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Russell Kerr Bean

Memorial Address*

Russell Kerr Bean
1900-1976

If I had prepared this memorial address for the *Readers Digest*, it would be a candidate for the magazine's "most unforgettable character" article. No one who ever met Russell Kerr Bean will ever forget him. He immediately liked you or disliked you, but either way he affected you. One thing is certain—he made a lasting impression on the profession of photogrammetry.

In the September, 1984 issue of *Photogrammetric Engineering and Remote Sensing* there is a list of 47 historical highlights of photogrammetry in the United States from 1904 to 1984, 34 of which took place after Russ Bean entered the field and before he retired. He was directly involved in the following eight:

1934	Formation of ASP
1935	First Semi-Annual Meeting—Wright Field, Dayton, Ohio.
1936	Multiplex mapping office established in Chattanooga, Tennessee as a cooperative effort by TVA and USGS to map the Tennessee Valley.
1936	Second Annual Meeting at Chattanooga, Tennessee.
1940	First American manufacture of optical-projection photogrammetric instrument: Multiplex, by Bausch and Lomb, to USGS design.
1943-1955	Development and improvement of Kelsh Plotter.
1949-1955	Development of ER-55 (Balplex-Twinplex).
1952-1959	Development of Orthophotoscope

This is a remarkable record for one man and a good summary of his contributions to the profession of photogrammetry.

* Presented at the Annual Convention of the American Society of Photogrammetry, Washington, D.C., 12 March 1985

The Early Days

Russ Bean was born in Falls Church, Virginia, on March 21, 1900, the son of Edith Kerr and Mellon Freeman Bean, a building contractor. His one sister, Mrs. Gladys Weech, lives in Baltimore and his one brother, Cecil, died in 1982. He graduated from Technical High School in Washington, D.C. and later attended night school there at Southeastern College.

Russ began working for the Federal Government in 1923 at the U.S. Geological Survey in Washington, D.C. In 1926 he left the Survey to work in Mexico as a surveyor and map maker for the Standard Oil Company (Figure 1). He returned to this country in 1929 to work for Brock and Weymouth in Philadelphia where he was one of their principal operators of the Aerocartograph (Figure 2). When the Depression forced Brock and Weymouth into bankruptcy, Russ found employment with the Corps of Engineers. In 1932, he transferred to the Army Research Center at Wright Field in Dayton, Ohio, where he worked as a specialist in photogrammetry. In 1936 he joined the Tennessee Valley Authority (TVA) in Chattanooga and played a key role in the joint TVA-U.S. Geological Survey program to map the Valley. He transferred to the Geological Survey in Arlington, Virginia, in 1941 and remained with the Survey in the Washington area for the next 22 years, until he retired in 1963.

FIG. 1. Surveying in Mexico, 1927.

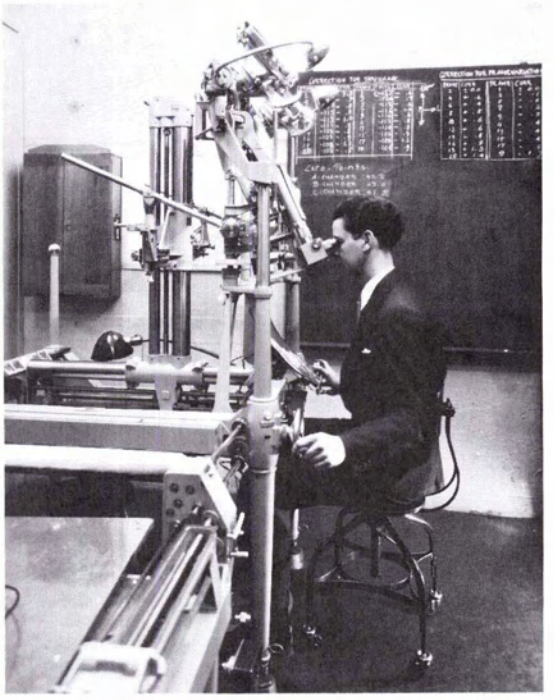

FIG. 2. Operating the Aerocartograph, circa 1929.

