How One Man Made a Difference: David Packard

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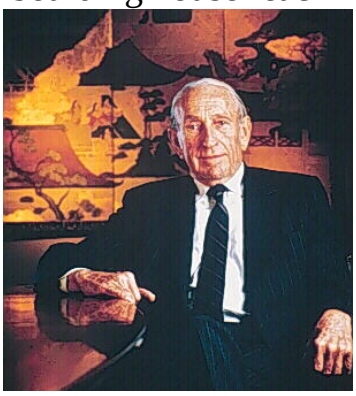
Introduction

I only met David Packard once – at the Beckman Center in Irvine, California. But I recall that dinner well. He was a giant of a man, with a “boarding house reach” so broad it could take in the high technology revolution, ocean conservation, and the overpopulation crisis all at once. His myriad accomplishments have been, and will continue to be, fodder for the great biographers and historians of our age and the next. I will assume here only the more modest task of chronicling how the boy from Pueblo, Colorado became the greatest private benefactor for oceanography of all time. And how his influence made a difference.



Early Promise

David Packard was born in 1912 in Pueblo, Colorado. His father and mother were both professionals: a lawyer and high school teacher, respectively, and had both been educated at Colorado College. Packard showed an early interest in science and engineering, using the *World Book Encyclopedia* as his source for material. Like most young boys (and some girls), he

experimented with blowing things up, until the day he nearly blew off his left thumb. Then he quit, and turned to making homemade radios as a safer pastime.

In high school, Packard excelled in everything: schoolwork, sports, and leadership. He was president of his class all 4 years, all-state basketball center, and won the high jump, the broad jump, the low hurdles, the high hurdles, and the discus at the all-state track meet. He knew more math and science than his teachers.

Packard enrolled at Stanford University in 1930. The tuition at that time was $114 per quarter, a whopping sum during the Depression. Fortunately, his father had been appointed a bankruptcy referee the year before, so was one of the very few to have real job security in that decade. At Stanford, Packard chose Electrical Engineering as his major, and lettered freshman year in football, basketball, and track. He eventually gave up all sports in order to concentrate on his studies, except for football, which he continued in response to peer pressure.

It was at Stanford that Packard was encouraged by Professor Fred Terman, who became his mentor. He also connected with fellow EE major, Bill Hewlett, with whom he shared dreams of someday starting their own business. And just as important, he met his future wife Lucile, while working as a dishwasher at the Delta Gamma sorority house.

The Birth of an Industry

After graduating from Stanford, Packard worked for General Electric in Schenectady, New York for several years, earning the handsome sum of $90 per month. Many thought him foolish to give that all up in 1938 for a $42 per month fellowship to return to Terman's lab at Stanford. Terman arranged for Packard to work with a young Stanford inventor by the name of Russ Varian at the laboratory of Charles Litton.

With support from Terman's fellowship and Lucile's job as secretary to the Stanford Registrar, Packard and Hewlett finally acted on their plans to start their own company in 1939. They flipped a coin to see whose name would go first: Packard-Hewlett? or Hewlett-Packard? They rented a small house on Addison Avenue in Palo Alto, and began building custom electronic

equipment in the one-car garage. Terman recalled that by simply driving by their house one could ascertain how the business was going. If the car was parked in the driveway, business must be good. If it was in the garage, they didn't have any work. By the fall of 1939, the business was off and running. One year later they had 10 employees, sales of $34,000, and had outgrown the garage. When HP was incorporated in 1947, income from providing instruments to measure and test electronic equipment had risen to $679,000. When the company went public 10 years later, annual sales were on the order of $30 million. In 1989, the small garage on Addison Avenue was declared a historical landmark as the "birthplace of Silicon Valley."

