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George D. Whitmore*

Memorial Address

WHEN GERALD FITZGERALD retired as Chief Topographic Engineer of the Geological Survey, he was succeeded in that position by George D. Whitmore. These two men were very much alike in one respect: each was a highly successful Chief Topographic Engineer, eminent in his field in the United States and around the world, honored by election to high office in the principal societies of his profession. But, although each of the two made outstanding contributions and achieved notable success in guiding the Nation's topographic mapping program, it would be hard to imagine two people more opposite in style, more different in philosophy, more unlike in personality.

Fitz was a gladiator, eager for the fray, ready to take on all comers in impromptu combat. "Never mind the briefings and the rehearsals and the preparations—let's get it settled, here and now." And this applied whether the adversary was a government official, a congressional committee, or, as Al Quinn once pointed out, Virg Kauffman.

George Whitmore, on the other hand, had a totally different style. "Maybe it will take longer, but let's be sure we're right in every iota of every detail before we state our position. So, we have already completed the eighth draft of this paper—okay, let's start on the ninth!" He believed in total preparation and in doing everything according to a carefully planned, well-defined system.

George Dewey Whitmore was born in Hillman, Michigan, on 25 April 1898, a few days before the famous victory of Admiral George Dewey at Manila Bay.

When one considers the hard times George Whitmore encountered in his early years, it becomes clear that he built a remarkable career, overcoming



George D. Whitmore
1898-1981

formidable obstacles to become, in the long run, a prominent leader in his profession. Circumstances did not permit young George to attend college, and by the time he was 19 he started on his first job as a surveyor. Yet 4 years later he had advanced so quickly in the field of engineering that he became a Registered Professional Engineer in North Carolina at the age of 23. By dint of diligent home study and intense application to his work, he earned a Civil Engineer diploma from the International Correspondence Schools.

George Whitmore began his career with R. H. Randall & Company, geodetic and topographic engineers specializing in comprehensive surveys and maps of cities and metropolitan areas (Figure 1). Working out of their headquarters at Toledo, Ohio, he rose through the Randall ranks from 1917 to 1926 serving progressively as rodman, chainman, recorder, instrumentman, chief of party, and resident engineer in such localities as Jackson, Michigan; Akron, Ohio; Bluefield, West Virginia; Richmond, Virginia; Durham and Greensboro, North Carolina; and Pittsburgh as resident in charge of office work and field surveys for geodetic and topographic surveys of the Pittsburgh area.

In 1926 he became Vice-President of R. H. Randall & Company and thereafter directed geodetic and topographic surveying and mapping projects for the cities of Pontiac, Michigan; Evansville, Indiana;

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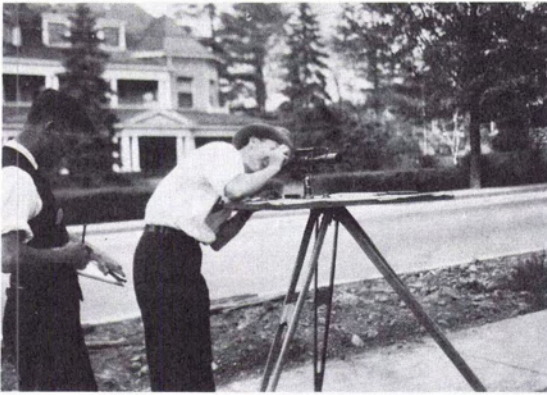


FIG. 1. Young George operating planetable.

Columbus, Ohio; Richmond, Virginia; Schenectady, New York; West Hartford, Connecticut; West Palm Beach, Florida; and parts of Hidalgo and Willacy Counties, Texas.

When the blue eagle of NRA flew during the Great Depression, work for private surveyors vanished and so did R. H. Randall & Company. But George Whitmore was not idle for long. He joined the Tennessee Valley Authority in 1933 as Chief of Surveys, Maps and Surveys Branch, working first at Knoxville and then at Chattanooga (Figure 2). He was responsible for planning and executing TVA's basic surveying and mapping programs, which included control surveys, topographic surveys and maps, cadastral surveys, and the plats of all reservoir areas, final boundary surveys of TVA holdings, aerial photography, and mosaics as needed, plus many surveys and investigations related to detailed design, construction, and maintenance. In cooperation with USGS, TVA



FIG. 2. George with TVA colleagues Harry Wiersema and Ned Sayford.

launched the biggest photogrammetric mapping project ever undertaken to that time—mapping the entire Tennessee Valley from aerial photography. In 1944 TVA loaned George to the Government of Brazil for 30 days as consultant on a new national mapping program (Figure 3).