SARA BEAN

Russ met Sara Coyner (Figure 3) in 1917 when he was 17 and working at a photo shop on F Street in downtown Washington. After a four-year courtship, they were married on Thanksgiving Day, November 24, 1921. Edith Mae, their only child, was born in 1931 in Arlington, Virginia. Russ was working for the Army Corps of Engineers at the time. Edith Mae is now Mrs. Waldemar Weichbrodt and lives in McLean, Virginia. Edith Mae's three children were joys of Russ's life. Her son Rusty is his namesake.

Sara, who now lives in Fairfax, Virginia, was 85 years old on September 1, 1984. I had the pleasure of lunching with her a few days after her 85th birthday and hearing firsthand about her life with Russ. She told me about how Russ leaped over the counter at the photo shop where he worked to greet her the first time they met; that they were married by her uncle who was a minister; about how she sailed from New York on an oil tanker in February 1926 to join Russ in Tampico, Mexico, where he was surveying prospective oil fields for the Standard Oil Company, and where they lived for three years. She also told me about how much she still misses having Russ around.

To know Sara Bean is to know where Russ Bean got his inspiration and stability. Theirs was a happy marriage for 55 years.

PUBLICATIONS

Russ Bean was not a prolific author. He encouraged those of us who worked for him to do most of the writing, but we were writing about *his* ideas. The more talented and productive of his writers was Morris M. Thompson, who is still at it today. Others, such as Marvin Scher, Rupe Southard, and myself, were also able to add to our bibliographies, thanks to Bean. He was, nevertheless, the author of a number of published papers that should be

FIG. 3. Sara Coyner, 1912, later to become Mrs. Bean.

mentioned because of their great significance to the profession. They are as follows:

- "The Multiplex Projector," published in 1935 in the *Newsnotes of the American Society of Photogrammetry*, Vol. 1, No. 6, pp. 17-20. In this paper, Bean stated: "Although new, the Multiplex, by its performance and various possibilities, warrants the careful consideration of any agency concerned with mapping." This was a very astute observation at the time. The Multiplex soon thereafter became the principal mapping instrument of the U.S. Army, the Tennessee Valley Authority, and the U.S. Geological Survey.
- "The Multiplex Projector," also published in 1935 in the *Newsnotes of the American Society of Photogrammetry*, Vol. 1, No. 7, pp. 27-37. This paper was a supplement to the previous paper. Bean presented it at the Semi-Annual Meeting of the American Society of Photogrammetry held at Wright Field, Dayton, Ohio, September 16-17, 1935.
- "Source and Correction of Errors Affecting Multiplex Mapping," published in 1940 in *Photogrammetric Engineering*, Vol. 6, No. 2, pp. 63-84. This paper, written when Bean was with the Tennessee Valley Authority, was a milestone on the route to understanding how a photogrammetric system works. It showed mathematically, for the first time, the interrelationship of the aerial camera, the film, the diapositive printer, and the mapping projector (Figure 4). The paper became a classic. It explained how precise mapping by photogrammetric methods could be accomplished, and probably marked the beginning of the end of mapping large areas by less-efficient field methods (Figure 5).
- "German Photogrammetry," published in 1946 in *Photogrammetric Engineering*, Vol. 12, pp. 87-91. This was a report presented at the 12th Annual Meeting of the American Society of Photogrammetry held in the Willard Hotel, Washington, D.C., in January 1946, on his findings during a mission he made to Germany shortly after V-E Day. Russ was acting on behalf of the Corps of Engineers to help locate German mapping instruments and to determine the state-of-the-art of German photogrammetry. To facilitate his mission, which lasted 4 months, he was given a civilian status equivalent to field-grade rank in the Army and was outfitted with an officer's uniform. In Germany, he located his old friend and colleague, Heinz Gruner, who spent World War II in Germany working at the Zeiss factory in Jena. Heinz was not allowed to return to the United States after a visit he made in 1936. It turned out that Heinz was the only one who knew where the Zeiss stereoplanigraphs were located. Together, Bean and Gruner located seven stereoplanigraphs, four rectifiers, and miscellaneous other equipment which they hurriedly disassembled, boxed, and shipped to the United States. Among this war booty was a Topogon V aerial-camera lens, which was copied by American optical firms and marketed as the Planigon lens. It soon became a standard for distortion-free lenses in aerial cameras manufactured in this country. Bean's findings and recommendations were a major contribution to the advancement of photogrammetry in the United States. One statement he made in his report, however, reveals how far we have progressed in the last 40 years. Concerning the use of instrument operators in Germany during the war he said: "With manpower decreasing, female help was tried and in several cases found efficient."
- "Development of the ER-55 Projector," published in 1953 in *Photogrammetric Engineering*, Vol. 19, No. 1, pp. 71-84. Bean presented this paper about one of his inventions, the ER-55 projector, at the 19th Annual Meeting of the ASP in the Shoreham Hotel, Washington, D.C., January 14-16, 1953. After the presentation, Dr. K. Pestrecov, a well-known optical consultant, commented as follows (Figure 6):

