

some remaining parallax, it is more or less up to the operator to decide what to do with this remaining parallax. That is exactly the point where the analytical method is far superior, because when using five points in relative orientation (of course assuming this same accuracy in the stereocomparators and ordinary plotting equipment), the results should be approximately the same. However, if using an analytical method, we have this facility of using more points and then the remaining parallaxes (always existing, due to the inaccuracy of photographic images) can be thus cast out; it must be decided in a mathematical way. Therefore, any speak-

ing about an infinite number of points which are used in instrumental work, is just not true.

THE MODERATOR. Thank you, Mr. Blachut. We mentioned earlier, in automation, we would like to get the arbitrary decision element out of this; and I think this brings out the point very nicely, about eliminating the worker.

If there are no other pertinent questions, I will take this opportunity to thank the members of this Panel, who have so graciously come, and stayed this length of time, to present what we believe are the problems and how they can be resolved.

### BIOGRAPHICAL SKETCHES OF PARTICIPANTS

EDWIN A. ROTH was born and educated in St. Louis, Mo. and is a graduate of Washington Univ. with a B.S. degree in Mathematics and Astronomy. He served with the Army Air Force from 1940 to 1945 and participated in the European campaign. In 1948 he entered on duty with the Aeronautical Chart and Information Center where he is presently employed in the Photogrammetric Equipment and Techniques Office as a consultant and specialist in the application of mathematics to photogrammetry.

He was the second President of the St. Louis Section of the American Society of Photogrammetry and is the author of two papers which have been published in *PHOTOGRAMMETRIC ENGINEERING*.

DR. PAUL M. PEPPER obtained his elementary and secondary schooling in Fort Wayne, Ind. He attended Indiana Univ. and obtained an A.B. degree in 1931 and a M.A. degree in 1932, both in Mathematics. From 1932 to 1937, he was the grantee of various graduate fellowships at the Univ. of Cincinnati where he obtained his Ph.D. degree in Mathematics in 1937. Honors: A.B. cum laude, Phi Beta Kappa, Sigma Xi, Alpha Pi Mu.

He was Instructor in the Dept. of Mathematics at the Univ. of Cincinnati from 1937 to 1938. Between 1938 and 1949 he rose from Instructor through Assoc. Professor of Mathematics at the Univ. of Notre Dame. In the summer of 1947 he was Research Fellow in Aeronautical Engineering at Harvard Univ. In 1949 he joined the staff of the Dept. of Industrial Engineering of The Ohio State Univ. as Assoc. Professor. He was Research Coordinator and, later, Asst. to the Director of The Ohio State Univ. Research Foundation, 1951 to 1953, 1957-, he was Director of the Mapping and Charting Research Lab. and Assoc. Professor of Mathematics from 1953 to 1957.

He is author of published papers in pure mathematics and in its applications to metallurgy and industrial engineering. He holds a patent on a calculating device. He is a member of several technical and scientific societies.

G. C. TEWINKEL has been employed in the U. S. Coast and Geodetic Survey in Washington, D. C. since 1941. He is chief of a small unit engaged in photogrammetric research, development and training. He was formerly employed by the Soil Conservation Service and by the U. S. Forest Service in Spokane, Wash. He is a



MEMBERS OF PANEL—(L to R) SCHUT, BODNAR, PEPPER, ROTH, SCHMID, TEWINKEL AND VAN PRAAG

graduate of the State College of Washington (1932) and of Syracuse Univ. (1940). He has served as member of the Board of Direction of the Society as well as on several committees including publications, the MANUAL, nomenclature and budget.

DR. HELLMUT SCHMID was born at Dresden, Germany. In 1938 he was graduated from the Univ. of Dresden with an M.S. degree in Geodesy and Photogrammetry. From 1938 to 1945 he was an assistant in this same institution. From 1938 to 1940 he held this position under the direction of Prof. Oesterhelt in the division for "Higher Geodesy, Geodetic—Astronomical Measurements and Cadastral Surveying." From 1940 to 1945 he was assistant in the division for "Terrestrial and Aerial Photogrammetry," under the direction of Prof. Hegershoff and later under Prof. K. Schwidofsky. In 1941 he received a doctorate in Engineering based on a dissertation about model deformations caused by residual errors during the process of relative orientation. 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 work shop measurements and all full scale trajectory measuring methods in connection with the development, testing and field use of the V-2 rockets.

Since 1945 Dr. Schmid has been employed by the Defense Dept. (Ordnance), working on geodetic problems and trajectory measuring methods in connection with guided missile developments. In 1950 he transferred from White Sands Proving Ground—Fort Bliss activities to the Ballistic Research Laboratories at the Aberdeen Proving Ground, Aberdeen, Md. Here he became Chief of the Geodesy and Photogrammetry Section of the Ballistic Measurements Laboratory, the position he now holds.

One of the principal tests of the Ballistic Measurements Laboratory is to study the application of terrestrial and aerial precision photogrammetric methods with respect to research and development projects for Ordnance.

B. J. BODNAR was graduated from New York University in 1938 with a Bachelor in Civil Engineering degree. His appointment as Jr. Engineer with the U.S.G.S. in Chattanooga, Tennessee, was followed by a variety of experience in all phases of multiplex mapping and triangulation. Since transferring to E.R.D.L. in 1952 he has been project engineer on the Stereopontometer, High Precision Stereoplotter, APR, and currently on the Analytical Triangulation development projects.

MR. V. A. VAN PRAAG received the B.S. degree in 1938 from Univ. of Calif. and M.B.A. degree from Harvard Univ. in 1940. He is presently employed by the Bendix Computer Division of Bendix Aviation Corp. as Manager, Special Products Sales.

He has worked on the development and marketing of the digital computers and systems for Bendix Computer Division ever since they have been delivering computers.

G. H. SCHUT obtained the degree of Surveying Engineer at the Technical Univ. at Delft, Netherlands and was employed by the Surveying Division of the Dutch Ministry of Public Works as Chief of the Computing Section from 1947 to 1952.

In 1952 he emigrated to Canada and since then has been employed by the National Research Council of Canada, Applied Physics Division, Photogrammetric Section. He developed a procedure of analytical aerial triangulation and coded this for Ferut, the electronic computer at the University of Toronto.



Semi-Annual Convention at St. Louis.