George's technical and administrative skills in carrying out the TVA mapping program were widely recognized, and in 1945 he was called to Washington to accept an appointment with the U.S. Geological Survey as Chief of Technical Staff, Topographic Division. In the dozen years in which George served in this position, the Division's operational systems underwent a tremendous transformation, with all of the Region offices converting to new Survey-developed equipment and techniques. In 1956 he became Deputy Chief Topographic Engineer, and in 1957 he was appointed Chief Topographic Engineer, succeeding Gerald FitzGerald, in which position he served until his retirement in 1968. As Chief Topographic Engineer, he was professionally and administratively responsible for planning and executing the U.S. National Topographic Program and related activities. During this time the Topographic Division experienced a great advancement in the rate of map production (Figure 4) and a continuing revolution in mapping techniques.

A key element in George's USGS career was his association with Russell K. Bean, who served under him as the leader of research on photogrammetric equipment (Figure 5). Russell Bean was tremendously talented in the development of instruments suitable for USGS mapping with aerial photography,



FIG. 3. News story on George's Brazil assignment.

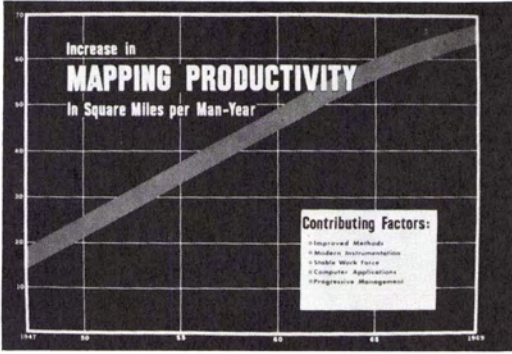


FIG. 4. Increase in mapping productivity, 1947-1968.

but he sometimes found himself in personality clashes with professional colleagues. Not so where George Whitmore was concerned. George managed Russ's talents and personality very well. He encouraged and gave backing to Russ's innovative ideas, and at the same time kept a firm rein on Russ's tendency to exasperate some people. The result of this association was a series of important photogrammetric developments of which the principal ones are:

- The ER-55 Projector (ellipsoidal-reflector projector with a principal distance of 55 mm). Russell Bean's patent on this instrument was assigned to the government. It was manufactured commercially and incorporated in the Balplex Plotter, under a license

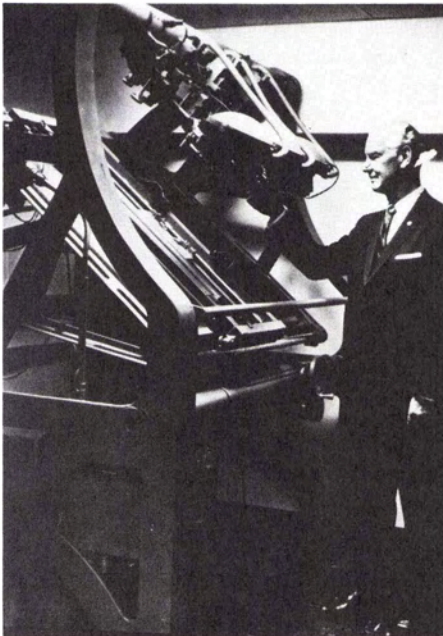


FIG. 5. R. K. Bean with orthophotoscope.

from the government, and this plotter is still in wide use.

- Improved Kelsh Plotter. The USGS team under Whitmore and Bean developed the swinging light source and the principal-distance-cam system which transformed the Kelsh plotter into a practical plotting instrument still in wide use today.
- The Orthophotoscope. With Whitmore's encouragement, Bean's team developed a system for producing scale-true photographs (ortho-photographs) from conventional aerial photographs with their built-in image displacements due to ground relief and camera tilt. The original orthophotoscope, for which Bean's patent was assigned to the government, has been superseded by a series of improved models. The principle of orthophotography is now incorporated in many sophisticated mapping systems used around the world.