  "This is an extraordinary development. I should say even revolutionary. . . . It (the projector) has its own foundation and special features which required an insight, imagination, and organizational daring. . . . We have witnessed today the presentation of a new development which may become another milestone in the history of optics and of photogrammetric instruments."
- "The Research Operator in Photogrammetry," published in 1950 in *Photogrammetric Engineering*,

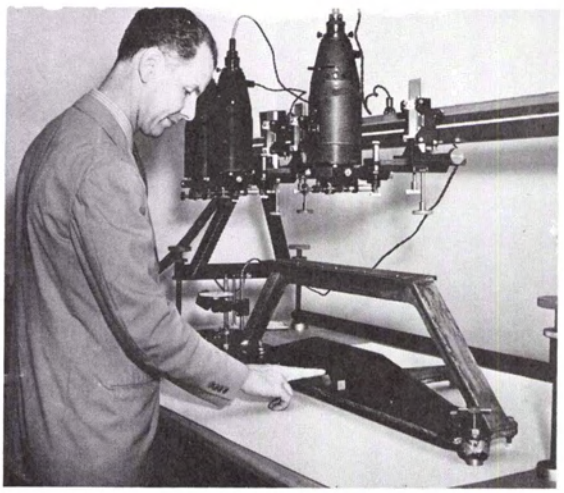

FIG. 4. Calibrating a Multiplex projector.

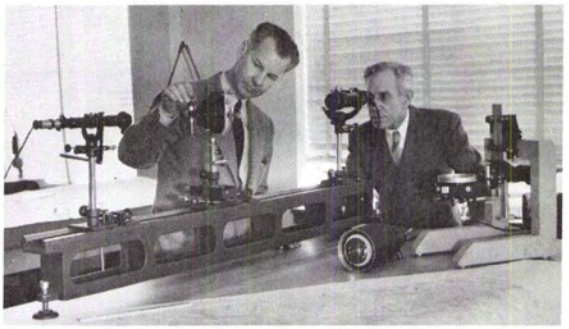

FIG. 5. Demonstrating the optics of a Multiplex projector to T. P. Pendleton.

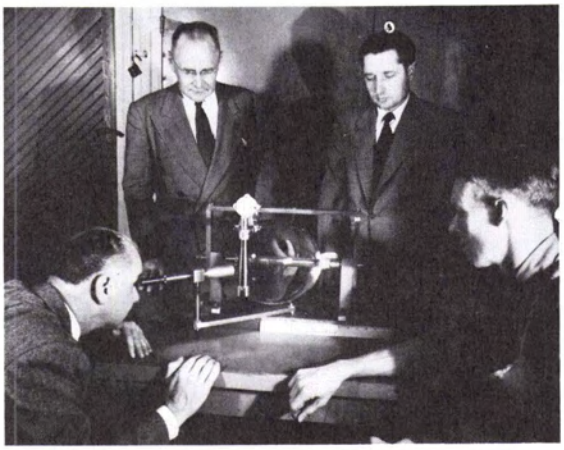

FIG. 6. Inspecting the glass mold for forming ER-55 projector reflectors, with K. Pestrecov and factory technicians.

Vol. 20, No. 1, pp. 98-100. This paper was part of a panel on Research in Photogrammetry at the 20th Annual Meeting of the ASP at the Shoreham Hotel, in Washington, D.C. In it Bean said: "The essential ingredient to progress in research is a driving force, a person or group of persons, who constantly press in new directions, who will not be restrained, who are willing to risk much to gain much." How true this was of him (Figure 7).

