Thomas D. Barrow—A legend in wildcatting

On 13 January 2003, Thomas (Tom) Barrow was honored by the Houston Geological Society (HGS) as a legend in wildcatting for his contributions to the petroleum industry. He was one of five special guests invited to this interactive forum. Tom learned early in his career how to think outside the box and applied the knowledge gained from good mentors to become a very successful oil finder. His father, L. T. Barrow, was the chief geologist (1929) and later chairman of the board (1937) for Humble Oil. He retired as chairman of the board in 1955.

Tom Barrow worked his way through the ranks and into the highest echelons of two major oil companies. In the process, he had a unique perspective on the discovery of two major domestic oil fields; namely, the East Texas Field and Prudhoe Bay. In 1951, he joined Humble Oil and Refining Company (Exxon) as a geologist in California and by 1962 was named Southeastern Region Exploration Manager. He moved up the corporate ladder with Humble to become its senior vice president, president, and a member of its board of directors. In this capacity, Tom was responsible for Exxon's worldwide E&P activities. Additionally, he was the contact director for Exxon Exploration and ESSO Eastern as well as corporate planning, mining, and synthetic fuels. His other corporate responsibilities included Exxon Research and Engineering Company, Imperial Oil Limited, Exxon Enterprises, Inc. as well as the Production and Science & Technology Division.

After retiring from Exxon in November 1978, Barrow joined SOHIO as vice chairman. He was responsible for SOHIO's oil and natural gas exploration and production activities, the worldwide minerals business of Kennecott (an indirect wholly owned subsidiary) as well as the corporate planning, research and development, and engineering and technology functions.

Following is an interview with Barrow conducted by Lawrence Gochioco, chairman of the *TLE* Editorial Board.

I understand that you learned geology at an early age. Can you elaborate?

Well, my father and mother were both geologists. I grew up around geological (and later geophysical) discussions at the dinner table and learned at an early age the value of being a good listener. My father's idea of a good Sunday afternoon outing was to drive to well sites, especially to wells that had accidents. I have seen my share of numerous "well blowouts," probably more than Red Adair did when we were both high school seniors.

When my father was working on his master's degree in geology (1923) at the University of Texas, Austin, he met my mother who was majoring in botany at that time. She switched to geology after she enrolled in a geology course where my father was then a geology lab instructor. They married in 1923. My maternal grandfather was a successful gold prospector from the west. He would be gone for weeks or months prospecting for gold in the Mojave Desert, California. Thus, my mother also grew up in an environment of family discussions involving rocks and minerals. So, when my mother was pregnant with me, I was already exposed (before I was born) to geologic discussions and lectures rather than to classical music. Is this early enough?

I can vividly recall those field trips as a young kid in which they would regularly point out exposed geologic structures and explain what they were and their significance. As a result of her botany background, my mother, Laura Thomson, went a step further and explained a correlation of why some plants and trees grow in certain areas only because of the minerals and chemicals contained in the soil as well as weather conditions. Without realizing it, I was being trained by my parents at an early age to be observant of surrounding areas and to pay close attention to direct and indirect indicators.

Figure 1. *The sea cliffs off Highway 1 near Santa Barbara, California, where Barrow studied the regional geology and mapped the outcrops in 1955-56.*

In high school, I was fairly good in math and the sciences. Many of my classmates knew about my knowledge of geology. Thus, they decided to mix geology, math, and sciences together to come up with a profession that would best fit my future career. Near graduation, the school newspaper printed an article about me in 1941: "Tom Barrow—geophysicist"—the only one in the class.

With a robust family background, it would seem that you would likely be majoring in geology. How did you end up getting a bachelor's degree in petroleum engineering?

My father felt that after high school graduation, I was too young to go to college. So, he sent me to Massachusetts to attend Philips Academy in Andover for a semester. It was there that I met and befriended George H. W. Bush, who later became the 41st U.S. president. On 7 December 1941, we learned of the sad news while walking home from the Episcopal Church. George and I went our separate ways because of the war. But we continued to maintain our ties and have remained good friends ever since.