George's efforts to improve mapping systems were by no means limited to the photogrammetric field. He backed the USGS development and use of the elevation meter for obtaining vertical control. When EDM (electronic-distance-measurement) instruments were introduced, the USGS field parties were among the first to adopt them for standard use (Figure 6). In the early days of computers, George encouraged the first efforts to solve surveying and mapping problems by electronic data processing. When scribing on coated plastics was introduced as a replacement for pen-and-ink drawing of maps on paper, USGS made the transition to scribing almost overnight (Figure 7).

George continually pressed for better map products, better techniques, and better equipment so that the mapping job could be done as efficiently as possible. But he always faced the same problem; the perennial shortage of funds to buy the things needed to do the job as it should be done. At his retirement dinner, the Topographic Troubadors finally gave George the luxury of a dream in which he prepared a shopping list for all the Survey goodies needed to



FIG. 6. USGS field party using EDM equipment.

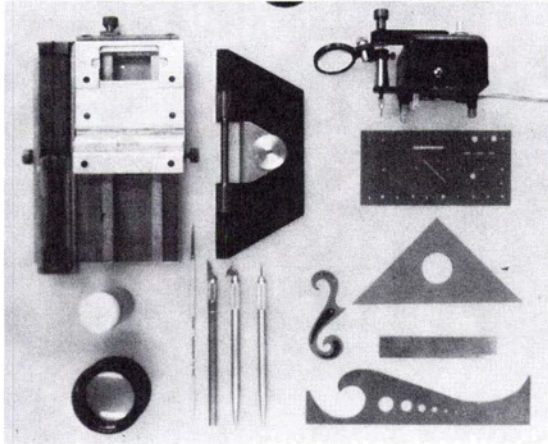


FIG. 7. Scribing instruments developed by USGS.

do the best job. Here is a part of his dream shopping list, which the Topographic Troubadors sang to the tune of "Seventy-six Trombones."

Seventy-six T-2's lead the shopping list
With a hundred and ten B-8's in the tab
They are followed by row on row
Of the finest orthophoto-scopes, pride of every mapping lab.

Seventy-six sedans head the vehicles
With a hundred and ten new jeeps right behind
There are more than a thousand PUGS
Springing up like bugs
EDM's of every shape and kind.

Seventy-six readouts to the EDP
While a hundred and ten machines share the time
To the rhythm of self-matched plates
All the mapping automates—
And the mappers can't make a dime.

Notwithstanding the heavy responsibility of directing the National Topographic Program, George's activities extended into many additional areas. He was extremely active in professional societies, serving on numerous key committees, with a term as Chairman of the ASCE Surveying and Mapping Division, a term as President of the American Society of Photogrammetry, and two terms as President of the American Congress on Surveying and Mapping. He is the only man ever to have held the top position in all three of the American learned societies in the field of surveying and mapping. As a distinguished leader in the surveying and mapping profession, he served in the following capacities:

- Member of Syracuse University Advisory Committee on Geodesy, Cartography, and Photogrammetry.
- Representative of The Ohio State University Committee on Geodesy, Cartography, and Photogrammetry.
- Chairman of the U.S. Government Technical Advisory Committee on Antarctic Mapping.

- U.S. Member of the Work Group on Geodesy and Cartography of the Scientific Committee on Antarctic Research of the International Council of Scientific Unions.

- Chairman of the Committee on Polar Research Panel on Geodesy and Cartography, of the National Academy of Sciences-National Research Council.

- Chairman of the Committee on International Cartographic Matters, advisory to State Department, under the National Academy of Sciences-National Research Council.

- American member of the Editorial Board of *Photogrammetria*, journal of the International Society for Photogrammetry.

- Chief of U.S. representative at U.N. Technical Conference on International Map of the World.

- Chairman of Committee on Topographic Maps and Aerophotogrammetry, Commission on Cartography, Pan American Institute of Geography and History.