- "Development of the Orthophotoscope," published in 1955 in *Photogrammetric Engineering*, Vol. 21, No. 4, pp. 529-535. This paper, presented at the 21st Annual Meeting of ASP at the Shoreham Hotel, Washington, D.C., described another invention of Bean's, the orthophotoscope, a device for converting conventional perspective photographs to the equivalent of orthographic photographs. On such photographs, horizontal distances can be measured accurately. This was a most significant contribution to the art of photogrammetry.
- "Use of the Orthophotoscope," published in 1957 in *Photogrammetric Engineering*, Vol. 23, No. 1, pp. 170-179. Bean co-authored this paper with Morris Thompson. It was presented by Thompson at the Semi-Annual Meeting of ASP in Denver, Colorado on October 2, 1956. It was an update on the development of this unique instrument and gave more details on the total system for producing orthophotographs and on the several applications.

In perusing the early publications of ASP for papers by Bean, I came across a number of references to him which revealed his considerable involvement in the profession. To begin with, he was one of the 12 founders of the American Society of Photogrammetry. Bean, who was listed as being with the "U.S. Engineer Corps," together with Colonel C. H. Birdseye, Commander O. S. Reading, W. N. Brown, J. L. Buckmaster, C. W. Collier, C. H. Davey, L. T. Eliel, Heinz Gruner, T. W. McKinley, J. W. Ninneman, and Marshall S. Wright, Sr., met in the dining room of Reading's house in Washington, D.C. on July 29, 1934 and conceived our Society, which in 1984 celebrated its 50th anniversary with over 8,000 members. The minutes of this first meeting included the following expectation:

> "It is hoped that at the next meeting there will be time for Messrs. Eliel and Bean to be a bit hard boiled in discussing the tests of the stereoplanigraph."

Bean was Director of the TVA Section of ASP in 1940 and 1941, and Second Vice President of ASP in 1947 (Figure 8).

The first issue of the first publication of ASP, the *Newsnotes of the American Society of Photogrammetry*, contained the following item:

> "Heinz Gruner and Russell K. Bean, who were in Washington on leave from the Corps of Engineers, operating the Stereoplanigraph in connection with the joint test being conducted by the Corps of Engineers, Geological Survey, and Fairchild Aerial Surveys, Inc., have returned to their permanent assignment at Dayton."

The second volume of the Newsnotes, published in 1936, contains an article by E. B. Woodward and C. W. Kendall on "Aerial Film Dimension Changes" in which Bean is credited with "invaluable assistance." In Volume 5, published in 1939, Bean reviewed the Second Edition of R. O. Anderson's book entitled *Applied Photogrammetry*.

PATENTS

In December 1954, Russ Bean was issued Government Patent Number 2696752 for a "Stereoscopic Photographic Projection Mapping Instrument" called the Twinplex, intended primarily for aerotriangulation of convergent or transverse low-

FIG. 7. With his drafting staff at USGS. Left to right: George Harrison, Russ Bean, Harold Graves, Jack Knauf, and John Pekala.

FIG. 8. Semi-Annual Meeting of the American Society of Photogrammetry, Chattanooga, Tennessee, September, 1936.

oblique photography (Figure 9). The advantages of such photography over conventional vertical photography were long recognized but never exploited. The wider angle of intersection of corresponding rays in the stereoscopic model resulted in greater accuracy, and the greater ground coverage required less field-survey control. While existing multiplex and Kelsh plotters could have been modified to compile convergent photography, a new instrument was needed to bridge control over a series of stereoscopic models. This led to the development of the Twinplex. It never became a production instrument, partly because of the concurrent development of super-wide-angle photography which eliminated the advantages of convergent photography, and partly because of the development of other more effective means for extending control. Nevertheless, as a result of this project, the Geological Survey used convergent photography to map thousands of square miles. By orienting the twin cameras transverse to the flight line, the Survey mapped 122,000 square miles of the Brooks Range in Alaska in the mid-1950's by the only practical way possible at the time—using the Bean-developed twin-low-oblique photography system. It also led to the development of the ER-55 projector, because multiplex projectors and Kelsh plotters did not provide enough light in the corners of convergent and transverse low-oblique photography models. There was yet another spin-off benefit. As the exploitation of convergent photography progressed, it became apparent that improvements were needed in the way aerial cameras were mounted in airplanes (Figure 10). This led to the manufacture of special camera