When I was ready for college, my father said that I had too much mathematics in me and becoming a geophysicist would not be best for me. Instead, he suggested that I should go into petroleum engineering which was then an emerging profession. When the draft got hot and heavy, I volunteered to join the Navy V12 program. I was called to return to Texas and to complete my petroleum engineering studies there. The U.S. government wanted to ensure that domestic exploration and production of petroleum would not be disrupted and would grow to meet the increasing needs of the war effort.

After I received my BS degree in petroleum engineering in June 1945 from the University of Texas, Austin, I went to midshipman school in California. A few months later, World War II ended and I had to decide what I wanted to do with my future. Because I was in the Navy Reserve, I was eligi-

ble for some educational grants offered by the U.S. government through the GI Bill. As a result, I decided to go to graduate school to earn my MA degree in geology (1948), from the University of Texas, Austin.

It appeared that your parents were very good role models and mentors. Did you continue to receive guidance from them after graduate school at UT?

Yes. After the war, master's degree graduates were becoming common, but PhD degree graduates were rare. Thus, my father advised me to pursue my PhD degree, preferably at Stanford University. He had the highest respect for Dr. A. I. Levorsen, who was then the preeminent petroleum geologist in the country. Dr. Levorsen became my academic advisor and suggested that my dissertation be the East Texas Basin. He had some unanswered concerns about petroleum migration. In addition, he also wanted to introduce other mapping methods. By then, I knew I wasn't going to be an academic, but a professional working in the oil industry.

What did your dissertation cover and what conclusions did you draw after your extensive research of the East Texas Oil Field?

My dissertation was a detailed analysis of every key horizon based on every wildcat well (hundreds of them) in 44 counties of East Texas. The project was sponsored by Humble Oil, and I did the first regional study of East Texas for them—a concept eventually adopted by Humble and used in future E&P strategies.

What I found from my research work was that most people thought all the oil in the East Texas Field had originally accumulated where it was because of the pinch out of the Woodbine sands on the west flank of the Sabine uplift. While it is zero on the isopach map, you will find from the close of the Cretaceous that the closure of the Woodbine pinch out isn't where the producing field is but is located several counties to the south. When the Tertiary tilt came into play, you lost the north closure on the pinch out and it appeared oil had migrated northward along a path close to the Woodbine sands pinch out. In the course of my work, I learned that there was a weak anomalous geophysical reading over the eastern part of Andersen County near the proposed pathway. I convinced Humble Oil management that this would be a good place to drill because it was very prospective (if you believe in long distance migration).

My dissertation included a report I submitted to Humble Oil recommending that they drill a well at this proposed site. It took them awhile to decide. But when they did, Humble discovered a 100-million barrel oil field, called the Neches Field. Oil produced from the Woodbine sands only and not from deeper horizons, as I predicted. News of the major discovery reached me before I received my PhD degree (1953). Humble Oil certainly got their money's worth when they sponsored my dissertation.

While I was Dr. Levorsen's graduate student, he promoted the idea of generating paleogeologic maps. This was a new concept at that time where the interpreter can remove overlying beds to map the surface of an underlying bed. It was tested on my dissertation since the East Texas field had a lot of well control and production history. For example, there was an unconformity at the base of the Austin chalk. If you removed the Austin chalk and all the overlying beds, what would the geologic map look like? So, you could map the pinch out of all these other units beneath the Austin chalk. In the process, I discovered that there was also an unconformity in the base of the Eagle Ford.

