

Webster defines geodesy as "That branch of applied mathematics which determines the exact positions of points and the figures and areas of large portions of the earth's surface, or the shape and size of the earth, and the variations of terrestrial gravity."

*Six lady geodesists
prove that no
place, but
no place
is*

BY KAY CAWLEY
Coast & Geodetic Survey



Would you believe forty-four men and six women and no problems? This is the case in the Coast and Geodetic Survey's Geodesy Division, where ESSA's 50 geodesists are employed. ESSA's lady geodesists — among the few in government service — have carved a solid niche in a profession begun in the United States in 1816 and kept a masculine domain until World War II.

Varied paths and circumstances led the six ladies to geodesy and ESSA. A would-be teacher was discouraged by low salaries; a prospective chemist found she was allergic to common chemicals; and an aspiring artist began to realize artists are born, not made. The convenience of the bus stop at the door of the Commerce Department launched one career, and one lady was "invited" into the elite club. Of the six, only one became a geodesist for geodesy's sake.

Jeanne L. Hess, of Bethel, Conn., holds the undisputed record for bravery among the women for her climb this spring to the top of a 90-foot tower, but admits she was so scared at first that her fingerprints are probably still in the metal.

The others, confirmed desk geodesists, are: Catherine C. Mortenson, of Long Island, N. Y.; Jean S. Campbell, of Hampton, Va.; Roma W. Miller, of Hyattsville, Md.; Helen Stettner, of Kensington, Md.; and Maralyn Louise Vorhauer, of Manassas, Va.

While all became geodesists for different reasons, on this there is mutual agreement: their work is fascinating, and—best of all—very satisfying.

Their efforts contribute to useful work that, because it is concerned with the application of mathematics to "the here and the now", does not end up buried in a file cabinet.

Their projects have included: computation of the distance of Astronaut Alan Shepard's first sub-orbital flight and of

Arthur Godfrey's 1966 round-the-world airplane flight; analysis of the effect of the 1964 Good Friday earthquake on the earth's gravity in Alaska; determination of the variations in latitudes on the surface of the earth caused by the "wobble" of the earth as its

north-south pole rotation axis changes; the analysis of data from earthquake investigations in California, Nevada and Alaska; adjustments on the North American 1927 Datum for the precise transcontinental traverse being measured to provide a more accurate determination of the size and shape of the earth; and quality control work in satellite triangulation, the new geodetic concept of determining precise locations by simultaneously photographing a satellite from two or more points on the earth.

During World War II a few women geodesists were assigned to field parties, but the practice was discontinued. The average woman is not physically or psychologically conditioned to expect her duties to include carrying heavy instruments, negotiating 90-foot towers, and working outside at night. This can put a strain on domestic harmony, if either party happens to be married.

According to CAPT. John O. Phillips, Chief of the Geodesy Division, another objection to assigning women to field parties is that when they get married they leave the party; whereas, when men marry, their wives join the party. (His case in point is the girl who eloped from a field party and was never seen again!)

Therefore, simply because they are women, ESSA's lady geodesists are limited to some extent because they lack the practical experience and insight into the profession the men gain from working regularly on field parties.

From time to time, however, a woman may be assigned on a temporary basis for a special project with field parties.

JEANNE L. HESS was detailed this spring to instruct field technicians in the use of a new computer and spend a few days observing field procedures. She said, "I really didn't give up teaching—only the subject has changed and my schoolroom is now a trailer, and my students—real great guys." She was impressed with the work the men are doing in the field and with their cooperation and teamwork.



After her field experience, Miss Hess is convinced she made the right decision last year when she resigned her teaching position at Wilton (Conn.) High School to become a geodesist.

Among the materials available for the school's bulletin board display on mathematics had been a poster on which the word "geodesy" was listed. Miss Hess researched the subject. Subsequently, she was referred to ESSA.

To what resulted in a fruitful interview Miss Hess brought her interest, enthusiasm and background, including a B.S. summa cum laude in mathematics and physics from Central Connecticut State College and a Master of Arts in Teaching mathematics from Harvard University. A member of Kappa Delta Pi (honorary education society), she was listed in Who's Who in Colleges and Universities, and had taught at Phillips Andover (Andover, Mass.) Academy for Boys before accepting her present position.

On her return to Wilton, she thanked her students for arousing her interest in geodesy, resigned her position, and returned to Rockville to begin her new career in the Triangulation Division.

She likes her new life and enjoys associating with geodesists—especially one in the Leveling Branch, Sandford R. Holdahl, with whom she is planning a fall wedding!

CATHERINE C. MORTENSON, for example, supervises a group of Triangulation Branch geodesists whose computations for C&GS certification for the Federation Aeronautique Internationale (F.A.I.) included the distance of Astronaut Alan Shepard's first sub-orbital flight and of Arthur Godfrey's 1966 round-the-world airplane flight. (The



F.A.I. racing sphere is the internationally accepted standard for measuring distances of airplane races, test flights, etc.)

She and her group also compute for certification by the C&GS for the National Aeronautical Association the distances and speed records set in airplane races and test planes. Also, they make computations for control stations for state and interstate highway systems, for the Pacific Missile Range at Point Mugu and San Nicholas Island, Calif., and for the White Sands (Utah) Missile Range.