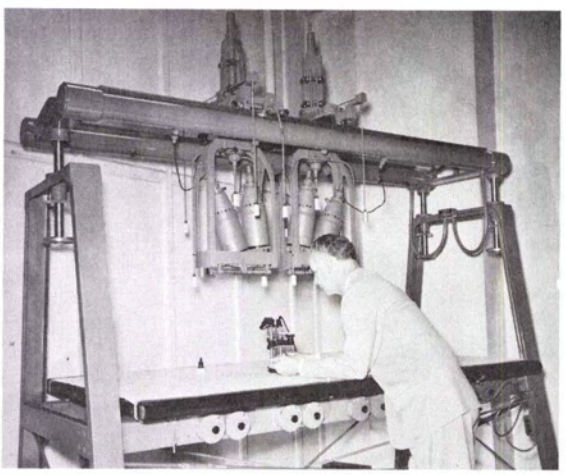

FIG. 9. The Twinplex.

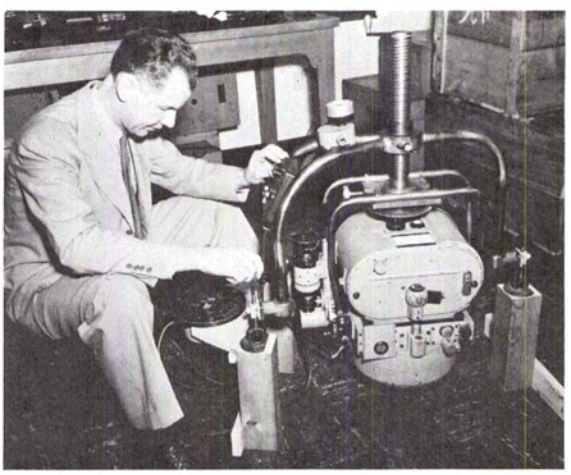

FIG. 10. Inspecting a camera mount.

mounts by the Fairchild Instrument Company to meet rigid requirements established by Bean.

In March 1956, Bean was issued Government Patent Number 2737846 for an "Ellipsoidal Reflector Projector for Stereo-Photogrammetric Map Plotting," more commonly known as the ER-55 projector, an instrument for the compilation of maps from stereoscopically projected photographic images (Figure 11). It incorporated a light source placed at one focus of a polished ellipsoidal surface, with the projection lens at the other focus, thereby obtaining high efficiency in utilizing the available light. The ER-55 plotter (two or more projectors) was designed for use with vertical, convergent low-oblique, or transverse low-oblique photography and was used by the Geological Survey to compile thousands of maps in the 1950's and 1960's. It is still in use today in small mapping firms. Manufacturing rights for the ER-55 were purchased from the Government by the Bausch and Lomb Optical Company which renamed it the Balplex Plotter and sold it commercially.

Government Patent Number 2869149 was issued to Bean in January 1959 for the orthophotoscope, a device for converting conventional perspective photographs to the equivalent of orthographic photographs (Figure 12). Bean originally conceived the idea in 1936, but it was not until 1950 that he asked his staff to perform the first experiments. By 1953 a workable mock-up model of the proposed instrument was completed. The orthophotoscope was initially developed in response to a request from geologists of the Geological Survey. To a geologist the orthophotograph offered the wealth of detail supplied by photography with the accuracy of measurement supplied by a map. Also, orthophotographs could be made in a fraction of the time required for a map. Applications of orthophotography sprang up everywhere. New categories of maps called orthophotomaps and orthophotoquads were developed. Several new instruments came on the market to satisfy the growing demands of orthophotography by the government, including the Department of Defense, and by private enterprise. New cartographic and photographic processing techniques were developed to improve the quality and aesthetic appeal of the final product. Orthophotoquads were being produced (and still are today) to satisfy the immediate needs of the map users while the conventional map products are being made.

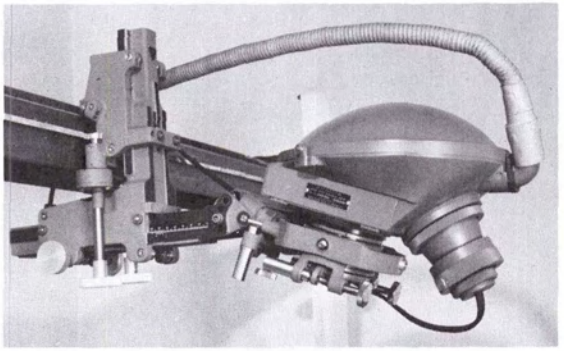

FIG. 11. ER-55 projector oriented to accommodate low oblique (20°) transverse photography.

