ing sources of known position at the time when their diurnal motion is tangent to the interferometer fringes. Keen reported that 11-centimeter observations of the source 3C286 show that its position is 15 seconds of arc from the quasi-stellar object with which it is identified, a discrepancy previously noted by J. S. Hey (*1*).

A. T. Moffet (California Institute of Technology) reviewed the work that has been done with the movable 90-foot (27.4-meter) antennas of Caltech's Owens Valley Observatory. He also described plans for four movable 130-foot (39.6-meter) paraboloid antennas with altazimuth mounts. Moffet showed a model of the double radio source 3C33 deduced from observations at Caltech (*2*); in this source the two components are elongated along the axis which joins them and are brightest at the two outermost edges. This model is consistent with the interpretation that double sources are galaxies that have undergone an explosion in which matter was expelled in two opposite directions. The bright outer edges could then be explained in terms of interaction of the exploded matter with intergalactic gas. The same kind of model applies to Cygnus A and some other sources, according to Moffet. Keen said that measurements at the National Radio Astronomy Observatory gave the same result for Cygnus A.

A. M. Shalloway of NRAO described the 100-channel autocorrelation receiver which is currently connected to the 300-foot (91.4-meter) meridian telescope. This instrument produces a 100-point autocorrelation function every 10 seconds on magnetic tape, and an off-line digital computer is used to calculate the corresponding power spectrum. The maximum width of the measured spectrum is 2.5 megacycles, and narrower spectra can readily be observed with increased resolution.

Miss E. J. Gundermann (Harvard College Observatory) described the Harvard ten-channel radiometer which is in operation at 18 centimeters and her observations of OH absorption lines in the direction of the galactic center. The OH lines are broad enough in several cases that the 1667- and 1665-megacycle transitions overlap. The velocity features at the two transitions are in good agreement, and, in confirmation of a result from Parkes (*3*), the observed intensity ratios depart from the theoretically expected value 9:5. Gundermann detected absorption in the galactic plane throughout the longitude range −1.5 to +4.0 degrees. The resulting velocity-longitude diagram cannot be interpreted as simple combinations of rotating and expanding circular arms. The lack of symmetry about the galactic center is marked. She reported an upper limit to the OH absorption or emission of 0.03°K in the direction of the galactic anticenter.

Summaries of the papers are printed in the 1964 *NEREM Record*, which is available from the Institute of Electrical and Electronics Engineers, 313 Washington Street, Newton, Massachusetts.

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*Harvard College Observatory,
Cambridge, Massachusetts*

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## Optics—An Action Program

In 1962 the Optical Society of America conducted a study on needs in the field of optics which showed that the need for scientific personnel trained in optics, now and for the foreseeable future, is four times greater than the supply of such personnel. Consequently, the Society initiated *Optics—An Action Program* (under NSF sponsorship) to stimulate research and education in optics. A symposium held at the 49th annual meeting of the Optical Society of America, on 6 October 1964 in New York City, reviewed the status of this program.

In the initial talk, Van Zandt Williams (Perkin-Elmer) reported progress on the six tasks which formed the original program. One of these, a study of the training of opticians and technicians, has been completed by Robert R. Brooks (Perkin-Elmer). Brooks made a thorough study of the need and training status in the United States and abroad and concluded that neither U.S. industry nor government is yet desirous of national training programs. Such programs can be undertaken locally if there is external pressure and guidance, and during the last year two junior colleges in California have initiated 1-year programs, one for opticians and another for optical technicians.

A second task, a study of education in optics, was undertaken by Mary E. Warga (executive secretary, O.S.A.). She is now concerned with getting statistics on current curricula in optics and comparing them with current curriculum needs. There is increasing evidence that the prime teaching requirement may be bringing the teacher up to date in modern optics so that he can better utilize the textbooks and time now available.

A third task is to stimulate academic engineering departments to accept responsibility for training in certain areas of applied optics; much of the present manpower need is for optical engineers. A first attempt to attract representatives of engineering departments to a summer colloquium at the Institute of Optics, the University of Rochester, in 1963 did not achieve that end. A new attempt to stimulate engineering effort is being made by W. L. Wolfe (University of Michigan).

Another task is an attempt to stimulate academic graduate research in optics. As a starting point, L. M. Biberman (Institute for Defense Analyses) directed a postcard survey of members of the O.S.A. in order to learn (i) the replier's field of research interest in optics, and (ii) the area of optics in which lack of research knowledge, data, and so forth most limited the replier's progress in research. It was most interesting that the dominant areas in which such research limitations were found were the technology or "engineering" areas, such as optical characteristics of materials, design and evaluation of optical components, and standardization of definitions, tests, and ratings of optical elements.

J. H. Taylor (Southwestern College, Memphis) discussed another task of the action program. He had conducted a symposium at his college, designed to stimulate undergraduate research in optical physics. With financial support from NSF and ONR, Taylor assembled teacher participants representing almost 100 colleges and universities and 25 speakers who reported on the status of research in various aspects of optics and pedagogy and on current government aid. Further, all participants were assigned to working groups which produced written reports, which were distributed to all members for discussion at a reporting session.

These conference reports, together with some results from other task studies, resulted in proposals for action which were submitted to the board of directors of the O.S.A. The board's ap-

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proval of pursuit of these new programs will permit a continuation of the excellent start made in this conference. It is now expected that a year's time will show improvement in undergraduate training in optics and increased pressure on undergraduates to continue for graduate research.

The task leaders will publish status reports for these programs in the Society's journals as various objectives are accomplished.

