

SYMPOSIUM

COMPUTING TRENDS IN PHOTOGRAMMETRY

MODERATOR

Mr. John V. Sharp

PARTICIPANTS

President Lundahl
Mr. John V. Sharp

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Introduction and presentation of a film *Electronic Computers in Business*. Courtesy of Arthur Anderson & Co. of New York City

Dr. Hellmut H. Schmid
Prof. Frederick J. Doyle

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*Analytical Photogrammetry**

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PRELIMINARY REMARKS

President Lundahl

THE program this afternoon is an innovation in photogrammetry. It is a most interesting panel in the form of a Symposium on Computing Trends in Photogrammetry.

John Sharp, who is the Moderator, majored in General Science at M.I.T., where he graduated in 1936. Following a series of engineering staff positions, he entered active duty in 1941 as an officer in the U. S. Naval Reserve. After discharge in January 1945, he joined the Bausch and Lomb Optical Company where he directed the

development of Bausch and Lomb photogrammetric instrument systems until 1951. Mr. Sharp accepted a position with the International Business Machines Corporation in 1952, where he is engaged in work concerned with developing data recording and processing systems. He was awarded the Fairchild Award in 1950 for his work in developing the Autofocus Rectifier and for his investigations of improvements in stereoscopic plotting instruments. He was a director of the American Society of Photogrammetry from 1950 until 1952.

INTRODUCTION

John V. Sharp, Chairman

THE art of improving any productive system, such as our map producing systems involves continual change. Three types of coordinated changes required to increase productivity are (1) in technical equipment used, (2) in productive methods, and (3) in the decisions of individuals who control the productive system.

The technical and methods changes in

systems involving computing equipment have been radical in the past decade. During this period the decisions of informed individuals to use computing systems have helped bring increased productivity to many industries.

A few members of the American Society of Photogrammetry already are aware of similar technical, method and decision

* Under a different title this paper was published in the December 1954 issue.

changes now taking place economically in map producing systems. Today's members of this Symposium are among them.

The purpose of the Symposium today is to increase the understanding among photogrammetrists of the trend toward the use of electronic computers within Photogrammetric Mapping Systems.

Computers of different sizes and types are well developed by several manufacturing organizations for use in data processing systems. Some of the concerns have excellent and wide-spread service facilities, both here and abroad to maintain these data processing systems.

Associated with computing equipment is equipment for use in measuring computable data, such as measured from aerial photographs. This type of equipment is being developed by forward-looking optical and electronic companies. Output of data from this equipment is automatically compatible with inputs to computers. But electronic computers take a bit of understanding to use them.

The film "Electronics in Accounting and Business" on computer operation, about to be presented, was chosen for two reasons. One is that electronic computing by engineers in any organization often begins with cooperative use of computers by engineers with their accountants; and secondly, the useful language of accountants, as well as of computing engineers are both contained in this film. Its original purpose was to train accountants to use modern computers, but I believe it will be an aid to a fuller understanding of electronic computers, and the papers and discussions to follow.

Accountants, like photogrammetrists, formerly used desk calculators; they still use them, but often to prepare plans for using electronic computers. With these background remarks, you now have the opportunity of seeing an excellent training film prepared by the Arthur Anderson & Co. of New York for its own use. This company, one of the outstanding accounting firms in the United States, kindly agreed to our use of this film.

One more point, obvious but important, is that organizations with large production usually need large computers; and that medium and small producers need small computers. This is why we need to know the use of various sizes. Accordingly three papers of the Symposium are devoted re-

spectively to what is loosely called the small, medium and large computers. Here's to photogrammetry's future and its improved productivity through electronic computing and data processing! To the members of the Symposium, a word of thanks for their work and effort in preparing their papers which are to be presented and discussed following the film. The film will now be shown.

