

# The world according to Ewing

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In 1958 we heard that the ocean research vessel *Vema* of Columbia University would be doing research in Chilean waters. Professor Maurice Ewing, head of the geological observatory at Columbia, would be on board, and would I care to join the cruise?

Ewing showed up ahead of the *Vema* for some talks on scientific cooperation with the Chilean Navy, and he asked me to come along and pay a courtesy visit to the Navy chief of staff. The Chilean armed forces have a distinguished military tradition. After a stunning victory in the 1879–1880 war against Peru and Bolivia, the Chilean army was reorganized by German officers headed by a tough Prussian general, Emil Koerner, the same one who introduced military service in Chile. He was very popular for his slapstick humor so he became the butt of good-natured Chilean jokes, under the nickname of “Don Otto.” Meanwhile the Chilean Navy had been created by an adventurous Scot, Lord Thomas Cochrane, tenth Earl of Dundonald (1775–1860), while the Air Force was trained by the Americans.

What are “Don Otto jokes”? Basically they are Polish jokes with a Chilean twist, mostly off-color. Polish jokes, I am sorry to say, were once all the rage in the American scientific community. Around that time—I think it was in 1981—we had a conference at MIT and I found myself seated next to geophysicist Renata Dmowska at the conference dinner while speaker after speaker told Polish jokes. Renata is originally from Poland, so she was annoyed, as well she might. She turned to me and said, “Polish jokes! Polish jokes! In Poland we have very good jokes!” Good try, I said.

Professor Ewing and I got along fine. We got to the Admiralty on time, and a captain in spotless white uniform let us in. The admiral was waiting for us. He was shorter than Ewing, who was average size but whose powerful build reminded one of a Texas quarterback. Ewing was around 50 at the time and beginning to show his age. He was past his second heart attack. He had a round rugged face, sandy hair, and the small lively eyes of a geologist or a leatherneck. The Chilean admiral offered us a seat and out of the blue, before I knew what was up, he let Ewing have it. It sounded like a regular chewing-out and Ewing was taking it without batting an eyelash. The surprising monologue went on for five or ten minutes and all the time I felt anguished about Ewing’s inexplicable

meekness, and about what was beginning to look like the disastrous failure of a middleman—myself.

Suddenly the admiral sat back and smiled at Ewing: “Now, what can I do for you?” “Well,” Ewing drawled comfortably, “we plan to do some shooting on our way down your coast so how about assigning us a ship to help us do the recording?” “Fine, let’s see what we have,” said the admiral. Some assistants were called in, and they went into technical details. Things seemed to go smoothly.

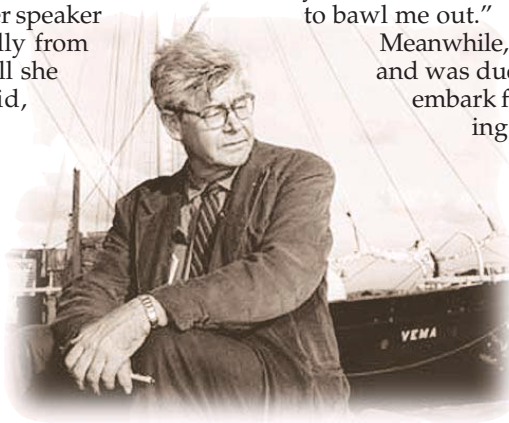
Once we were back on the street I asked Doc Ewing what had happened. “You have to realize,” he explained, “Navy people are the same all over the world. The admiral had to take me to task for intruding on his territory. In the previous cruise we went from east to west so we navigated the straits with an Argentine navy ship.” Ewing was referring to the Beagle Passage in Patagonia, which was claimed by both neighboring nations. It had first been explored by Darwin, and it was then disputed territory. “And we couldn’t very well ask the Chileans for permission,” Ewing continued. “Anyway, the Argentines couldn’t because it would have looked like acknowledging the sovereignty of the Chileans; and neither could we because we were their guests. So the Chileans had to bawl me out. But it’s all in good fun. This year we’ll be sailing in the opposite direction, escorted by a Chilean vessel, and it will be the turn of the Argentines to bawl me out.”

Meanwhile, the *Vema* had arrived. It was now in port and was due to leave in a few days, so I decided to embark for the leg Valparaiso-Puerto Montt, sailing down the Chilean coast in a southerly direction. The weather was fine. Ewing knew that no other time of year would do. The seas of Patagonia are greatly respected by sailors all over the world, and that since before Darwin’s days. By comparing Patagonia to warmer places in the northern hemisphere, such as Dublin, Darwin had been able to show that climate depends on more than just latitude. The rain forests of southern Chile, he suggested, might mislead one into

assuming that the Chilean climate ought to be much warmer than it actually is.

