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ABSTRACT

Photographic reproduction facilities in health sciences education institutions produce better teaching, research, patient care, and public relations. A central photographic program allows for a professional staff, complete physical facilities, and equipment systems that are impractical on a small departmental scale. The photographic reproduction services and capabilities, organization, staffing and training, and budget and finance are discussed. Space and equipment requirements for photographic reproduction are illustrated. (HAB)

organizing a biological photographic unit

A Guide to Organizing a Biological Photographic Unit in HEALTH SCIENCE EDUCATIONAL INSTITUTIONS

by Melvin C. Shaffer
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Virginia Commonwealth University

This monograph was developed as a service to the health sciences academic community, under agreement between the author and the Office of Audiovisual Educational Development, Bureau of Health Manpower Education, Atlanta, Georgia, and the National Medical Audiovisual Center, National Library of Medicine, Atlanta, Georgia.

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About the Author

Melvin C. Shaffer is an Associate Professor and Director of the Visual Education Department at Virginia Commonwealth University. His career in biomedical communications began as a photographer at the Meyers' Clinic Hospital in West Virginia followed by wartime assignments to the Armed Forces Institute of Pathology in Washington, D.C., with assignments in Africa and Europe as a biological photographer.

He was asked in 1947 by the Medical College of Virginia to organize a department designed to bring to medical education some of the experiences of the military during the war years in mass education through the use of various media.

Mr. Shaffer has been active in the Health Sciences Communications Association and at the present time holds the position of President-elect. He also is Chairman of the Health Sciences Communications Association Publications Committee and has been active in the movement towards a federation of the Association of Medical Illustrators, the Biological Photographic Association and the Health Sciences Communications Association.

His department at the Medical College of Virginia, Virginia Commonwealth University, serves not only the Health Sciences Center but also the Academic Division for audiovisual production services to a campus of approximately 14,000 students. He is the author of many papers in the field of communications including an intensive study of instructional television in the Soviet Union. His current research interests are in the field of self study in medical education and he directs an active program at the Medical College of Virginia, School of Medicine, involving a multimedia approach in the basic skills of medical education.

RATIONALE

In the health sciences, photographic reproductions are essential in teaching, research, patient care, and public relations, and should be the first priority in a new communications facility.

An effective photographic service is often the path to more sophisticated media utilization by faculty and staff and thus should be a top priority in any communications program. The absence of a good photo service can result in a low acceptance of any form of media utilization in instruction.

Need for photographs. Professional quality photographs are essential in recording research findings, in recording patient progress, and in communicating these findings to others. Slides are used in most medical presentations, and their use for this purpose is increasing. A study at the Medical College of Virginia, School of Medicine indicated that one hundred percent of the lectures reviewed during a three-month period were enhanced by slides, film, or television tape. A similar study made at three national medical meetings supports this finding.

A review of 100 articles published in professional medical journals produced 87 articles illustrated by photographs. Aside from the printed or spoken word, photography is the principal communicating method in use at the present time in health sciences education.

Photography in patient care. Few photographic procedures directly aid in diagnosis, but the indirect relationship to patient care through teaching and research is indisputable. Additionally, photography plays an important direct role in research as a recording medium and as a time and motion altering device. Such photographic techniques can accomplish what cannot be achieved by any other method.

Advantages of a central program. A central photographic program allows for the development of professional staff, physical facilities, and equipment systems that are impractical on a small departmental scale. Efficiencies of organization of work and large scale production of routine photo services greatly reduce costs.

One photographer working alone in a "hand" operation may produce 20-30 slides each day, but three photographers working in a semi-automatic facility can easily produce 300 to 400.

The accumulation of specialized types of photo capabilities in a central facility permits the acquisition of specialized equipment and personnel, and, thus, services are performed that would not be available otherwise.

Photography as part of a large media production center. Photography works well in the context of a larger media production center. There is a need for interaction between photographers, artists, printers, and television personnel because quite often all are involved in a common effort to produce materials; for example, a film or film insert for a television demonstration.

In addition, a healthy competition between artists and photographers can result in a higher level of creativity.

Noncentralized services. There are some specialized needs for photo-type services, however, that are best handled at the departmental level. Such things as processing for electron microscopy and spectroscopy are normally a part of the training of researchers using the technique. Many pathologists take routine pictures with automatic cameras as they examine slides. The photo unit should cooperate and assist these specialized areas in any way needed, offering training to lab technicians in film processing and repairing or adjusting cameras.