From HP to ROVs

As Peter Bing noted during his remarks at David Packard's memorial at the Monterey Bay Aquarium in 1996, "…like the sea, underneath the surface David Packard teemed with the energy of life, with complexity, with productivity. His work defined him, and his pleasure was not simply in success, but in the possibilities it opened up for more new ideas and projects." The phenomenal success of HP provided the resources for Packard to pursue any of a number of passions. Already in the early 1950's Hewlett and Packard, both as individuals and in the corporate sense, had established a tradition of philanthropy. But it was not until several decades later that the oceans became a primary focus for Packard's attention.

Packard's interest in deep-sea technology began after Melvin Laird, the Secretary of Defense, asked him to come to Washington in 1969 to serve as his deputy. While at the Pentagon he had oversight of the *Glomar Explorer*'s secret recovery of part of a sunken Soviet submarine, all cloaked under the guise of a deep-sea mining operation being sponsored by the eccentric millionaire, Howard Hughes. Packard by necessity became familiar with the prospects and limitations of deep-sea work. He was proud of that operation and enjoyed telling guardedly cryptic stories about it later on.

His daughters, Nancy Burnett and Julie Packard, deserve the credit for getting him interested in marine science. They both studied Marine Biology in graduate school in the 1970's and developed a passion for marine conservation. Nancy, Robin Burnett, Steve Webster, and Chuck Baxter were the first to suggest that the Packard family should build an aquarium, like no other, with marine creatures displayed in their natural habitats, to broaden

public awareness of Monterey Bay and the ocean environment. Thus was born the Monterey Bay Aquarium on the famed Cannery Row. Once Nancy and Julie got their father involved, there was no turning back.

David and Lucile Packard did not simply sign the checks; they took a very direct and immediate interest in the plans for the Aquarium. Packard himself designed the wave machines. At his foundry in Big Sur, he cast handles in the shapes of sea otters for the macro video exhibit. Every Friday afternoon, David and Lucile would show up at the boat works at Hopkins Marine Station to review with the architects and exhibit specialists the latest plans. Steve Webster recalls one Friday afternoon in 1981 when they were presenting the layout for the first floor of exhibits, which would involve a transect from the rocky shores to the sandy shores, as though one were hiking north from Big Sur to Elkhorn Slough. The sandy shore exhibit would include some sand, some grass, and some fish. Packard studied the plans for the sandy shore habitat, and said, "Well, you need some birds in there." *Eek! We don't have any birds in there! We need some birds in there!* By the next week when the Packards again visited, the sandy shore aquarium had become an aviary. It hadn't been *designed* to be an aviary, and no one was even sure if the long, narrow space would even *work* as an aviary. But in the end, it turned out just fine. The Aquarium opened to the public in 1984.

In keeping with Packard tradition, the Aquarium sought to apply the most current technology to further its purpose. In order to bring the highest-quality images of the deep sea to Aquarium visitors, MBA engineer Derek Baylis designed and constructed an underwater housing for a broadcast-quality video camera. The existence of this camera came to the attention of Dr. Bruce Robison of UC Santa Barbara, who had been frustrated in his attempts to capture the wonders of the fragile gelatinous organisms of the midwater on film. In 1985, the Aquarium's camera, mounted on the manned submersible *Deep Rover,*® provided superb documentation of the strange new creatures still be to discovered in that dark world below the depths where sunlight penetrates. These and other early research forays prompted plans to build a "research arm" of the Aquarium, an organization that would be devoted to furthering the Aquarium's mission by providing new discoveries for exhibits and basic research on animal husbandry. David Packard, however, had bigger things in mind.

In autumn of 1986, Packard convened a blue-ribbon panel of oceanographers to discuss the rationale for establishing a research institution on the shores of Monterey Bay. The group included Ross Heath from the University of Washington and Walter Munk from Scripps, who remain members of MBARI's Board of Directors to this day. The committee reported to Packard that the new institute should have "a clear identity distinct from that of other oceanographic institutions and a reason for being that leaves no doubt that the institute occupies a mostly vacant niche of importance." The following year, May of 1987, the Monterey Bay Aquarium Research Institute was incorporated as an entity independent from the Aquarium with a broad mandate for cutting-edge research and development in oceanography.

