HIGHER EDUCATION FOR PHOTOGRAMMETRY IN GOVERNMENT MAPPING

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THERE has been a great deal said, written and done about education for photogrammetry during the past several years. There is much information available for anyone who wishes to read the literature. This Society has published some excellent information during the last five years. It is hoped that the detailed report of the Seminar on photogrammetry which was held last summer in Denver will be made in the Journal.

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Most, if not nearly all, of the civil engineering schools in the United States now have in their curriculum one course or more in photogrammetry. Also many educational institutions teach photogrammetry to a certain degree, in connection with other types of activity, such as forestry, geology, soil conservation, etc. Most of this effort has taken place during the last ten to twelve years. As might be expected in the growth of any new field, particularly when the educational aspect of that growth is considered, serious growing pains have been experienced. Various schools have taken quite different attitudes toward the photogrammetric training that should be offered. Therefore it seems that the efforts and plans in the field of education for photogrammetry should be directed, or concentrated, toward certain definite objectives. It is my purpose to briefly outline or summarize a proposed objective that could well be followed by the educational institutions.

There are apparently three different basic needs for training in photogrammetry. The first may be classified as the need for knowledge regarding capabilities of photogrammetry. This need falls in the field of other specialists, principally other engineers, who need to use the results of photogrammetric studies and surveys. This group includes the professional fields which extensively utilize photogrammetric or surveying and mapping products. Such training should be designed to familiarize the student, not with the details of how to carry out a photogrammetric survey, but with what can be accomplished by photogrammetry.

The second need is that of the student who plans to continue *specialized* study and practice in photogrammetry throughout his career, particularly in the field of research and procedural development. Such college training study should be carried out in graduate schools and should not be considered in the undergraduate field.

The third need of photogrammetric training is that required in the training of a mapping engineer, who will participate regularly in photogrammetric operations on mapping projects. It is this class of training about which the following comments are principally directed.

In considering the training necessary for the mapping engineer, one must

first conclude or be convinced that photogrammetry should not be considered a field in itself. On the contrary, photogrammetry should be considered as one of the several tools, steps or phases used in mapping work. Photogrammetry by itself is no more important than any of the other several steps or phases used to accomplish a mapping program.

Within the mapping activities of the Government, photogrammetry is used as a tool in what might be classified as six closely related fields of activity. These fields are as follows:

a. Geodesy.
b. Photogrammetry.
c. Hydrography.
d. Cadastre.
e. Topography.
f. Cartography.

At present, civil engineer courses include some elementary parts of several of these fields. However, it is impossible to include in an ordinary civil engineer curriculum enough emphasis on all of these fields to amount to very much as long as the mechanical or structural courses of study are included as required subjects. Therefore it is believed that *it will be necessary* in the not too distant future *to establish undergraduate courses of study which will lead to a B.S. degree in surveying and mapping.*

It is a policy of the Topographic Division, Geological Survey to rotate field and office mapping personnel so that the individual employee will gain experience in the various phases of mapping. These varied assignments ordinarily include periods of activity in three or four of the fields of surveying and mapping. These are: geodesy, topography, photogrammetry and cartography. It has been found by experience that the more successful individuals, especially in the supervisory grades, have had rather extensive experience in two, three or four of these fields. In addition to working directly in the two to four fields, he is usually called upon to apply principles or theories of the other related fields, either directly or indirectly, in his daily work. For instance, when the area assigned to a topographic engineer includes coastal areas, it is necessary for the engineer to make determinations involving the fore-shore area, tide water streams, etc. Any study in hydrography which he might have had during college days would materially assist him in making the necessary determinations. The field engineer is also constantly required to solve problems regarding political boundaries, land lines, etc. The photogrammetric engineer should be aware of the geologic structure of the terrain he plots, as well as the land lines which the fences or field lines represent. He should be able to make an intelligent geodetic analysis of the control, and he should be accurately aware of the requirements of the cartographer who must convert the completed manuscript into final publication materials.

The general surveying and mapping course of study (these words are used for lack of better nomenclature at the present) should include many of the same basic science courses now included in the engineering curriculum. In addition, it should include required subjects basic to all of these six related fields.

A graduate with such a degree would be sought-for by any or all of the several agencies of the government carrying out mapping work, whether their activity be principally topographic, photogrammetric, cadastral, hydrographic, cartographic or geodetic work.

The demands of governmental mapping agencies is such that a comparatively small number of schools giving B.S. degrees in surveying and mapping

could supply the necessary professional recruits. During the next several years, while such courses are being established, the civil engineer departments should continue the present or improved courses in photogrammetry and the other fields. However, as soon as such degrees are given by an appreciable number of schools, the mapping course offered in engineering should be gradually modified to meet the needs of engineers and other professional personnel, such as geologists, foresters, petroleum engineers, land planners etc., who need to develop a comprehension of the capabilities of the principal methods of collecting, evaluating and presenting data regarding the earth's surface, and who may need to be familiar with certain photogrammetric techniques needed in their particular speciality.

Chairman McNair: Next, for training in photogrammetry as applicable to highway engineering, we will hear from Mr. Spelman, Division Engineer of the Bureau of Public Roads at Arlington, Virginia. He has been particularly active in this field and especially connected with obtaining personnel and the related problems. He knows the type of training required for highway work, not only in the Public Roads Administration, but also with various State highway departments and other highway groups.

TRAINING IN PHOTOGRAMMETRY FOR HIGHWAY ENGINEERING

H. J. Spelman, Division Engineer, Bureau of Public Roads

IN HIGHWAY engineering, photogrammetry is useful for route selection and for locating sources of construction materials, principally sand, gravel and stone.

In locating sources of materials we are in the field of the geologist and use photogrammetry qualitatively. In route selection we use it quantitatively to determine grades, alignment and cross section, and qualitatively to adjust the location to land use, and to the nature of the land. For example, we may select a location so as to avoid swamps, landslide areas, or similarly bad country, and likewise so as to obviate cutting a fine farm in two, or to avoid great property destruction in an urban area.

H. J. SPELMAN

Graduates coming to highway work as Junior Engineers should have had some training in photogrammetry. They need knowledge of and training in the use of aerial photographs in reconnaissance of area, reconnaissance of line, in preliminary surveys for the establishment of the location of a highway, and in identification of soils and physical objects from aerial photographs.

It is a problem for you gentlemen from the colleges to determine how much