

Donald J. Belcher

February 11, 1911 — February 8, 2005

Donald J. Belcher, Professor Emeritus of Civil and Environmental Engineering, died February 8, 2005, in Papa'loa, Hawaii, three days short of his 94th birthday. Don's lifelong exploration of the practical engineering applications of aerial photography—a discipline that became known as aerial photographic interpretation and, more recently, remote sensing—placed him as the foremost pioneer in this field.

At a celebration near Belcher's 90th birthday, CEE Professor Emeritus Floyd O. Slate, who knew Don as a university colleague and friend for 62 years, said this:

"There are lots of internationally eminent researchers who make enormous contributions that advance our fundamental knowledge in engineering and science disciplines. Yet very few start an entirely new discipline and then continue to develop it as Don did. That legacy places Don's life work squarely in the annals of engineering history."

Born in Chicago, Illinois, on February 11, 1911, he was the son of the late Ova Clarence and Helen Edson Jenks Belcher. He earned the Bachelor of Science in Civil Engineering degree in 1934, the Master of Engineering degree in 1939, the Master of Science degree in 1940, and in 1941, the professional degree Civil Engineer, all from Purdue University. His main research interest at Purdue was the mapping and engineering characterization of soils for highway projects. By the early years of World War II, Don had already acquired a strong expertise in aerial photography applied to practical problems, and he wrote to General Douglas MacArthur to offer his services. As a result, he became a civilian consultant who worked to improve the military's intelligence of battlefield conditions, especially landing beaches for the army's Pacific campaign. Later, using his skills in interpreting aerial photographs, he helped locate landmines in Western Europe and consulted with U.S. military and civilian agencies and foreign governments.

In 1947, after seven years of teaching and research at Purdue University (interrupted only by his consulting with the military), he joined Cornell's School of Civil Engineering. He was hired to strengthen the School's programs in transportation and geotechnical engineering. He soon founded the Center for Aerial Photographic Studies and directed it until his retirement in 1976. This center spawned an entirely new division within CEE, the group now known as remote sensing. Among his distinguished colleagues in this effort were Professors Ta Liang and Arthur J. McNair, both of whom predeceased Professor Belcher.

Don Belcher distinguished himself as an educator, scholar, innovator, and consultant. Known for his excellent teaching, he welcomed generations of students from diverse fields into his courses on airphoto interpretation. His graduate students have gone on to assume leading positions in the field of remote sensing. He also played a formative role in the early years of the CEE Master of Engineering Program. In October 2000, the Donald J. Belcher Master of Engineering Fellowship for graduate students in Civil and Environmental Engineering was established at the initiative of one of his former graduate students. At that time, a luncheon was held to celebrate the launching of the fellowship endowment and to honor Belcher for his outstanding career.

Belcher's list of accomplishments and contributions include the following notables. He was credited with locating the site for Brasilia, Brazil's capital city that was created in virgin territory. Don was called upon to find a site for the world's largest radio telescope and he identified the 1,000-foot-diameter bowl in the karst cockpit country of Puerto Rico that now supports the dish of the Arecibo Observatory (still administered for the NSF by Cornell). As the exploration of space advanced, he helped interpret surface conditions on both the moon and Mars and used satellite photos to identify sources of industrial pollution. At the dawn of the information age, Belcher also pioneered a computer-based land-use and natural-resource inventory system that was adopted by New York State, Puerto Rico, South Africa, Australia, and Venezuela.

We include here excerpts from an eloquent memorial written by one of Don's first graduate students, J.D. (Jack) Mollard:

"I arrived at Purdue in early September 1945, not long after Don returned from a stint as advisor to General Douglas MacArthur in the Philippines. Don had already published an impressive list of research papers and one larger co-authored volume that would launch his illustrious career. At the time, Don was 'breaking new ground,' detecting permafrost features in Alaska for the U.S. Army Corps of Engineers, and I assisted Don in the lab. I was Don's third graduate student at Purdue, and there were scores to follow, mostly at Cornell.

"Although Don would not have known it at the time, he is responsible for two wonderful happenings in my life: meeting my wife, Mary Jean, and a lifelong fabulous career that I still love after 60 years, and am practicing actively at 81 years of age.

The first thing Don said when I arrived at Cornell was, 'You've got two jobs: 1) finding placer gold in northern California, and 2) locating diamond pipes in South Africa.' Don handed me a huge bundle of airphotos and I went to work. A few months later, I met Mary Jean pouring punch (non-alcoholic!) at a graduate student party, and I couldn't resist striking up a conversation. I was wearing cowboy boots. Later in the evening, Mary Jean rushed back to her apartment she shared with five other graduate students to say, 'I met this fellow from a place called Saskatchewan. He says he's a cowboy, and he's locating gold and diamonds from the air.' She had the veracity of my comments checked out at the Registrar's office. I passed! A few nights later, Mary Jean, Don and I had a beer around 5:30 p.m., on the way home from class.

