

THE NEED FOR QUANTITATIVE EVALUATION OF THE PHOTO INTERPRETATION SYSTEM*

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ABSTRACT

Photo interpretation is now widely used as a means of obtaining information. At the present time it is an "art" and quantitative methods are suggested to make the approach more scientific. The object would be to determine present accuracy and efficiency quantitatively as well as proper evaluation of all phases of the photo interpretation system in terms of the end product—the report.

THE utility of photo interpretation is attested by the thousands of men and women who employ it as a means of obtaining information in their respective professional fields. Its professional status is apparent in (1) the recent creation of a separate commission in the International Society of Photogrammetry, (2) this third annual symposium of our Society, and (3) our Society's President, Arthur Lundahl, whose interests are about equally divided between photo interpretation and photogrammetry. With such professional recognition and practical application, it seems reasonable to believe that photo interpretation has attained a semblance of maturity.

Therefore, as photo interpreters, there should no longer be any need of convincing ourselves or our map making colleagues of the usefulness of this art. In my opinion the energy and enthusiasm formerly directed towards making our presence and usefulness known should now be devoted to the subject of learning just how good we are and how we can go about improving this end product of the photo reconnaissance system.

While you question my audacity to make such a statement may I ask a few questions. Do any of you know how to evaluate properly the progress of a P.I. in training? When is the trainee qualified to do responsible work? Do any of you know the extent of differences that might be expected between photo interpreters within one professional field working on the same problem? Do any of you know the maximum amount of information that can be gleaned by photo interpretation in each of the various aspects of specialized

fields, such as geology, forestry, soils engineering, soil conservation, etc.?

Moessner (1) has recently provided us with a simple quantitative measure of a person's ability to see stereoscopically. How many other techniques have been developed to aid in the selection and training of photo interpreters? Have any of our P.I. training centers or facilities established, or made plans for, an actual field area of known content for which air photos are available for testing P.I. performance?

Cameron (2), Pomeroy and Cline (3), Bateson (4), and Young (5) are among the very few known to the author as having made some quantitative evaluation of photo interpretation in their respective fields. Can we permit another five or ten years to elapse without appreciably decreasing this deficit in knowledge?

It is reasonable to believe that a photo interpreter who has the use of a key will have more in his report than if he did not use the key. Has anyone determined how much additional information there is in a report because a key was used? Does anyone know how much of this additional information is correct?

According to Voss (6), Metcalf (7), and Mayr (8) keys have been used in the natural sciences for over two and a half centuries. During this entire period the definition of the term key has been as follows: a series of alternate choices in an elimination process leading to the exact identification of an object. However in recent years the Interservice Committee of Photo Interpretation Research, Keys and Techniques (9) has defined seven key forms of which the dichotomous key is one. I agree with Smith (10) that it is

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unfortunate that this time honored technical term has been redefined because of the confusion that it creates for those who have been trained in the natural sciences. It is my opinion that we should evaluate and compare quantitatively true keys, and other aids called keys, that have been prepared for photo interpreters. Such studies should indicate their comparative worth and the area in which keys or other aids are of the most value.

MacDonald (11) has clearly depicted the likely area where there can be a loss of information between the "message" and the P.I. "report." Apparently the generally accepted philosophy by workers in the photo reconnaissance field has been that improvement of each facet, such as cameras, camera mounts, films, filters, laboratory techniques, etc., will always improve the P.I. report. Has anyone determined quantitatively the effective contribution to more accurate photo interpretation resulting from improvements in each of these factors individually?

Permit me to be specific on the most commonly used piece of P.I. equipment, the stereoscope. The inadequacies of mirror and lens stereoscopes currently in use have been recognized by many in the field of photo interpretation. Recently a new stereoscope appeared on the market which costs considerably more but appears to have much promise with respect to reduction of operator fatigue and increase in accuracy and speed. Has anyone designed and conducted experiments to critically compare this new stereoscope with those in common use? If past performance is any criterion the decision to adopt or ignore this new stereoscope will be based on tests which are not directly related to P.I. or on the opinion of several photo interpreters who have qualitatively examined the instrument for a brief period.

All of the questions which I have raised about the various aspects of photo interpretation accuracy are subject to solution. In order to bring about their solution we must use experimental design and sampling techniques employed by other scientific disciplines. Thus we will be able to evaluate properly photo interpretation on a quantitative basis, and we will also be able to evaluate more scientifically all proposed changes in equipment and methods in terms of the P.I. report.

It has often been said that the payoff

for the soldier is combat. By the same reasoning the payoff for the photo reconnaissance system is the amount and accuracy of information in the P.I. report. As photo interpreters we should constantly strive to achieve perfection.

In this short paper I have raised a number of questions regarding the need for quantitative evaluation of photo interpretation equipment, methodology, workers and reports. Might it not be fitting to suggest that some future symposium be devoted to quantitative methods and evaluation in the photo interpretation field?

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DISCUSSION OF DR. YOUNG'S PAPER

QUESTION: Most photo analysis is not concerned with measurement but with subjective interpretation. How can you

apply quantitative and qualitative analysis to photo interpretation keys?

DR. YOUNG: If I understand your question properly, I don't propose at this point that we examine the method by which the photo interpreter's mind operates. What I am interested in is his end product; that is his report. If we know what kind of information we want (we don't always know this), we ought to be able to judge how much information the photo interpreter is recording in his report, and how much gain there has been through the use of the key; in other words, the total information that is requested, not the total information on the photo. For instance, the total information requested totals a hundred per cent; the photo interpreter is able to get sixty per cent without a key. By use of the key his report shows that he obtained seventy per cent. Then a ten per cent gain in information has been secured through the use of the key. The quantitative aspects of the studies that I propose are the examination of the photo interpreter's report. The photo interpreter himself operates in a very subjective manner. He examines a pair of photos and he comes up with something in his report. What I want

to know is how much more information did he get from a key.

QUESTION: Isn't this a matter of training? Organizations like the Naval Photo Interpretation Center that have training facilities and that have to train multitudes of people, could evaluate the equipment very easily by using experimentally various stereoscopes and films in the student exercises. From this it could be determined whether one stereoscope or one film was experimentally better than another. It would be particularly difficult to circulate films among practicing interpreters and get their results back for final analysis.

DR. ROSCOE: The answer to your question is that testing equipment is not the function of the training agencies within the Services. Within the Military Services this function is assigned to some other agency. The Air Force, as an example. Such an agency is the Air Force Proving Ground Command at Eglin Air Force Base. The Proving Ground which does such proving and testing may go to the school to utilize the students as controls to test the equipment, but this testing would not be the responsibility of the training agency.

VALIDITY OF PI KEYS IN THE INTERPRETATION OF INDUSTRY*

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ABSTRACT

Industrial photo interpretation is defined. Its scope, objectives and limitations are examined. Procedures for doing industrial photo interpretation are discussed as well as the use and validity of keys in such procedures.

THIS paper will place two propositions before this panel for discussion:

First, that the subject matter of industrial photo interpretation can be organized and presented according to the "keys" method.

Second, that certain objectives of industrial photo interpretation can be achieved or furthered through using industrial keys.

The subject matter of industrial photo interpretation includes raw materials, equipment for physical and chemical processing, materials-handling and storage equipment, materials in-process, end products, the buildings housing any or all of these elements, as well as the functional interrelationships that bind them together.

What are the criteria by which we can judge or evaluate the propositions? Let

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