Miss Mortenson entered Hunter College with the intention of becoming a teacher, but, succumbing to the lure of the more attractive government salaries, became a geodesic mathematician in the Survey's New York Computing Office after receiving her B.A. in mathematics. A year later she was offered a tempting teaching position, which she refused.

She has never regretted her decision—for 24 years she has continued to appreciate and enjoy the professional atmosphere in the Survey, and feels it is almost like an extension of college because she associates with people she likes and with whom she shares common interests and mutual respect.

She transferred to the Survey's Washington, D.C., headquarters in 1950, and now lives in Rockville, Md.

JEAN S. CAMPBELL took a roundabout route to the geodesy field.

She was born in Panama, where her Army officer father was stationed with the Coast Artillery, and subsequently lived in various parts of the world. After spending two years at Fort Mills High School, on the island of



Corregidor in the Philippine Islands, she graduated from East Lansing (Mich.) High School.

Concurrent with receiving her B.A. degree in chemistry from Randolph Macon Woman's College in Lynchburg, Va., came the crushing discovery that she had developed allergies to several common chemicals. Cheated by fate of her career as a chemist, she studied engineering and mathematics at the University of Rochester (N. Y.) and the University of Virginia extension school at Hampton, Va.

After working as a mathematician for the National Advisory Committee for Aeronautics and the Office of Naval Intelligence, she edited the Office of Naval Research Logistics Quarterly and the Digital Computer Newsletter, and subsequently was a scientific writer and editor for the National Aeronautics and Space Administration.

In 1963 she joined the Survey's Scientific and Technical Publications Staff as an editor. When an opening for a geodesist was announced in 1965, she applied for the position, and was selected. She now does quality control work in satellite triangulation. She lives in Washington, D.C.

ROMA W. MILLER literally became a geodesist overnight. One day in 1955 when she went home from work she was a mathematician; the next day she was a geodesist. Her work did not change—a Civil Service Commission review resulted in the decision that it had become too specialized for her to be called a mathematician.



Following her graduation from high school, she had entered New York University's School of Commercial Art. Six months later, she transferred to Hunter College, where she subsequently received a B.A. in mathematics. During World War II, she was employed as a statistician with the Department of Agriculture and the War Production Board. With the Korean conflict she returned to the government to work for the National Production Administration, and at its termination in 1952, became a mathematician in the Survey.

Mrs. Miller's duties in the Astronomy and Gravity Branch include computation of latitudes, longitudes and azimuths for control of triangulation surveys for Air Force missile bases and for the Geodetic Satellite Program's worldwide triangulation net. She has also computed gravity surveys in the United States, including those made in Alaska since the 1964 Good Friday Earthquake, and has worked on the Survey's Latitude program. In conjunction with our observatories at Gaithersburg, Md., and Ukiah, Calif., the Branch is seeking to determine the variations in latitudes on the surface of the earth caused by the "wobble" of the earth as its north-south pole rotation axis changes.

Her most important title is not geodesist-mathematician-statistician, but the one two-year-old Robert Woodyard calls her—"Grandma."

Mrs. Miller and her husband, Frederic, live in Hyattsville, Md.

HELEN STETTNER. Fate, in the guise of a convenient bus stop on a rainy day, led Helen Stettner into geodesy.

Having arrived for a job interview in another government agency too late to see the proper person, between showers she dashed out to catch a bus, which stopped next at the door of the Commerce Department. Hoping someone



in the Commerce Department was looking for someone with her qualifications—B.A. in mathematics and chemistry from Brooklyn College—she alighted from the bus and ran inside. That day in 1948 she became part of the Triangulation Branch.

As her husband's work dictated frequent family moves, she had also been an inspector of contact lenses for a private industry firm, and a gage inspector and engineering aide for the Army Ordnance Division.

In 1950, when motherhood was imminent, she resigned and did not work until 1961, when she became a mathematical statistician for the National Institutes of Health in Bethesda, Md. When the Survey moved to its Rockville headquarters, she again joined the Triangulation Branch.

Mrs. Stettner is engaged primarily in analysis of data from the earthquake investigations in California, Nevada and Alaska, the ultimate goal of which is the ability to predict earthquakes.

She and her husband, Max, have two daughters, Barbara and Arlene.

MARALYN LOUISE VORHAUER was "invited" by the Survey to be a geodesist. Following receipt of her B.S. in mathematics from George Washington University she was rated by the Civil Service Commission as a mathematician. She received a letter from the Survey indicating interest in employing her if she could be rated as a geodesist. She



secured the rating and since June 1965 has been working in the Triangulation Branch.

She computes adjustments on the North American Datum from data submitted by field parties working on the precise transcontinental traverse being measured to provide a more accurate determination of the size and shape of the earth. This involves determination of latitudes, longitudes and elevations of points on the continent which will ultimately permit full coordination and correlation of surveys, maps and charts of the country.

Mrs. Vorhauer and her husband and their young son, "Dusty", live in Falls Church, Va.

Geodesy will probably remain pretty much a man's world, but ESSA's lady geodesists are glad they share it, and urge other women to investigate opportunities in it and other fields commonly recognized as exclusively male realms.