“Don had a list of diverse research contracts with several different clients. One was to design a camera having an extraordinarily long focal length (96-inches) so that U.S. Air Force pilots then engaged in the Korean War could fly above enemy anti-aircraft guns and still take pictures of enemy troop movements. I had the job of estimating how high and how often the flights should be made. Another project entailed predicting beach sand softness for off-landing troops and vehicles without getting bogged down. Still another was designing a nuclear densometer to determine the moisture content and density of soil for civil engineering works, particularly transportation projects.

“Don enjoyed a good joke. He would bury a case of beer in an esker gravel pit and send a class under the direction of a graduate student, dowsing and then, spade in hand, digging in the gravel pit for water. Eureka! That was a happy surprise on a hot summer day.

“Don was happiest when interpreting stereoscopic airphotos to discover some object hidden below ground surface. Often the airphotos were taken from 6 or so miles above ground, and at locations hundreds to thousands of miles from where Don was making the search.

“During the end of WWII, Don located dozens of Civil Aeronautics Administration (CAA) airstrips around the USA. They were used to train war and civilian pilots. He not only located the airstrips, he found gravel to construct the runways —and all done remotely from 3-D airphotos. A few years later, he started searching for diamonds, gold, and base metals, often-in faraway places. And in the last 10 years, I’ve been looking for diamonds in four different locations in Canada, using Don’s clues.

“I recall him looking for oil-bearing structures, called diapirs, along the southern coast of Louisiana and Texas. As things turned out, I was the beneficiary of those studies because one of the first contracts I got in the Canadian Arctic Islands (Bathurst, Melville, and smaller islands), in 1957, was looking for oil and gas structures from airphotos. Dr. J.D. Bateman, Toronto, said he gave me that contract because I was a Belcher protégé.

“Stories of Don’s unique abilities to find, outline, and evaluate natural resources and sites spread far and wide with his increasing fame: locating groundwater beneath the desert in Iran, locating the site for the new capital city in Brazil (Brasilia), locating the site of the radio-telescope at Arecibo in Puerto Rico.

“Don was always at the forefront of new developments in aerial and space remote sensing, analyzing 3-D black-and-white panchromatic airphotos, true-color and false-color airphotos, black-and-white and false-color infrared photos, and thermal infrared and radar imagery. When the first poor-quality planetary imagery came out, Don was probably the first to interpret surface features on Mars. I have one of his early research publications on Mars interpretation, in which he describes permafrost and glacial features. He was senior author on a co-authored pioneering paper with Carl Sagan.

“Don’s interpreted airphotos, maps and reports included international consulting projects the world over: every continent and, in some cases, several countries on the same continent. Don was also a recognized pioneer in the multidiscipline applications of computer processing and mapping, beginning with natural resource maps of several counties in New York State.

“Two things remain inscribed in my memory from our celebration of Don’s career at Cornell a few years ago. Those of us who were his students from the very first, including his first graduate student Bob Frost, gave our memories of Don: researcher, mentor, good man, and friend.

“Another alumnus at that celebration, an anthropologist from Cambodia, got up to say that he had read some of Don’s work and wanted to take his introductory course. He said that he had absolutely no background that would allow him to take it. But, when he asked Don if he could take his course because he felt he could learn something new that he could apply in his own research work in Cambodia, Don replied, ‘Why not?’ The gentleman said it was the best course he’d ever attended—a common remark from Don’s students. I wasn’t surprised at Don’s reaction because in the first class of Don’s I took at Cornell, there were students from the faculties of engineering, agriculture, forestry, geology, town planning, and perhaps others. If someone had a genuine interest in applied airphoto interpretation, was keen to learn, and could apply the information that Don taught, they were accepted.”

Donald Belcher was preceded in death by his wife, Nancy Foote Belcher; and daughter, Helen Stacy Belcher. He is survived by daughters, Marilyn Kay (Gerald) Whisman of Goddard, Kansas, and Candace Brann of Hiram, Ohio; and by sons, Dr. Mathew Belcher and his wife, Dr. Emily Claspell of Kamuela, Hawaii, Mark Belcher and his wife, Anne Marie Thurber of Washington, D.C., and Neil Belcher, and his wife, Ailish of Ithaca. Eight grandchildren and eight great-grandchildren also survive him.

Eugenia M. Barnaba, J.D. Mollard, Warren Philipson, John F. Abel