* * *

MR. SHARP: (*continuing*) The first paper will be given by Dr. Hellmut H. Schmid. He was born at Dresden, Germany. After four years of education in the fields of geodesy and photogrammetry at the University of Dresden, Germany, he graduated in 1938 with a M.S. degree. From 1938 to 1945 he was an Assistant at the same Geodetic Institute. From 1938 to 1940 he worked under the direction of Prof. Oesterheld in the division for "Higher Geodesy, Geodetic-Astronomical Measurements and Cadastral Surveying." During 1940 to 1945 he was Assistant in the division for "Terrestrial and Aerial Photogrammetry," under the direction of Prof. Hugerhoff and later of Prof. K. Schwidofsky. In 1941 he received his doctorate in Engineering. During the war he was on temporary assignment with the German Rocket center at Peenemunde, as chief of a branch in charge of geodetic measurements, precision workshop measurements and full scale trajectory measuring methods in connection with the development, testing and field use of the V-2 rockets. Since 1945 he has been employed by the Defense Department (Ordnance) working on geodetic problems and trajectory measuring methods in connection with guided missile developments. In 1950 he became chief of the "Geodesy and Photogrammetry Section" of the Ballistic Research Laboratories at Aberdeen Proving Ground, Aberdeen, Maryland. One of the principal tasks of this section is to study the application of terrestrial and aerial precision photogrammetric methods with respect to research and development projects for Ordnance. In the December 1954 issue of PHOTOGRAMMETRIC ENGINEERING, he reported that he can compute a spatial resection or camera orientation problem in five minutes on the Ordvac which he reports costs about \$100 an hour. Thus, for \$8 he can compute a space resection.

The next speaker will be Frederick J. Doyle. He made his first acquaintance with mapping during World War II while serving in the Pacific Theatre with the 949th Topographic Engineers. After the war he was administrative officer for the Inter American Geodetic Survey in Central and South America. While still hospitalized from a disastrous plane crash in the Andes Mountains, he enrolled in Syracuse University. Later he served as instructor in surveying and photogrammetry at that University. After graduation from Syracuse as B.S. in C.E., Mr. Doyle was awarded a Fulbright Grant for advanced studies in photogrammetry under Prof. Schermerhorn at the International Training Centre. This was followed by an inspection tour of the major photogrammetric instrument manufacturing and mapping agencies in western Europe. Mr. Doyle is now a research associate at the Mapping and Charting Research Laboratory and assistant professor in the Institute of Geodesy, Photogrammetry, and Cartography at Ohio State University.

The third speaker will be Professor Arthur J. McNair. He was born and raised in Leadville, Colorado. He holds the degrees B.S. (C.E.), M.S., and C.E. from the University of Colorado. Upon graduation he was an Instructor and later Associate Professor in Civil Engineering at the University of Colorado. In 1949 he moved to Cornell University where he is now Professor of Civil Engineering and Head of the Surveying Department. He has spent summers in consulting practice as a professional engineer and land surveyor, mostly in Colorado. Professor McNair is the author of several technical publications. He is a member of several professional and honorary societies. In 1950 he was general chairman of the National Photogrammetry Seminar for teachers in the U. S. and Canada co-sponsored by the American Society of Photogrammetry, American Society for Engineering Education and the University of Denver. He is a past chairman of Committee 8 (Surveying and Mapping), past chairman of the Civil Engineering Division and currently a member of the General Council, all of the American Society for Engineering Education. He is a past director of both American Society of Photogrammetry and the American Congress of Surveying and Mapping.

Mr. R. S. Brandt will follow Professor McNair. Mr. Brandt in 1941 received his B.S. Degree from the University of Chicago with major emphasis in Physics, Optics and Mathematics. In the next 5 years Mr. Brandt served in the U. S. Corps of Engineers and was assigned to geodetic and mapping tasks in the Office, Chief of Engineers, Military Grid Unit; the 29th Engineer Topographic Battalion and to the "Houghton" in the European Theatre of Operations. Mr. Brandt has been employed by the Army Map Service since 1946. He first served as Chief, Photogrammetric Equipment Section, later as Chief, Triangulation Branch. He is presently assigned as Chief of the Development Branch in the Photogrammetric Division, Army Map Service.* Mr. Brandt is well known for his work in the practical development of techniques and procedures for aerotriangulation and is presently serving the American Society of Photogrammetry as reporter to Commission III of the International Society of Photogrammetry. He is also a member of the Mathematical Association of America. Mr. Brandt's experience has been concerned with quantity production of maps and associated triangulation computing problems on the Remington Rand Univac.

