, and every few months, when the supply of silver nitrate was running low, John would wash and dry the silver chloride and mix it with an equivalent amount of sodium carbonate and fuse the mixture to yield metallic silver. He then dissolved the metal in nitric acid to produce a new supply of silver nitrate -- our tax-dollars at work

My main job was to oversee the work of two WPA (Works Projects Agency) workers donated to Scripps by the Federal Government. They had been instructed by Roger and my predecessor in how to perform "mechanical" analyses of mud samples collected on various cruises. Basically, it involved separating each sample into ten size grades--each representing half the particle diameter of its neighbor. This was done by first drying a quarter of the sample and running it through a nested set of sieves clamped to a shaker. Each sieve had openings half as large as the one above. There were five sieves on the stack starting at 1mm and ending at 1/16 mm. The finer grade intervals were separated by suspending a quarter of the sample in .01M sodium carbonate in tall 1 liter graduated cylinders. Usually a group of a dozen samples were processed at the same time. One of the WPA workers started at the left end of the row and the other one set up a pipette rack to begin withdrawing a 15 cc sample as a set level below the upper meniscus one minute after the cylinder had been turned upright. Each pipette sample in turn was delivered into previously weighed Petrie dishes held on a tray by employee #1. After the last sample was withdrawn the dishes were placed on a steam table to dry. By now it was time for the next sample to be withdrawn from each cylinder in turn. The time after uprighting the cylinders was worked out so that the largest particle size in each sample was half that of the previous sample. After the sample dishes were dried on the steam-bath, they were transferred to a large glass drying vessel, which had concentrated sulfuric acid below the samples. The purpose was to remove and water vapor left in the dried sediment or clinging to the sample dish. The next morning, each dish was removed using tongs and weighed to the nearest milligram. After the weights were entered on the data sheet, the dishes were all washed for the next set of samples. My job at that point was to get the weight of each successive sample and combine those with the weights of the sieve samples and plot a histogram of particle size distribution. Usually the plots of at least six successive depth samples were plotted on the same sheet.

The other analysis performed concerned the water content of the mud, as a function of depth below the sea bottom. Merely weighing the sample wet and after drying was not sufficiently accurate, because of partial drying before getting the wet weight. Instead, a quarter of the sample was put in a large test tube containing a porous clay filter. The sample was washed with distilled water several times, and the filtrate was titrated with silver nitrate to determine how much sea water was originally present. That is where my Physical chemistry entered the picture. I realized that the chloride titration could be done without having to remove the mud first. You could measure the electrical conductivity of the mud suspension while adding silver nitrate. Before the end-point the conductivity should decrease slowly, and after the silver chloride was all precipitated, the conductivity should rise sharply. By plotting conductivity vs volume of AgNO_3 , the intersection of the two lines would give the exact end-point. When I outlined my idea to Roger he said that I should use it as the subject of a Masters thesis.

At that point, the six-month grant was about to expire, but there was no hint on Roger's part that I should leave. A job offer had come in for me which was the result of my being recommended by my Optics professor at UCLA for a job at the Spencer Lens Company of Buffalo, New York. Roger said it was up to me to decide, but he advised carrying on at SIO. It is ironic that I ended up in Buffalo anyway, but that was many years later. .

My next move was to go back up to UCLA for summer school, and take biology and bacteriology. After that I was enrolled in the Graduate Division of UCLA. For the next two years, I took the required 24 units of Oceanography, perfected the conductivity titration concept, and with the help of a radio-repair man that Roger knew in La Jolla, built the required apparatus.

During that interval, I decided to buy a newer car than the 1927 Model A Ford that my dad had given me. I found a beautiful 1935 black coupe owned by the manager of the Chevron gas station in La Jolla. He wanted \$375 for the car so I asked Roger if he would loan me \$300, which I would repay at the rate of \$15/mo. He said that he couldn't see how I could live on \$85/mo. so he would raise my salary by \$15/mo, until the debt was paid off. In effect, he gave me the money out of his own pocket!. At about this time, my sister Carolyn asked if she could come down and live with me for awhile. I said certainly, and a short time later Marston Sargent and his wife moved out Cottage #7-- the southernmost of a row of cottages intended for married grad students or staff members. Tillie Genter said that Carolyn and I could move in, and the rent was \$15/mo, furnished and including utilities!. Roger even suggested to Carolyn that his lawyer in La Lolla was in need of a secretary.

Finally, In early April of 1941, my fiancee and I decided to get married. The Revelles gave us a send-off breakfast before we departed for Yuma. Ellen even offered us the guest house of her mother's near Julian for our honeymoon. After completing my thesis, which was titled "THE CONDUCTOMETRIC DETERMINATION OF CHLORIDE AND SULFATE IN SEA WATER", and passing a German reading exam at UCLA, I received the MA degree at UCLA in early June, 1942

By then, we were at war, and Roger (a Naval Reservist) was put on active duty and stationed at the U.S.Navy Radio and Sound Laboratory on Point Loma. He was assigned the job of recruiting a staff to do research on radar wave propagation. He asked me to join his team, pointing out that radar waves were similar to light waves, only with longer wavelength. I joined the US Civil Service. Several other Scripps grads also worked on Point Loma. Walter Munk and Marston Sargent worked for the NDRC (National Defense Research Committee) in the field of underwater sound. SIO also organized a school for teaching Naval officers how to predict sea and swell conditions for amphibious landings. The training that all of us received at SIO was used in several ways to help the United States war effort



1939
 UPPER LEFT: Scripps Camp
 " Right Scripps Hall w/overpass
 to Library Bldg. Met Clark Hindman
 Left Center: Max Latherman in front
 of Cottage #7
 Right Center: Me on E-W Scripps
 Lower Left: Me, Catherine, Ellen
 Revelle and Dick Fleming at our
 Honeymoon retreat: Ellen's mother's
 guest house in Pine Hills (near Julian)