- Alternate U.S. member of Commission on Cartography, Pan American Institute of Geography and History.

- Member of the 5-man Governing Council of the International Society for Photogrammetry from 1960 to 1964.

- Continuing his professional contributions in his retirement, he served as U.S. National Member of the Commission on Cartography, Pan American Institute of Geography and History.

George Whitmore was a Fellow of the American Geographical Society, the American Association for the Advancement of Science, and the American Society of Civil Engineers. He was also a member of the American Geophysical Union, Society of American Military Engineers, American Geological Institute, Canadian Institute of Surveying, Washington Society of Engineers, Arctic Institute of North America, American Polar Society, and a Director of the Antarctic Society.

George was the author of four texts for class study in surveying, mapping, and photogrammetry prepared by the International Textbook Company. He was the author of a well-known book, *Advanced Surveying and Mapping*, published by the International Textbook Company (Figure 8). He was the editor and principal author of ASCE Manual No. 10, *Technical Procedures for City Surveys*, published by the American Society of Civil Engineers. He was associate editor and coauthor of the section on Surveying, Geodesy, and Photogrammetry in *American Civil Engineering Practice*, published by John Wiley and Sons. He was the author-editor of Chapter 1 of the *Manual of Photogrammetry* in both the second and third editions, published by the American Society of Photogrammetry. He also wrote dozens of technical articles which appeared in a wide variety of technical journals over the years.

A charter member of ASP, George remained active in the society for some 40 years. His first article in an ASP publication appeared in 1936. Subsequently, he served on innumerable society commit-

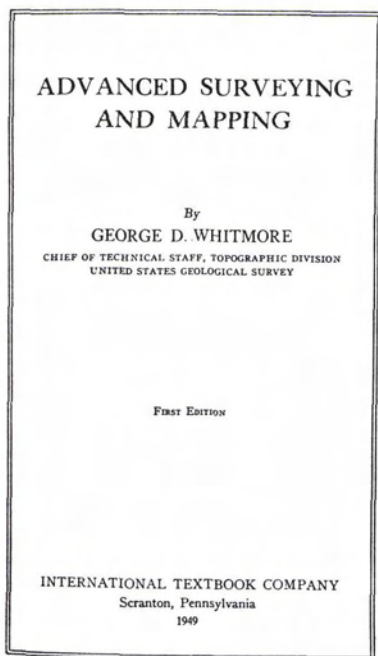


FIG. 8. Title page of one of George's books.

Section. With B. Austin Barry and Alfred O. Quinn, he served on the three-man Special Task Committee of ASCE which produced the landmark report, "Status of Surveying and Mapping in the United States;" this report, which confirmed the status of surveying as an engineering activity, was adopted as official ASCE policy in 1959.

George Whitmore has been honored with the following high awards:

- Distinguished Service Award, U.S. Department of the Interior, 1958.
- Luis Struck Award (for stimulating Inter-American understanding in photogrammetry), American Society of Photogrammetry, 1968.
- Whitmore Mountains, Antarctica, named for him.
- ASCE Surveying and Mapping Award, 1974.
- Honorary Member, American Society of Photogrammetry, 1954.
- Honorary Member, American Congress on Surveying and Mapping, 1969.
- Honorary Member, American Society of Civil Engineers, 1979. (George is the only man ever to have been made an honorary member of all three American societies, the highest professional recognition attainable in each society.)
- Honorary Member, Canadian Institute of Surveying (the only American to be so honored.)

tees. He was chairman of the ASP Committee that developed the National Map Accuracy Standards, adopted by the Bureau of the Budget in 1941, and, with minor revisions, still in force today. He served a distinguished term as President of ASP in 1952.

George was equally active in the American Congress on Surveying and Mapping, participating in its founding and serving two terms as ACSM President (Figure 9).

George played a role in ASCE activities over a long period. In addition to chairing the Surveying and Mapping Division in 1949, he served as chairman of the City Surveys Committee and as chairman of the Mapping Committee of the National Capital

We have dwelt on George Whitmore's honors, technical accomplishments, and contributions to his profession. Now, let us take a look at George as a person. What kind of a man was he?