Establishing "Clear Identity"

Many precepts from Packard's views on research and management are embedded in MBARI's mission and structure. For example, Packard recognized that technology for exploration of ocean depths in excess of 600 meters had not advanced significantly since *Alvin* was built in the 1960's. MBARI was tasked with applying three new areas of technology to exploration of the oceans: remotely operated vehicles (ROVs), advanced instrumentation, and computers. Packard advocated sending instruments to sea, not people. He encouraged instrumentation that would return information to shore, not samples. Thus demonstrating the utility to ocean research of ROVs equipped with high-quality cameras and a suite of *in situ* sensors became the first assignment for the young institution. In his own words, MBARI was to "Go deep. Stay long. Take risks. Ask big questions. Don't be afraid to make mistakes; if you don't make mistakes, you're not reaching far enough."

The complexity of these systems led Packard to insist on a peer relationship among scientists, engineers, and operations staff. The role of the institute scientists would be to formulate research questions that are important, but remain unanswered on account of the lack of technology to gather crucial data. Engineers would then devise the platforms and instrument systems for addressing these questions. The operations staff would focus on maintaining and operating these systems for scientific experiments. Contrast this to the situation at the typical research university – where scientists solve the problems that they *can* solve with existing technology, rather than the

problems they *should* solve. Engineers sometimes build nifty systems for which no one has a use. Marine technicians, moreover, are expected to carry out the experiments of researchers whom they have never met, but who show up on the ship with "half an idea and fewer parts." MBARI's sometimes difficult three-way partnership of the science, engineering, and operations cultures remains one of its chief distinguishing features.

In 1989, Packard noted "Deep-water research involves immense amounts of data. I have the impression that much more time is being spent in collecting the data than in looking at it and analyzing it. We believe that situation can be greatly improved." This insight led MBARI to invest substantial resources into proper archiving, indexing, and dissemination of its vast data holdings, both from the ROVs and MBARI's moorings. MBARI's video annotation system sets the standard for how to extract information to solve problems that cannot be addressed with the film from one experiment or one PI's collection. Thus Packard established a fourth leg of the stool: science, engineering, operations, *and* information dissemination.

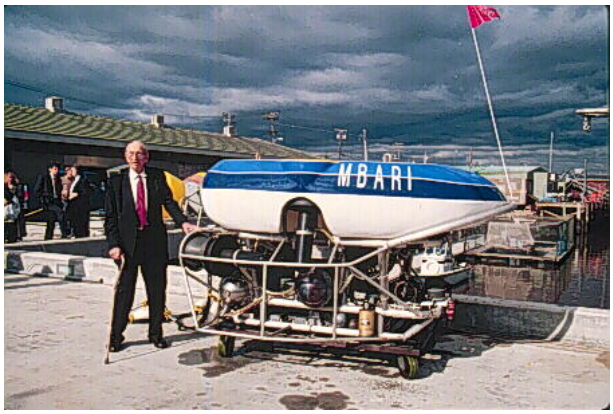
Finally, Packard knew too well the drawbacks associated with federally funded research: the conservatism of peer review, the difficulty in maintaining an institute focus, the impossibility of addressing really big questions when the research portfolio is just the sum of a multitude of individual PI grants. Thus he became not only MBARI's founder, but also its benefactor. From his personal fortune, he provided the start-up costs for the institution and its annual operating grant. To this day, the David and Lucile Packard Foundation continues to supply over 75% of the institution's annual budget, as well as funds for new facilities.

As had been the case at the Aquarium, David Packard was personally involved with the research at his new institution. He was president of the board, but left the day-to-day running of the institution to its Director (initially, Dick Barber). He frequently dropped in unannounced at laboratories or shops to check on the progress of projects ("management by walking around," he called it). He never failed to demand a justification from the project personnel whenever he thought something should have been done differently. As is sometimes the case with forceful personalities, the staff did not always know when he was asking a question versus giving an order.