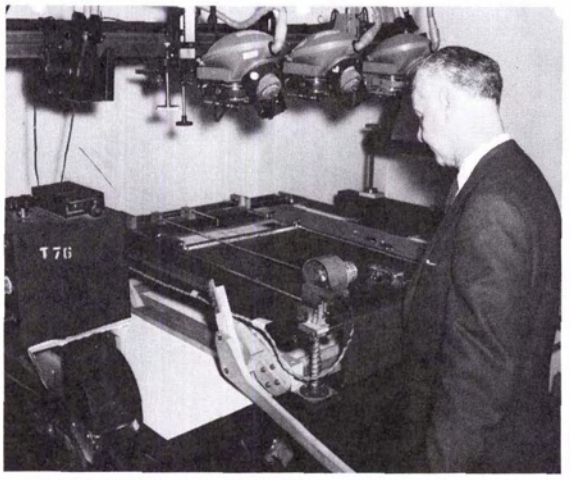

FIG. 12. "Breadboard" model of Orthophotoscope.

Of all of Bean's contributions to our profession, I believe his development of the orthophotoscope and his promotion of orthophotomapping was his greatest achievement. One could say he opened up a whole new era in photogrammetry and mapping, leading to great economic benefits to our country as well as immeasurable gains in national defense mapping.

Bean also applied for a patent on a system for stereoscopic calibration of photogrammetric systems. The heart of this system was a multi-collimator calibrator with an array of collimators which projected resolution targets through an aerial camera lens onto a sensitized glass plate which, when developed, was examined on a comparator to determine the distortion characteristics of the camera systems (Figure 13). Such an instrument was built to Bean's specifications by the David W. Mann Company in 1954 and with several added collimators is still in use today by the Geological Survey to check out aerial cameras before they are used for USGS mapping projects. This service is also available to non-Survey contractors, and currently about 100 aerial cameras per year are examined using the collimator. A patent was not granted because of the prior existence of other collimators, albeit none were used in the kind of system developed by Bean.

BEAN'S BOYS

Russ's legacy also included a corps of talented photogrammetrists, known in the heyday of photo-

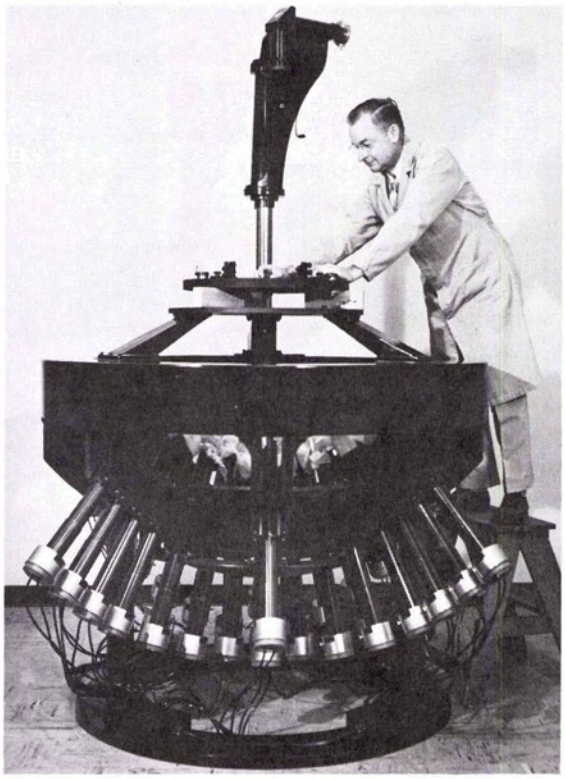

FIG. 13. Multi-collimator camera calibrator being used by Reynold Ask.

grammetric research at the U.S. Geological Survey as "Bean's Boys," whose careers blossomed under the tutelage, inspiration, and goading of "Mr. Bean." (Figure 14.) Excluding myself, who served him for 13 years and later succeeded him as Chief of the Office of Research and Technical Standards, the group included William E. Harman, pioneer in precision aerial photography and winner of the Talbert Abrams Award; James G. Lewis, inventor of the photoangulator and the rectoblique and stereoblique plotters; Hugh B. Loving, Past President and Honorary Member of ASP and inventor of the airborne control (ABC) system; Rupert B. Southard, who later became Chief of the National Mapping Division, USGS, and a winner of the Luis Struck Award; and Morris M. Thompson, Honorary Member of ASP and winner of the Talbert Abrams and Fairchild Awards. Also under Russ's direction and influence were Jack W. Knauf, inventor of the stereoimage alternator and winner of the Talbert Abrams Award, and Marvin B. Scher, inventor of the stereotemplet system and winner of the Fairchild award (Figure 15).