Mention was made earlier of the meticulous nature of George's work habits. According to daughter Jane Whitmore (George had three daughters and two sons), his meticulousness carried into his private life. Everything was recorded, leaving nothing to memory or chance. Jane tells us that George kept a little notebook with a separate page for each of his children where he noted everything fiscal: how much allowance, how much loaned, how much spent. Perhaps he had a good reason not to trust his memory; Jane recounts an incident where George was bragging about a good Irish restaurant in Knoxville, but he couldn't remember the name. But, the kids recognized from his description that the restaurant was "O'Neil's"—which tickled them, because George had married Helen O'Neil, their mother and his wife.

Jane remembers many things about her father that she cherishes. She recalls that when she was a little girl in Knoxville she would sit up with George in the breakfast nook while he worked on ICS courses or the book he was writing. She recalls too that he was an accomplished carpenter and repair man who did all the fixing up whenever they moved to a new home.

George solved the family's transportation problem by buying a used limousine with jump seats from a funeral director. This enabled George and Helen and all five children to travel together in one car on their frequent jaunts.



FIG. 9. USGS mapping leaders at ACSM dinner, 1950. Gerald FitzGerald facing his wife, and (clockwise from Fitz) Mr. and Mrs. R. Moravetz, Mr. and Mrs. G. Whitmore, Mr. and Mrs. E. Fennell, and Mr. and Mrs. R. Lyddan.

I can personally recall many instances of George's meticulous way of operating. The incident that sticks in my mind occurred when George and Bill Fischer and Rupe Southard and I were driving from Washington to Thousand Islands for a meeting of ASP. We figured the distance to be 400 miles and agreed that each of the four would drive 100 miles. During George's turn we were crossing a desolate stretch of the Montezuma Swamp, when George pulled the car over on a none-too-firm shoulder. "The trip odometer," he announced, "now reads 300.0 Next driver!"

Al Quinn recalls a time during his TVA days when he came to the conclusion that he had learned all he could regarding the computation and layout of grids and projections, and it was time to go into the field for surveying experience. So he got a date with his boss, George Whitmore, and made his pitch. "What are your qualifications for field work?" asked George. "Virtually none, except summer camp in college," Al responded, "but I am interested, willing, and able." George pondered that replay for a moment, then he said: "Okay, I believe you; be ready to leave for our field office in Maryville, Tennessee at 6 A.M. tomorrow!" And Al goes on to tell us: "I always appreciated his belief in my confidence and I like to think that I never let him down. It did a lot in building my love for my career in surveying and mapping." There are many others among us who received similar motivation and inspiration from our contacts with George Whitmore.

In formal situations, George was a formal man, giving the impression of a serious, no-nonsense



FIG. 11. George goes along with office gag: "Selection of candidates for promotion."

person (Figure 10). But the fact is that he relished a little nonsense now and then, loved a good joke, and liked to unbend with his friends. Even at the office, where he was usually all business, he liked to be included in an occasional gag, such as that shown in Figure 11.

After retiring from USGS in 1968, George spent his remaining years with daughter Jane in Woodstock, Illinois. His daughter Patricia (Mrs. John R. Tambon) lived next door, while daughter Margaret (Mrs. John Gallagher) lives in Reisterstown, Maryland.

George's final professional accolade, election to Honorary Membership in the American Society of Civil Engineers—an honor that comes to few engineers indeed—came in 1979 when George was physically unable to attend the ASCE convention to receive the award and son Bob accepted it on behalf of his father. But the citation for that award sums up an eminent career, and we will close with that citation:

GEORGE D. WHITMORE, F.ASCE, is elected an Honorary Member of the American Society of Civil Engineers in recognition of an outstanding career of leadership in the field of surveying and mapping as a principal of an engineering firm, as the chief of the Tennessee Valley Authority's basic surveying and mapping program, and as the head of the U.S. Geological Survey's National Topographic Program, as well as a lifetime of dedicated service to the American Society of Civil Engineers and other scientific organizations, in many official capacities.



FIG. 10. George at his final Topographic Division Staff Conference as he passed the title of Chief Topographic Engineer on to Robert H. Lyddan (seated next to George in middle of front row).