prints, or transparencies. We must have all-weather photography and be able to secure photography from guided missiles, from extreme heights, and from tremendous distances. This, I think is your problem, and one which the society and its members are well qualified to meet.

In this brief résumé of the use of the fourth and fifth atomic bombs, I have not attempted to bring before you the results obtained. Most of these results are and will remain classified. Some of the studies are continuing while others are temporarily suspended for want of personnel and funds. However, the record is there on the film, 87,000 still exposures, 93,000 feet of motion picture film, and will be available for study in the years to come. You may be sure that not many atomic bombs will be detonated in the immediate future. I think you realize that the photogrammetrist has played, and will continue to play, an important part in the analysis of the atomic phenomena. The spectroscopic and photo density studies are of direct interest to the photogrammetric industry. It is obvious that we are living in an age of transition. The American people are more concerned about their position in the world of the future than at any other time in our history. By retaining the atomic bomb in our possession, we know that the peace of the world is secure, at least for the time being. The folly of repeating the disarmament of 1923 is apparent to most of us.

PRESIDENT SANDERS: Thank you, Colonel Cullen. There is a very friendly rivalry, and many of us who smile a little bit when we see the Army and the Navy get together are the very ones who realize that they do work together beautifully when the time comes for a showdown. One illustration of that is the fact that a Navy picture is now to be used to illustrate more completely the talk which Colonel Cullen has just delivered.

The motion picture "Operation Crossroads" emanates from the Joint Army-Navy Task Force One as part of the record of that operation. In order that we may have a proper perspective to start out with, a few words of introduction of the film are to be given by Mr. A. C. Lundahl, of the Photo Interpretation Center of the U. S. Navy. Mr. Lundahl.

MR. A. C. LUNDAHL: Mr. President, Ladies and Gentlemen: I am caught in a cross fire of Army and Navy relations, but it is not going to prevent me from telling you some of the reactions which have occurred in our plant in the handling of the photogrammetric data relating to Operation Crossroads. First, before I tell you something about that, I want to give you a thumbnail sketch of what our organization is, inasmuch as it is the youngest photogrammetric organization in Washington at the present time.

Although we trained many hundreds of Navy photo interpreters during the war, we were converted to a civilian status about March 1, 1946, and following that conversion the first objective which was handed to us was the treatment of the photos of Operation Crossroads.

The Naval Photographic Interpretation Center is divided into five units. We have a Terrain Model Section, which makes rubber models that handle various spot assignments where model making is required. We have a Photo Interpretation Unit, which is currently engaged in keeping abreast not only of all the information that we acquired during the war but of new information on enemy airfields, on enemy flak analysis, and various radar planning devices, and all the other aspects of photo interpretation with which you are already familiar. We have an Interpretation Training Unit, which is currently training about thirty-five USN officers in the principles of photo interpretation. Upon completion of the fifteen-week course, they are assigned to duty with the fleet. We also have a photogrammetry course which lasts fifteen weeks, and we have

approximately fifteen officers assigned to this course. These officers are also given special intelligence assignments in keeping with their training. We have a Library Section, which keeps abreast of all the intelligence literature, and we have a Photogrammetry Unit.

The first assignment of this Photogrammetry Unit was the treatment of the photos from Operation Crossroads, which were sent to us before the Test Able in the sense that we had to compose mosaics which were used in the planning stages. These mosaics, of 1:10,000 and 1:20,000 scales, were prepared in sections and sent off to the technical director for distribution. That was our initial contribution to the cause.

The second contribution to the cause was in being represented on a so-called composite panel which daily sat to review the photography which came in from the Pacific, to decide what could or could not be released to the press. There are some very difficult problems to be answered there. A group of high ranking Army and Navy officers cannot tell just what information can be squeezed from a photograph and, as a result, photogrammetrists sat in on those sessions, and it was their calculated opinion that, in many cases, resulted in what pictures were or were not going to be released. On several occasions we had to perform spot analyses to tell just exactly what information could be derived from these photos. These analyses were made, and on the basis of the opinions submitted by the group, the photos were or were not released.

The main job, however, was the treatment of the photographs themselves for the various quantitative data desired. Colonel Cullen in his very excellent talk has alluded to the photogrammetric processes which were applied to these photographs. We were a small organization, and we had to supplement our talents and our equipment with the help of many others. I should like briefly to list them: Mr. David Landen and Mr. Anton Navratil of the Geological Survey gave a good deal of their time to the handling of the Wilson photoalidade applications to Operation Crossroads. Mr. Medina and Mr. McCurdy gave us excellent advice in the handling of certain problems. Mr. Wilson did likewise. The Army Map Service gave unstintingly of the use of their SEC-2 rectifier, the big German rectifier with which you are all familiar, in performing certain phases of the operation. Each and all of these men gave us a great deal of help, and without their cooperation the results would not have been as good as they were—and they were good.

I am not bragging, and I am not trying to list the results for you, because I can not, but I might say that the results which were derived by the Naval Photographic Interpretation Center agreed very closely with the Army and very closely with the results which were derived by other technical means that I am not at liberty to disclose. These results were placed in the hands of the technical director of Joint Task Force One and have been used in their compilation of the final report.

I might say that the Army's handling of the photography at Task Unit 152, the Aeronautical Service plant in St. Louis, was mainly from the geographical trimetrogon approach to handling of the data. The Navy approach was essentially analytical. We did all kinds of special resections. We performed reams and reams of paper work on all of these separate phenomena, and we found in addition to our data that there are some very fundamental techniques which you can apply to atomic phenomena.

We were impressed with the results that could be derived from terrestrial photogrammetry. As you know, the Navy installed towers. We had K-18 photographs from those towers. On the basis of the results we derived from new

methods worked out, we got accuracies which we did not believe were possible at the start of the operation. Some day perhaps you might know of these things. It will make one of the most glowing chapters in the history of the American Society of Photogrammetry to know that so many of its men were represented on the scene which resulted in accuracies perhaps unrealized before.

I shall not go into that today. It is not my province, and I have not the time for it, much as I would like to, and of course there is a security blanket on me.

Another thing I would like to mention in passing is that the film* which you are about to see was of course taken with the aid of Army and Navy cameras and has been put together to make an interesting sequence. I hope that you will enjoy seeing it as much as we enjoy presenting it to you. Although I can not get at this blackboard and draw these diagrams and string these cosines out for you, I hope you will realize that photogrammetry has its hands up to the elbow in the problem, and it was their results which made the great expenditures of funds worth while.

We were commended twice at the end of the operations by the technical director of Joint Task Force One, who said in so many words that in view of the violence of the phenomenon it was anticipated from the very beginning that the main records would be photographic and that the intelligent, first-rate handling of these photographic records would require intelligent application of photogrammetric methods. These have been done. The results are in. I hope you enjoy the film.

Thank you.

PRESIDENT SANDERS: I thank you all for attending the Thirteenth Annual Meeting. The meeting is now adjourned. May we have a successful year.

[The meeting adjourned at three-thirty-five o'clock.]

* The film "Operation Crossroads," which followed Mr. Lundahl's introduction, is without doubt the most interesting and complete coverage of that operation which the public has been permitted to view.

---

## NEWS NOTE

Bausch & Lomb Optical Company has recently adopted a unique projection method of testing photographic lenses to insure precision quality control. Distinct advantages are claimed for the projection method over the conventional lens testing methods previously employed. It is suggested that interested readers may request a description of the procedure from the company.