The East Texas oil field was trapped by the pinch out in the Woodbine sands beneath the Austin chalk. When you generate isopach maps of the Austin chalk, the Taylor above it, and the Navarro above that, the isopach thin (or pinch out) is not over the East Texas oil field but is located in Houston County to the south. Thus, if you believe in early migration and consider the time between the beginning of the Austin and the close of the Cretaceous, there was plenty of time for oil and gas to migrate and accumulate down there. I examined a number of wells drilled along this north-south trend and they all had oil and gas shows from the Woodbine sands. However, a few wells produced oil from more than one reservoir, indicating that it was a stratigraphic trap. As the Tertiary dropped in elevation, oil and gas migrated updip (northward) to the structural closure where the East Texas field was located.

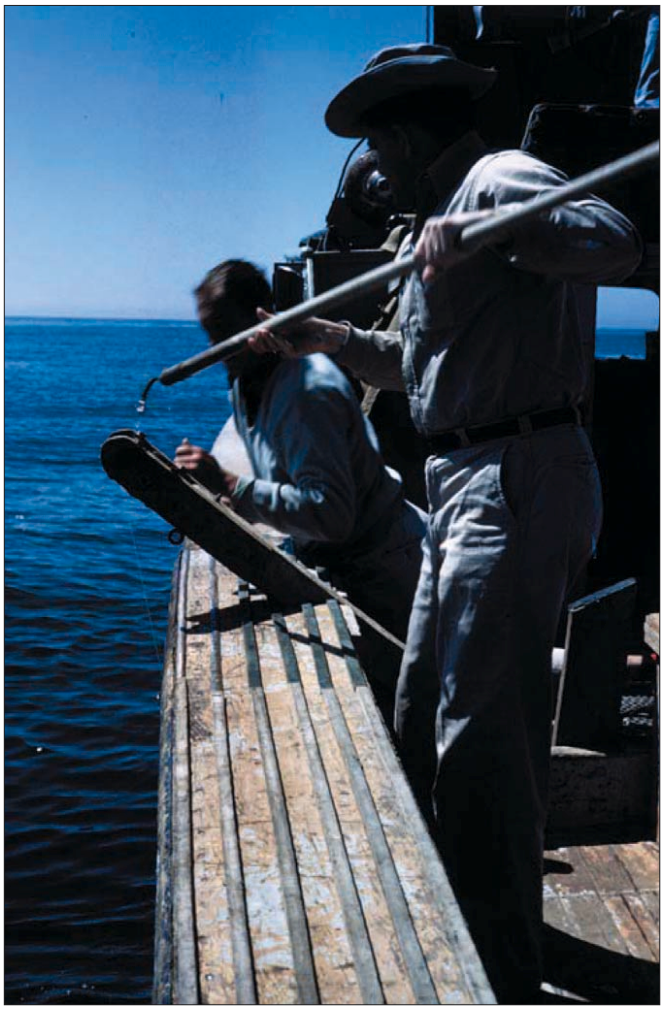

Figure 2. *Barrow retrieving rock samples from his aqualung team during underwater exploration off Santa Barbara, California in 1955.*

There was one pressing question that concerned Dr. Levorsen, and that he wanted to ask me. The question was, "Did oil migrate early or late?" Based on my dissertation, I told him that oil can migrate "early and late." When Dr. Levorsen retired from Stanford University and wrote a book on petroleum geology, he acknowledged my contribution to his thought process and to the petroleum industry.

How did the major oil discovery in Prudhoe Bay come about?

I had been with the company for just over 10 years when the Jersey Company established ESSO Exploration, which was to be our international exploration company. This provided me the opportunity to study worldwide basins (circa

Figure 3. *With a Geiger counter on hand, Barrow leads a field expedition to explore for uranium in Western Australia in 1974-75.*

early 1960s). I also read an earlier report by a Jersey geologist named Louis Weeks who wrote that the best place to find oil is at the mouth of deltas and major river systems. The Mississippi River was his prime example. By 1964, we actively looked at major deltas from around the world.