Without taking anything away from Harry T. Kelsh, inventor of the Kelsh plotter, it was in Russ Bean's research unit in the Geological Survey and under his personal guidance that the Kelsh plotter was completely redesigned for large-scale production, making it the highly successful instrument it came to be in both government and private industry. Harry Kelsh was working under the direction of Russ Bean during this period of the plotter's development.

WHAT OTHERS SAY

Anyone who was born on the vernal equinox at the beginning of the 20th century, as Russ Bean was, had to be a man of some destiny. The best measure of a man is most often how he is judged by history—how he is remembered by those who knew him after he is gone. I contacted a number of Russ Bean's friends and colleagues and asked them to give me their recollections of this remarkable man. Here is some of what they had to say:

> "I always like Russ. He was a good friend." Joseph P. Burns, former member of Bean's staff.
>
> "He was fun to work for!" Eloise R. Byrd, his secretary for many years.
>
> "Mathematics was not one of Bean's strong points, but his research inquisitiveness and inventive and mechanical aptitude, and knowledge of O. Von Gruber's translated lectures and essays on photogrammetry made him a formidable and successful instructor and developer." Walter S. Dix, TVA colleague.
>
> "I like him very much. He was always there when you needed him. He was very talented mechanically." Heinz Gruner, a good friend for 40 years.

FIG. 14. USGS photogrammetric group at meeting in Sacramento, California, 1956.

FIG. 15. USGS research staff, 1960. From left: Marvin Scher, Jack Knauf, Harold Graves, Rupert Southard, Russ Bean, Art Shope, Otto Gutenson, Ray Ask, Hugh Loving, Jim Lewis, and Jim Buckmaster.

"He was a hard worker and an asset to the group of those individuals interested in photogrammetric research and . . . responsible in giving the push to many of the advances in the analog applications of the period." Daniel Kennedy, former Central Region Engineer, USGS.

"Mr. Bean was enthusiastic, brilliant, personable, and humorous. Through his innovations, the Topographic Division of the Geological Survey became a leader in the photogrammetric community." J. W. Knauf, designer on Bean's staff for 17 years.

"I can best describe Russ Bean by saying he always kept things "stirred up." He expected and got the best from those under him and he also expected and got the best from those working under private contract to the Federal Government." James G. Lewis, Chief, Research and Development Branch, USGS, under Bean.

"He would always argue with you just to make you prove your point. He always said he didn't have ulcers, he gave them! That was about true, too." A. C. McCutchen, former Central Region Engineer, USGS.

"Russ was always ready, willing, and able to discuss ideas and their application to the real world of mapping. He was a great help to me both in my enjoyment of my chosen profession, and in my use of fundamental theory." A. O. Quinn, former TVA employee under Bean.

"He was our tutor and challenged us with photogrammetry problems that had not as yet been solved. He made us feel like pioneers in a new scientific field. He appeared to measure us, not so much by the answers we offered, but by the questions we asked. More than anything else, he made me appreciate my job." Marvin B. Scher, member of the USGS-TVA research group, and later Chief, Branch of Photogrammetry, USGS, under Bean.

"He had his idiosyncrasies but, of all the people I worked for in the Survey, I respected his technical knowledge the most." Arthur Shope, former staff engineer in Bean's office.

"Russell Bean was a talented photogrammetrist, a successful instigator of progressive photogrammetric development, an unassailable debater, a keen judge of talent, and an unquenchable spirit. Of all his qualities, I think the best was his ability to challenge the people who worked with him, many of whom were extremely talented. I value the years I worked for him and am grateful for the boost that experience gave my career." R. B. Southard, one of "Bean's Boys" and now Chief, National Mapping Division, USGS.

"To my mind, Russ was an authentic genius in the field of photogrammetry. His genius lay in a remarkable, intuitive knowledge of what would work and what would not work. When we gave him our solution to a mathematical problem, he would say the answer was wrong; then we would review our solution and discover that it was indeed wrong. Just about everything I know about photogrammetry I learned from Russ, without benefit of text books." Morris Thompson, another of "Bean's Boys" who worked closely with Bean, on and off, from 1939 to 1963.