The port of Valparaiso is a two-hour drive from Santiago, but in 1958 it took twice as long because the Barriga Ridge had not yet been tunneled. My parents saw me off in my dad’s old faithful Chevy. As I reached the pier there was no ship! At first I thought she must have left without me, but when I got close to the water’s edge there she was lying down there in all her glory. Technically the *Vema* was a schooner; she had three masts and a beautifully carved and gilded bowsprit. She was 60-m long and very elegant. She flew the Panamanian flag. Ewing had turned this prince of ships into a frog by ripping out the midship staterooms to squeeze in all the lab space he could. As I soon was to find out, he had also made life pretty uncomfortable for his scientific crew.

The *Vema* had originally belonged to Georg Unger Vetlesen, a Norwegian-American shipping magnate who was the founder of SAS Airlines. She had been donated (I



Ewing

*Editor’s note: This item is excerpted from the memoirs of Cinna Lomnitz, emeritus professor of geophysics at the National Autonomous University of Mexico and one of the world’s leading authorities on earthquake seismology. Lomnitz, a native of Chile, was that country’s first PhD in the geosciences and founded its Institute of Geophysics (now Department of Geophysics) in 1957. Shortly thereafter he had the opportunity to work with Maurice Ewing on one of the voyages which ultimately led to the first accurate maps of the ocean floor. His recollections of that experience provide a rare, and superbly written, verbal portrait of a scientist of historic stature at work at the height of his career and intellectual powers.*

was told) to Ewing just six years before, and I was lucky to be able to participate in her 15<sup>th</sup> cruise. She was a very busy ship, especially when Doc Ewing was on board.

As I walked down the steep gangway I felt like saying goodbye to the solid earth for good. I shared a steerage cabin with two research assistants I never actually met: The cabin was small and totally dark. No porthole was provided, and there was no obvious ventilation. The moment the *Vema* steered out to sea she started rolling so badly that I had to withdraw to my cabin in a hurry. It was not my first ocean trip, and I had thought that I was not prone to seasickness, but this was different. I laid down on a lower berth in total darkness and never budged for an undetermined length of time, during which I alternately bumped my head and my toes against the walls of the cabin as the ship rolled. The berth must have been transverse to the ship's axis.

Uncounted hours of misery went by. Nameless cabinmates would stumble in at odd hours and plop themselves on any free berth. Sometimes they would tumble down on me from the upper berth and start swearing, but otherwise no one took any notice of me. I couldn't sleep. I couldn't tell whether it was day or night.

Finally I decided that I had had enough. I was sure that I was about to breathe my last unless I made a last effort to get up. Otherwise I would have ended my days on board the *Vema*—unsung, unnoticed, and unidentified. I raised myself, opened the cabin door, and blinked: There was glorious daylight outside, one day and two nights after embarking. As luck would have it, it was also lunchtime. The sun was shining as I wobbled down the corridor. I decided to follow a quaint personage who appeared to be the cook because of some rather untidy white overalls he was wearing. He was indeed the Danish cook—and a genius, as were most of the people on board. I sat down and wolfed a one-pound ham steak. I have not been seasick ever since.

Now I felt fit to report for work. I was assigned to a "shooter" crew on the aft deck. Our task consisted of packing explosives for the seismic refraction work. We handled half-pound bricks of a yellow butter-like substance in clear plastic containers. It was tetrotol, a TNT-like navy-surplus explosive. We never actually sighted the recording ship, but we were in radio contact. The signal which started the recorder running came from a hydrophone which was towed behind the *Vema*.

The procedure was as follows. Different areas of the aft deck had been assigned to three separate dynamite crews. One crew used saws to cut the tetrotol bricks to the proper size. Another crew snipped the fuses to the right length and inserted each fuse into its cap, using a crimping tool to fasten it firmly. The third crew, of which I was a member, built the charges and assembled the whole thing. We used steel bands to strap the tetrotol bricks together in sizes of 2, 4, 8, 16, and 32 pounds each; every package was provided with its cap and fuse. Then the fuses were taped to the charges, and a fuse lighter was slipped over the free end of the fuse. The lighter charges had some balloons to prevent them from sinking, but the heavier charges were allowed to sink. Finally, a senior crew member shouldered each charge, pulled the cord on the fuse lighter, swayed to the rail, and threw the charge overboard with the fuse merrily burning. This went on hour after hour, at a rate of a blast a minute.