Dr. Paul Herget will speak on Analytical Photogrammetry. He was born in Cincinnati and received his doctorate in 1935 from the University of Cincinnati. In 1933 he was an instructor in Astronomy at that University and in 1943 became Professor of Astronomy, a position which he now holds. Dr. Herget is also Consultant to the Mapping and Charting Laboratories at Ohio State University. He is a member of several technical societies including The American Society for Computing Machinery.

Dr. Herget has worked in the computing field for a long time and is one of the outstanding leaders in that field. He knows the practice and the language of computing by electronics well, and most recently by computation on the Univac, according to the papers, has found Lost Moon No. 8 to the Planet Jupiter. He will tell us something about a new analytical method that is different than either the Church or the

* Subsequent to the Annual Meeting, Mr. Brandt entered the employ of Hycon Aerial Surveys.—*Editor*.

Anderson methods. This information was published in the December 1954 issue of PHOTOGRAMMETRIC ENGINEERING.

Mr. Randall D. Esten, from the Engineer Research & Development Laboratories, Fort Belvoir will speak on The Development of Photogrammetric Computing Systems. Mr. Esten received a B.S. in Physics from M.I.T. in 1945, and an M.S. in Photogrammetry from Syracuse University in 1948. He is presently the Chief,

Map Compilation Techniques Section, Map Compilation Branch, Topographic Engineering Department, Engineer Research and Development Laboratories. He formerly was a Research Associate at the Mapping and Charting Research Laboratory of the Ohio State University Research Foundation and a Physicist at Corning Glass Works. His talk in the area of computational systems I'm sure will include new thoughts for us to consider.

ANALYTICAL PHOTOGRAMMETRY AS APPLIED TO FLIGHT-TESTING*

Dr. Hellmut Schmid, Geodesist, Ballistic Research Laboratories, Aberdeen Proving Ground, Maryland

ABSTRACT

After a few remarks on the mission of the Ballistic Research Laboratories with respect to the determination of accurate trajectory information of airborne test vehicles, the application of photogrammetric measuring methods is singled out. It is shown how the analytical methods applied serve basically the same purpose as those in conventional fields of photogrammetry concerned with the determination of spatial coordinates of individual points, and how these methods, on the other hand, lead to an approach to a certain extent different from the treatment of the corresponding stereoscopic evaluation on universal plotters. The discussion is supplemented by some remarks on equipment used in measuring plate coordinates, and on the phase of digitalizing the comparator readings.

ONE of the missions of the Ballistic Research Laboratories of Aberdeen is the development of full-scale trajectory measuring methods for problems assigned to Ordnance, especially in connection with the development of guided missiles and related projects. In general terms this task may be characterized as the problem of determining the space-time coordinates of the trajectories of airborne targets. Both electronic and optical measuring methods are in use and their further development is under investigation. In the Optical Measurements Branch, one of the methods studied is concerned with the application of ground-based and airborne precision photogrammetric cameras, for the purpose of providing an independent trajectory measuring method, and to serve as a calibration standard for other optical and

electronic measuring methods. The scope of our work and the basic concept underlying our approach are more fully appreciated if it is understood that the measuring methods under consideration must be applicable to the determination of the trajectories of various types of guided missiles, of small and large airborne test vehicles, directly or remotely controlled, as well as of free flight ballistic missiles flying over short, moderate and long ranges. The problem presents a challenge because the accuracy requirements of position and time are comparable to those encountered in classical geodetic measuring methods.

Although this introduction might lead one to expect a very special treatment of the photogrammetric problem, this actually is not required. After removing the time-coordinate and disregarding the synchro-

* This is a part of the Symposium on Computing Trends in Photogrammetry held on March 7, 1955 during the Society's Annual Meeting.