HONORS

Among Russ Bean's high honors were the following:

The Distinguished Service Award, the highest award of the Department of the Interior, was presented to him by Secretary of the Interior Fred A. Seaton in 1957, for outstanding contributions to Federal service.

The Photogrammetric Award of the American Society of Photogrammetry was awarded to him in 1951 and again in 1959. No other person has ever been honored twice with this most prestigious award given "to stimulate the development of the art of aerial photogrammetry in the United States."

The Honorary Membership Award, considered to be the highest award of the American Society of Photogrammetry, was bestowed on Russell K. Bean in 1967. This award is given only to individuals who have rendered distinguished service to the Society or who have attained distinction in the field of photogrammetry. Russ did both. It is limited to a total of 21 at

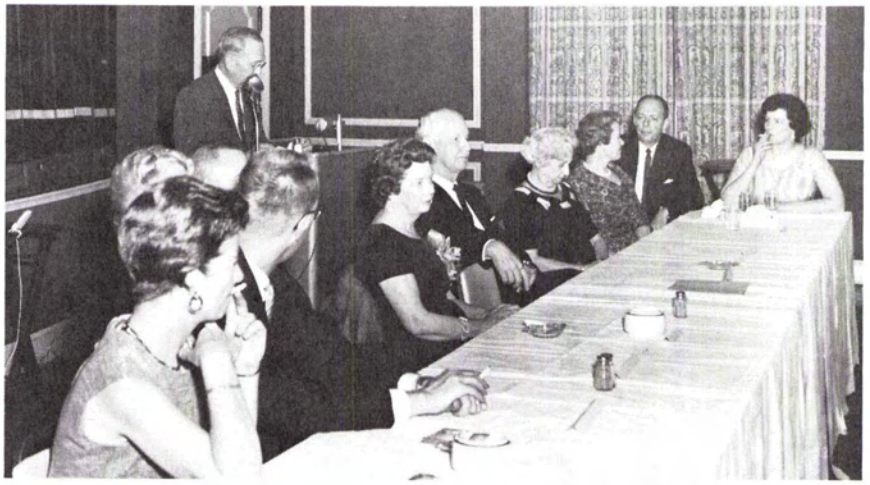

FIG. 16. Russ Bean retirement dinner, 1963. At Russ's right is Mrs. Bean. Daughter Edith Mae is at the far end of the table. George Whitmore is at the lectern.

any given time from the total membership which at the time of his award was about 5,000.

RETIREMENT

After his retirement from the Geological Survey in April, 1963, Russ worked for about six years for the Kelsh Instrument Co. in Baltimore, Maryland. Bothered by Parkinson's disease and restricted by an ailing heart, he later retreated from public life to spend more time in home workshop and with his family. On April 20, 1976, at the age of 76, Russ Bean suffered a fatal heart attack at his home in Vienna, Virginia, with Sara by his side.

When he retired, the Topo Players, a group of Geological Survey entertainers, some of whom had more courage than talent (I was one), honored him with a musical show at the Officer's Club in the old Naval Gun Factory in Washington (Figure 16). Entitled "We Fuss Over Russ," written by Morris Thompson and directed by Rupe Southard, the show featured parodies on such songs as "Cielito Lindo," (recalling Russ's Mexican period), "Mr. Gallagher and Mr. Shean" (George Whitmore and Russ Bean), and "The Bowery" (The Beanery). I was privileged that night to do a solo to the tune of "My Gal Sal" about "Our Cuss Russ." The last verse bears repeating because I think it was very descriptive of Russ's method of operation. It went like this:

The inventions authored by Russ
Are fashioned with feudin' and fuss
And lenses and motions
And big-deal promotions
And one part muss
And some times they work like a charm
And some times they're viewed with alarm
But no use denying
He never stops trying
That's our cuss, Russ.

We closed the show with some H.M.S. Pinafore by Gilbert and Sullivan. As we sang our cheers "for the retiring chieftain of the research crew," I was not the only one there whose eyes were moist with affection for Russell K. Bean, a giant in the field of photogrammetry, to whom we owe so much.

Members of Russ Bean's family with Memorial Lecture Speakers.