We also decided to include and explore old deltas. There had been some wells drilled in the foothills of the Brooks Range (Alaska) and all of them were dry holes. A small gas deposit was discovered near the Naval Reserve to the west. The only known oil seep was located to the east in ANWR, near an Eskimo village and on the shores of the Arctic Ocean. Studying the regional geology, I came to the conclusion that there was an ancestral high that ran along the Arctic. The big thick basin was out in the Brooks Range where you have big structures, but not much oil. It was most likely then that the oil migrated to the structural high, similar to the East Texas Field.

Humble had a deal with Atlantic (which later became Atlantic Richfield), but we preferred to be the nonoperator. We were working on some geophysical data collected in the area. Richfield was interested in drilling the foothills, but Humble was interested in the coastal plain. So, we decided to drill a well between the two locations that came up dry. I persuaded Richfield to move the crew up along the coastal plain. The second well found a huge structure. But more important to me, I saw a similarity in the structures as in the East Texas Field. Geophysical data showed a huge unconformity to the west of the second well where beds likely thickened and we convinced ourselves to drill it. We drilled the third well which became the discovery well of Prudhoe Bay (circa late 1960s), downdip from the closure.

I looked upon Prudhoe Bay, which is the largest oil field discovered in North America, as being the child of the next largest oil field—the East Texas Field.

Earlier you mentioned about your exposure to geophysics. Do you believe that innovative technologies such as geophysics played a role in your success?

Absolutely, I was raised at an early age to learn how to integrate innovative concepts and technologies. When I was a young boy (in the 1930s), my father told me that the seismic refraction method was passé and would soon be replaced by the seismic reflection technique. There were discussions on gravity and magnetics too. A good friend of my father's, Wallace Pratt, was instrumental in advancing and promoting geophysics within Humble. Due to the highly competitive nature of our business, we kept most of these technologies locked behind closed doors. For example, a major competitor of ours claimed to be first in using "bright spots" as direct hydrocarbon indicators. This was a matter of conjecture. Merrill Hodge and I used this concept at lease sales a few years before their publication, and gained possession of blocks that had a lot of these bright spots. We remained quiet though.

Few people knew that visualization methods started as early as in the late 1950s. Some geologists tried to correlate strips of log data by hanging them from office ceilings to simulate their surface locations. Key horizons were then interpreted by tying them together with colored strings. Stepping back from the glass office, you began to see trends and surface layers of structures. As more seismic data were collected in the 1960s, we began using a backlit light display case with images of multiple 2D seismic data. It was crude compared to the current 3D visualization techniques powered by workstations and PC-clustered supercomputers, but it worked for us then.

There was an element of uncertainty in trying to correlate geologic information between wells. That was why it was important to integrate geophysical data into the prospect generation stage because it provided valuable continuous subsurface information between the wells. As such, it reduced the risks and improved your chances of finding oil.

You are one of the few geologists/geophysicists to reach the top of corporate America. Do you have any advice for some of us who aspire to reach that level?

A rabbit's foot would help, but it was both skill and luck. Part of it was happening to be at the right place and time, and to be in a situation where your presence was known and recognized. I started work at Humble as an entry-level geologist. My first assignment was in a district office in Chico, California (in the early 1950s). We drilled a prospect based on seismic data and found the first commercial gas production (Wild Goose Field), east of the Sacramento Valley. I happened to be the field geologist when it came in. I recognized the gas sands mixed in with channel sands of younger age. My analysis and report caught the eye of management.

I was transferred to Los Angeles to study the Ventura Basin. I worked the area for a while and saw an opportunity to explore offshore. Geophysical data quality was very poor around the Coal-Oil Point area. It was called Coal-Oil Point by Sir Francis Drake in the 17th century because the air smelled of kerosene. It didn't take a genius to see producing wells located nearby and along the coastline indicated the presence of an oil field. Aerial photographs showed kelp grew on rock outcrops. If you mapped the kelp, then you mapped the outcrop. I gathered my Navy friends together and hired them on weekends to conduct underwater exploration using the aqualung near Santa Barbara. They meticulously mapped the outcrops for me. Rock samples in small sacks were sent to the surface by balloons. I retrieved them and recorded their coordinates or surface locations. Soon, we collected enough geologic data and mapped a few prospects (closures). We then partnered with SOCAL (Chevron) to drill a well and found a major oil field not far from a tar seep. It was a creative approach to offshore exploration and I was promoted to regional exploration manager. I employed the same underwater exploration technique and made another discovery off Newport Beach.