Aden B. Meinel is starting a graduate program at the University of Arizona which, in cooperation with the departments of mathematics, physics, and engineering, will turn out personnel experienced in optics. His talk was concerned with the premises and philosophy behind the effort rather than with the program itself.

As studies have shown, industry—through neglect on the part of the universities—has assumed the principal role in training its specialists in optics (approximately one percent of physics graduate students are doing research in optics, yet 8 to 10 percent of all employed physicists are working in optics). It is certainly true (as a consequence?) that industry, and not the university, gets the greatest share of government support for basic research in optics. This is felt not to be the best relationship that could exist between university and industry in the research area. The reversal and restoration of proper responsibilities will require understanding and cooperation among universities, industry, and government. Meinel outlined four basic steps which must be taken in order to restore the university's role:

1) The university must provide the leadership to recruit a core faculty from industry.

2) The university must obtain from private and public sources a commitment for basic support over a period of several years which would provide for a liberal growth rate.

3) Money must be provided for construction of the physical plants required. This is a major hurdle, since such plants do not now exist in universities and a program cannot succeed on too little too late.

4) There must be funding of a number of research projects with specific objectives which, when combined with the funds which should be made available to institutions, will provide the means of engaging in advanced research. Some of this support for specific projects will be of the type that


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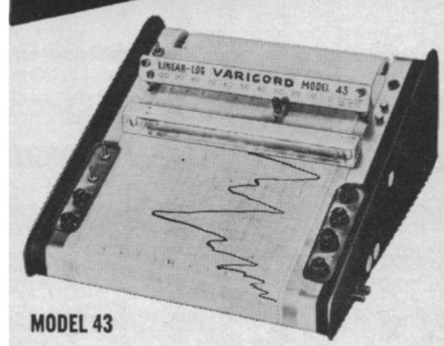

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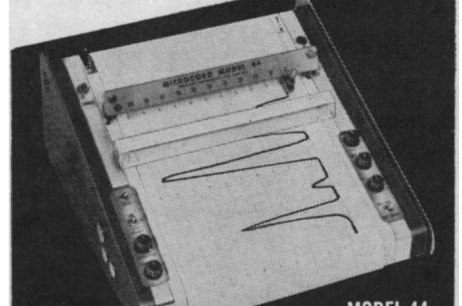

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industry is now receiving. In return, the university should not undertake more projects than are needed to further its prime objective, the training of personnel in optics.

There followed a fairly lively discussion of all facets of the "optics problem." However, compared to the somewhat bitter symposium at the annual meeting just 2 years ago, there is evidence of increasing understanding on the part of the members of what is occurring.

Optics is no longer an active discipline of physics. Neither is heat, sound, or mechanics. However, optical techniques are major tools of all branches of physics, and therefore physicists must themselves provide or find some means of obtaining personnel competent in optics.

Engineers must recognize that much of the resurgent need in optics is in the field of optical engineering, in which new components and systems for space reconnaissance, surveillance, and information processing are required. Engineers, like physicists, have a great need for competent workers in optics.

The pervasive influence of optics on physics, engineering, biology, and physiology may result in programs similar to Meinel's in which a graduate facility works with all departments.

Optics is an excellent area of research to be entered into by faculty members in small colleges, because the cost of equipment is often less than in other fields. It is still difficult for such faculty members to get requests for grants appreciated by granting agencies. However, there is evidence of increasing interest in optics by the Department of Defense; there is evidence that the small-college teacher can make his needs understood; and there is evidence that optics education is enlarging.

The meeting adjourned with a more optimistic outlook than prevailed 2 years ago.

VAN ZANDT WILLIAMS
*Perkin-Elmer Corporation,*
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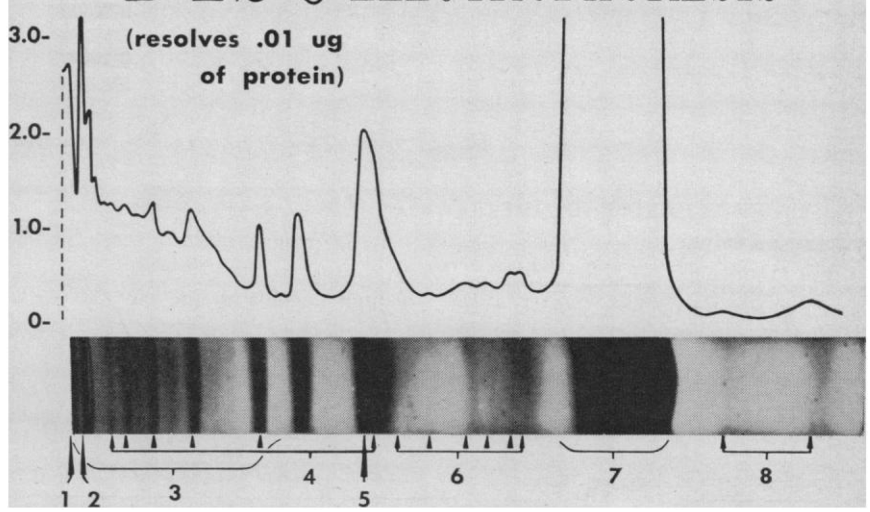


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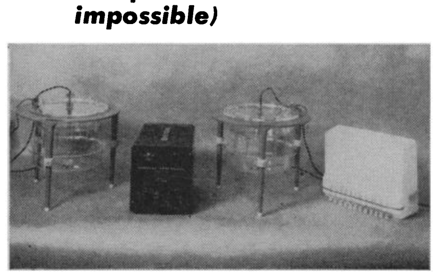

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