At the age of 77 years, David Packard decided to study oceanography. Bruce Robison recalls getting a tour of Packard's Big Sur ranch in 1989, when MBARI was operating off Point Sur to document and recover samples from the wreck of the *USS Macon* with the ROV. Robison noted that the book by his bedside reading light was a text on plankton. When he pointed it out, Packard immediately began grilling him with questions about plankton. He never missed an opportunity to learn from those around him.

In the early days, the institute was small enough that each employee felt like a member of Packard's family. Packard never failed to let the staff know how much he appreciated their efforts. They were invited on hunting and fishing trips to properties held by Packard. He thus developed a loyal and devoted following. His legend looms large at MBARI to this day.

MBARI Matures



MBARI met with early success in its goal to demonstrate the applications of ROVs to deep sea research using the *Point Lobos*, an ex-Gulf Coast utility boat, and *Ventana*, an ROV based on an oil industry workhorse. By 1990, it came time to start upping the ante. Packard's vision was for "the most advanced ship of its time" and an ROV, both dedicated to research and using the latest technology. Both the ship, christened the *Western Flyer* after the wooden ship that carried Doc Ricketts and John Steinbeck on their epic voyage to the Sea of Cortez, and the ROV, *Tiburon* (Spanish for "shark"), incorporate a number of unusual design features.

The *Western Flyer* is an all-aluminum SWATH ship (Small Waterplane Area Twin Hull). The SWATH design creates an incredibly stable platform for ROV operations, even in rough seas. It contains a center moon pool for launching and recovering the ROV in rough weather. It was the first small ship to incorporate five, highly fuel-efficient, diesel electric engines. Extensive use of computers and remote cameras allows the ship to function

with a crew of only 9, even for extended operations of two weeks or more. The ROV control room is state of the art, with aircraft-type seats for comfort and an impressive array of screens and panels to monitor all systems on the ROV.

Tiburon was a significant departure from the current state of the art. It was designed to be an electric vehicle: exceptionally quiet, with high performance control to minimize vehicle disturbance. A variable buoyancy (VB) system allows the vehicle to hover inches above a soft bottom, without using thrusters that would cloud the water with sediment. It was built completely in house at MBARI, and reached its design depth of 4000 m in December, 1997.

It was apparent during the design and construction of the *Western Flyer* and *Tiburon* that MBARI was outgrowing its small building in Pacific Grove. The marine operations for the institution had long ago moved to Moss Landing, where the ships could be berthed. When a 4-acre parcel of land adjacent to the marine operations in Moss Landing was to be sold at a public auction in 1991, MBARI secured the property. Ground for the new building was broken in 1994, and late in 1995, the new occupants moved in.

The Legacy

Three months later, on March 26, 1996 David Packard died at the age of 83. He lived just long enough to christen the *Western Flyer* and take one ride on her. His staff was settled in their striking new headquarters, and *Tiburon* was undergoing its engineering shakedown. Thus three pillars that would provide the foundation for MBARI's scientific aspirations were already in place. In the next four years, the MBARI researchers would begin to capitalize on his vision:

- Installing ocean observatories on the seafloor using ROVs as the technician's eyes and hands;
- Precisely calibrating the anomalies in carbon cycling associated with the 1997-9 El Niño/La Niña;
- Remotely detecting the first onset of a harmful algal bloom and tracking the vector for the disease using molecular probes;

- Quantifying the phase diagram for liquid CO_2 at abyssal temperatures and pressures thought appropriate for CO_2 sequestration.

And the best is yet to come. I hope that Packard would be proud of the fruits of his investment. As Peter Bing put it, MBARI was "…an exploration he was determined to create, in the hope that his explorers will one day return with the great riches of human betterment, which still lie beyond our present horizons."

Acknowledgements

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Sources

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