The company was moving into a brand new area and upper management felt I was creative and had talent. So they transferred me to New Orleans because they were run-

Figure 4. *Thomas D. and Janice Barrow in their study.*

ning out of good ideas. I was given the job of finding oil offshore Louisiana. Soon, I developed a reputation within the company as a successful oil finder. When a worldwide exploration group was formed, I became its executive vice president. The assignment eventually led to discoveries in the North Sea, Australia, and Prudhoe Bay. Basically, I learned how to apply myself based on the knowledge and experience gained. And, I still have my rabbit's foot.

After sharing with us your long successful career, do you have any shortcomings?

Yes, my wife, Janice, occasionally reminds me that I have already failed in this endeavor eight times. I said I was going to retire, but changed my mind again. Looks like, I am bound to fail a ninth attempt.

Do you have any other extracurricular activities aside from finding oil?

Both my parents firmly believed in giving back to the community what you sow. They were very active in the local community through charitable and cultural activities. My paternal grandfather was one of the founding deacons of the University Baptist Church in Austin. One of my uncles was the founding deacon of the River Oaks Baptist Church, and my parents were active at the Episcopal Christ Church, where I was baptized.

Likewise, Janice and I are also active in this respect. I have been a foundation board member and a trustee for several professional societies, such as the American Geographical Society in which my father and Wallace Pratt were active members. Morgan Davis got me into the foundations of AAPG, GSA, and AGI. We continue to support the Houston Symphony Orchestra and assist in the restoration of flood-damaged music.

We are Trustee Emeritus and Executive Committee members of the Baylor College of Medicine. In 2001, after tropical storm, Allison, caused extensive damage (in millions of dollars) to expensive equipment and research works, I played a key role in advising the executive board to be proactive. As a result of my naval experience, I argued extensively to convince them to install more expensive waterproof doors in the lower levels of buildings at Baylor to create airtight rooms to prevent heavy storms from flooding again. In addition, air intakes were also raised a few feet above the ground in order for generators and pumps to work effectively. After they were installed, medical staff members teasingly called them, the "Barrow doors." After it successfully passed the test from a recent tropical storm, the Medical Center began installing them in their buildings and called them waterproof doors, as they should be.

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The word "retirement" does not exist in Tom Barrow's vocabulary. At 79, he is still active running his own oil company. Tom feels strongly about himself as being the right man at the right place and time. Tom had excellent mentors early (his parents) and later in his career (Wallace Pratt and A. I. Levorsen). They provided him the necessary background and skills to become innovative in his own ways. First, he showed the importance of conducting regional studies in order to get a better understanding of petroleum systems—its migration and accumulation. Second, he demonstrated the value of generating paleogeologic maps of key horizons, similar to sequence stratigraphy. And third, he has the uncanny ability to integrate geophysics into his thought process. I believe Barrow was ahead of his time, and when he looked at prospects, he visualized them in his mind and in 3D. That was why he became a very successful oil finder.

The Barrows' philanthropy, volunteerism, and involvement with Baylor College of Medicine and the Medical Center demonstrate their commitment and dedication to helping the local community. Thousands of Americans die each year of cancer and other ailments. Finding cures has to be an ongoing process. His insistence of installing waterproof doors at Houston's key medical laboratories will ensure that the nation's cancer and medical research will not suffer another major setback from floods caused by tropical storms.

Like his father before him, Tom Barrow is also mentoring his son, Ken, who helps him run the family oil company. Ken is a geologist and his wife is also a third generation geologist. The seeds have already been sown for the Barrow family to continue to occupy a prominent place in the field of geosciences and petroleum industry. TLE