The trick was getting the timing in sync with the rolling of the *Vema*. This was important, because a 32-pound explosion could do a lot of damage to crew and ship. Once the charge was thrown overboard there was a sigh of relief while the fuse kept on burning underwater as the charge was sinking. When it blew up we could feel the shock wave,

which was recorded on the hydrophone and eventually on the recording ship. Thus Ewing obtained the geological structure of the world's oceans.

Packs heavier than 32 pounds could not safely be handled by a swaying human trying to reach the railing of a rolling vessel before the fuse burnt down to the tetrotol. But there was more fun to come. The *Vema* was also carrying surplus depth charges from World War II. These were evil-looking barrels with a hole down the middle, like oversized steel donuts. They were used in antisubmarine warfare. A destroyer had some special catapults that were used to hurl those missiles overboard, but the *Vema* used a human catapult. The trick was to fasten a depth charge to the starboard rail with ropes right where the gangplank used to be when the vessel was docked. Then several bricks of explosives were stuffed down the center hole of the barrel, and a fuse was taped to the explosives. At Ewing's command the fuse was lit, but timing was essential because the ship was rolling—and the fuse was burning. As soon as the ship rolled over to starboard Ewing himself—he would not let anyone else do it—heaved the burning depth charge overboard with a great shout. Some of us were always on hand to restrain Ewing from following the depth charge into the foaming waves: as we well knew, the water was freezing and a depth charge could easily blow up Doc and the rest of the *Vema*. But Doc had figured out a way to use surplus depth charges for science.

Ewing's idea of seismic refraction was actually quite daring in other ways. In 1958 the location of vessels on the open seas was not known nearly as accurately as it is today, in the age of GPS. So basically the *Vema* would be sailing around in circles while the recording vessel steamed away, or vice versa. There was rarely visual contact between the two ships. I think the seismic traveltimes were computed from the direct and reflected pulses of the explosion recorded on board the *Vema*, as we knew the water depth from the sounding equipment. The system worked rather well, considering the uncertainties. But it was also quite hazardous. During the next cruise the chief scientist, John Hennion, blew himself up while handling an explosive pack. It occurred on the same stretch of ocean I had been on. The cause of the accident was what we used to call the "second-cap problem." Ewing had noticed that one cap was not always powerful enough to detonate all the explosive bricks in a pack. Thus, in a pack of 32 bricks, six or seven bricks might fail to go off, and that was a loss of power. To prevent this, an extra blank cap was inserted to boost the firing. Because this extra cap was open and carried no fuse, a spark from a burning fuse could accidentally detonate it and blow up the pack while it was still on board. At least this was the presumed cause of the accident. The *Vema* got off lightly: she might carry as much as 20 tons of tetrotol at any given time.

Actually the accident could have happened in several different ways. For example, once in a while a fuse would start burning by itself. People who handled anything with a fuse on it would grab the fuse: If it felt hot the best option was to drop it and run. With luck the deck might get dented and no one was killed, but you cannot trust being lucky all the time. After 1961 no explosives were allowed on board the *Vema*, and the use of the air gun became mandatory.

In other words, science on the high seas was high adventure. With Maurice Ewing on board anything could happen. He was the last survivor of a lineage of great navigators and explorers. As if to symbolize what was taking place on the *Vema*, Ewing flew the Jolly Roger over the masthead. The black flag with the skull and crossbones went up the mast as soon as we left Chilean territorial waters. As if to make

sure that everyone got the message, the captain of the *Vema* sported a peg leg.

As happens normally in scientific cruises, there was a divided command. The captain and his crew took care of navigation and related daily chores, while Ewing and his scientists did the research. Actually, however, Doc Ewing was in charge of the ship at all times. He never slept. He was everywhere at once. He would take 15-minute catnaps in an armchair and keep going. While I was onboard he never took off his green T-shirt with a big hole under his right arm. When not doing seismic refraction he would drill the ocean floor, one core a day, and Doc himself, like a leatherneck, would be pushing the heavy steel tubing hanging down from the derrick. He showed an amazing physical and mental stamina. He exhausted everybody on board. He would not let you relax.

