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WANTED — TRAINING — IN PHOTOGRAMMETRY

by G. C. TEWINKEL, U. S. Coast and Geodetic Survey.

These remarks deal with the background of training this organization desires of its new employees of college graduate level working in the Division of Photogrammetry. The present situation is not an ideal one since many of the employees were wholly unfamiliar with mapping with photographs when they began working with the Division. And due to the lack of prospective professional employees, positions are being filled with sub-professionals whose special training is certainly adequate but whose visions are apt to be limited somewhat by the lack of a broad fundamental engineering training. Moreover, the civil engineer is frequently less interested and less prepared for work in photogrammetry than the forester, geologist, mathematician, and physicist. The civil engineer is usually better prepared for work in bridge design and sewage disposal than in surveying and mapping. This is due partly to the comparative small size of the field of mapping and partly to the lack of information of the instructors as to the true state of affairs.

The reader is perhaps acquainted with the course in photogrammetry offered at Syracuse University. This school is mentioned because it furnishes the only basis of comparison with which I am familiar. It is felt that the undergraduate training furnishes the student with sufficient theoretical knowledge but with inadequate conceptions and skill in the operation of the stereophotogrammetric instruments, in the art of making radial plots, and in the relative importance of the different phases and methods of map making. The graduate student does not appear to be much better equipped than the undergraduate. Hence it seems that it is necessary for a student to devote even more time to the study of photogrammetry than is offered at Syracuse.

In my opinion, the college should stress both the fundamental theories and the operation of photogrammetric instruments, preferably the multiplex. The student should be able to visualize the deformations of the stereoscope model due to the several states of improper relative orientation. I do not think the student should be proficient in multiplex operation, but he should be so thoroughly familiar with it that he is cognizant of his lack of training. The college trained photogrammetrist should be well informed of the principles and procedures of radial plotting because that method is perhaps the most widely used for making maps from photographs. He should understand the geometry of the aerial photograph with sufficient clarity so that he cannot make glaring mistakes and so that he knows the nature of the errors embodied in the system and the means for correcting and compensating for those errors. He should be informed as to the degree of precision that can be and is being obtained by graphic methods utilizing very simple procedures and instruments together with meticulous care in drafting.

It is not a practice of this organization to use only college graduates as stereoscopic instrument operators. Yet it creates organizational strength to have a few operators with college training, and also for all other professional men to be thoroughly familiar with the operation and limitations of the instruments. It is quite probable that most instrument operators should be sub-professional — should be purely skilled operators whose training has been highly specialized and limited. The training of these men is not a proper function of a university but of a training school or on-the-job training.

First, men are needed who have a good general knowledge of photogrammetry and allied surveying subjects, and, second, trained instrument operators are needed. At present neither is available. We find it necessary to train or partly train all our men — even the college graduates — both in field work and office work before they are sufficiently familiar with the procedures to be of adequate usefulness.

A course in theoretical photogrammetry is conducted periodically for groups of our employees on office time. The treatment of mathematics is made to fit the background of the particular group being taught since all are not college graduates. The course consists of twenty-four hours of lecture time with numerical problems for the student to solve, and the requirement that the student keep a good, neat notebook. The student receives the practical side of his training while at work. The course includes simple geometric optics, the scale relationships of the vertical photograph, relief displacement, the principles of radial plotting,

parallax and elevations, the human eye and stereoscopy, the geometry of the tilted photograph, simple analytic problems involving tilt, three methods for tilt determination, the theory of rectification, the oblique photograph, and stereoscopic plotting instruments. The purpose of the course is to explain to the photogrammetrist the fundamental reasons underlying his activities, to give him a well-founded basis for understanding the entire field of photogrammetry, to impress upon him that the theory and practice of photogrammetry is far from exploited, and to encourage clear thinking with respect to the many practical problems of the science.

There is a regular program for transferring a few office men to field operations three to six months during the summers. Multiplex operators receive at least six months of non-productive training, and other instrument operators receive somewhat less. New employees are usually placed first in sections where they may receive training in the office techniques such as the manipulation of the drafting pen in map compilation, in the making of radial plots, etc.

There will probably always be a need for some sort of office training program in photogrammetry because the bulk of the work can be performed economically by non-professional workers of high school graduate level. Also, the science utilizes a number of comparatively simple principles and procedures that are little known outside the mapping field. The well-informed engineering graduate is the logical person to conduct such a training program. In many instances his only source of photogrammetric knowledge has been his own office. His view-point is thus limited and his ability to teach the subject is curtailed.

It would indeed be helpful if the graduate photogrammetrist could enter duty prepared to go to work. Perhaps that is too much to expect since the graduate civil engineer is proficient neither as a draftsman nor as a transitman. It would even be an improvement over the present situation if each civil engineer had just six semester hours of wise instruction in practical photogrammetry. It is indeed a depressing situation when one visualizes the relatively limited number of positions available in the field of photogrammetry together with the high cost of instruments for the colleges. There might seem to be a practical limit on the number of colleges offering specialized training in the subject. But when one considers the facts that no large mapping program is undertaken to-day without considering the use of aerial photographs, and that the army with the best maps has always been victorious, then there seems to be little excuse for not including about six semester hours of photogrammetry in every civil engineering curriculum.