He told me that he had been born in the Texas Panhandle, in a small town “where electric light had forgotten to arrive.” He had worked his way through college, gotten his PhD in mathematics at Rice, and seen his brother John through college as well. He made his first money delivering newspapers on his bicycle. During the war he worked at the submarine warfare unit of the navy where he helped discover SOFAR, a low-velocity channel in the upper ocean. When an enemy sub wanted to surface she had to cross the SOFAR channel and Ewing was always listening. You could detect the sound of an electric engine for hundreds of miles. The discovery spelled the end of German submarines. They were located and sunk one by one.

Doc produced the first accurate map of the floor of the oceans. He charted the worldwide system of ocean ridges. He discovered worldwide climate change just by looking at the changing color of mud cores from the ocean bottom.

Doc had a way with students, women, and millionaires. He was always soft-spoken but his way of saying essential things made people perk up. “If you don’t know it, measure it,” was one of his favorite sayings. He never used jargon if he could help it. In 1948 Thomas Lamont’s widow Florence gave Ewing the Lamont Estate in Palisades, New York—a huge wooded property on the right bank of the Hudson River, facing Nyack. I suppose that it must be about the size of the Columbia University campus in New York City. It has been the home of the Lamont-Doherty Earth Observatory ever since: and Ewing was its director for the first 25 years. He would have kept going, but Columbia University retired him at age 65—which Doc took as a personal affront. In a huff he went back to Texas to start from scratch. He died there in 1974. The *Vema* logged a million miles of observations on the world’s oceans before it too was retired. It was replaced by the R/V *Maurice Ewing*.

Between cruises Doc could be found in his director’s office at Lamont. It had a spiral staircase to an upper room with a couch, where he took his famous 15-minute naps. He worked day and night, just as he did on board the *Vema*. There were stories about his private life, most of which were pure inventions. For example, it was rumored that he would regularly change wives by marrying his secretary. The secretary was promoted to move into the director’s home and Doc never saw her again, because he rarely went home. Then a new secretary would be hired and the process would start again. But it’s a lie: Doc married only three times. He just had become a legend in his lifetime.

Powerful figures are sometimes misunderstood. Maurice

Ewing was not an exception. He absolutely refused to be fenced in. The *Vema* was chartered in Panama, not because Doc had any special feelings for that beautiful country but because it saved him tax money for research. He solved the flag problem by flying the pirate ensign, which was illegal—and Doc knew it perfectly well. A vessel flying the Jolly Roger on the high seas is an outlaw and can be fired upon at will. While Doc might have hoisted the American flag, or the flag of Texas, he respected the feelings of all the non-Texans and non-Americans on board. Science was the only thing that mattered to him. But he also had a feel for drama, so the captain of the *Vema* had a peg leg.

Ewing collaborated and published with more talented people than any scientist I know of. Many were his students. His standards were extremely high, but he asked for nothing he didn’t demand of himself. He might have won the Nobel Prize if there had been one for the kind of work he did, but he’d never found the time for prizes even if Nobel had thought of the earth sciences. His friend Vetlesen eventually did create a generous prize for earth scientists, and Doc won the first one. Vetlesen specified that it should be awarded by Lamont.

Geophysics is a hybrid discipline. Many famous geophysicists were actually physicists or mathematicians, including Ewing, Jeffreys, and Pekeris. However, Ewing was often described as a geologist, and he didn’t mind in the least. As far as I know, he never corrected anyone who said so. He wore that label as a high distinction. He called his institute “Geological Observatory.” Much later, the name was changed to “Earth Observatory,” but Ewing might not have approved or seen the point.

People like Ewing can never stick to just one field. Doc was best known for his work on ocean sound, but he never stopped looking around. He was the first to drill the ocean floor and he used seismic refraction to map the thickness of the crust under two-thirds of the earth’s surface. Incidentally, he was able to confirm Gutenberg’s early estimates of the thickness of the oceanic crust. British pioneers such as Lord Rayleigh, A. E. H. Love, and H. Lamb had done much of the spadework, but Ewing developed the theory of seismic surface waves just because he needed to understand his experimental results. With Frank Press he created the Worldwide Standard Seismic Network for a similar reason.

A genius is defined as a person who has an exceptionally great mental or creative ability. Maurice Ewing was the one genius I have ever met. He was a man of considerable vision, with an extraordinary capacity for recognizing human potential wherever he found it. One of his students, Jim Brune, worked for him nine years in a cubbyhole because Doc wouldn’t let him graduate. He was too valuable to let him leave. But Doc never exploited anyone: you were free to go. It’s just that you wanted to stay. It was an honor to work for Doc Ewing. [TJE](#)

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Lomnitz