Not many centers could employ a photo staff large enough to service all these specialized areas, and faculty and staff who actively do photo work are a blessing and should be helped and encouraged.

Nature of those being served. Basic to any service function is an understanding of those being served. By the very nature of their work and training, the faculty and staff of a medical center are crisis oriented. Consequently, services offered them must be compatible with this work style. A later section presents a method for organizing a photo unit to achieve this compatibility.

SERVICES AND CAPABILITIES

Services Offered. The essential services that a photography unit should offer are listed below in the approximate order in which they are demanded.

1. Slides from charts, graphs, books, x-rays, photographs, research recorders, and so on. This category of work is, by far, the largest volume producer in a photo unit, and furnishing this type of service is the first priority in organizing a new unit.
2. Clinical photography for slides of patients and specimen materials. These photographs can be made with portable equipment or in a studio.
3. Surgical photographs made in the operating room with portable equipment. They must be made rapidly and be of very high quality. Photographers performing this service must be experienced since the photograph cannot be repeated.
   In general, a photographer needs to be immediately available during peak periods, but in most cases it is not practical to have one standing by in the surgical area.
4. Public relations photos for publication and brochure illustration. An occasional photo of visiting VIP's will be needed.
5. Autopsy photographs. These are best done in the autopsy room. An average of fourteen pictures in situ and of specimens removed is needed per autopsy. Generally, large format, color photos are made from which prints or 35mm slides can be duplicated.
6. Portrait and application photos. The number of personnel in training at a medical center and the resultant need for application and passport photos make it highly desirable to have this service available as a convenience to the staff. This service can also be used as a source of income to the department.
7. Student identification cards. Many simplified systems are available for this purpose. While some photographers tend to belittle such routine functions, they are nevertheless a logical part of the photo department's duties. This activity is usually carried out in conjunction with the registrar and the personnel office.

8. Slide set with audio tape or syllabuses. Photo departments should be able to prepare them rapidly and efficiently. Several projector-sound recording units are available and are simple to use. The increasing emphasis on self-study and the fact that slides lend themselves to up-dating make large volume production of slide copies a necessary photo service.
9. Special types of slides. The most popular in medicine are the diazo slide (color background, white lettering) and direct positive copies of x-rays. While attractive, slides of these types are not necessarily essential.
10. Limited production of motion pictures. Many subjects must be seen in motion to be understood. For example, a gait disorder cannot be demonstrated by slides; the student must see the patient in motion. Starting with this simple approach, motion picture production can expand to other more complex types of production, including the addition of sound.

    Generally, it is somewhat impractical for the average photo service to produce color, sound, full-length films. Costs for this will exceed $20.00 per minute for film and laboratory, and $40.00 per minute for sound recording and preparation of A&B rolls. Unless a good script is written and professional equipment, talent, and funding in the order of $60.00 per minute of screen time are available — complete sound, color films are seldom successful. Short, single concept films, however, are inexpensive, highly useful, and can be made by the average photo service.
11. Color printing. This can seldom be justified in the average photo department. Making color prints is expensive and time consuming. Excellent, relatively inexpensive color print services are available.

Service schedule. Requests for routine services should be met on a one day basis whenever possible. Experience has shown that when work is done on the basis of a due date, some staff members will tend to delay until the due date before acting.

Quantity requirements. The quantities of different types of photographic products requested will vary greatly depending on local circumstances. In schools where there is great concern for the "publish or perish" factor, a very large proportion of the photo service effort will be in support of research. Materials made for instruction will be minimal and the actual volume will be relatively low.

In schools where credit for teaching is extended, large volume production of slide sets, single concept films, and other photographic services will be needed.

At the Medical College of Virginia, where materials for both publications and teaching are produced in quantity, one senior photographer and one photo helper per one hundred full-time faculty has proved adequate.

Faculty self-help. Faculty and staff should be encouraged to do some of their own photography. This is especially true in photomicroscopy where many excellent camera attachments are available. The photo staff should maintain a familiarity with this equipment in order to instruct and assist faculty.

Color processing. Color processing is a difficult and exacting task to perform and maintain over a long period of time. The processing of color film by a photo service should be undertaken only after careful cost and service demand analyses. Generally, if a workload is under forty rolls per day and adequate commercial service is available, commercial service should be used. A workload of over forty rolls per day could justify obtaining the equipment and personnel to efficiently process color.

In order to assure consistent quality, test strips should be processed with each batch and these strips should be retained for at least a year so that periodic studies can be made of long range quality control.

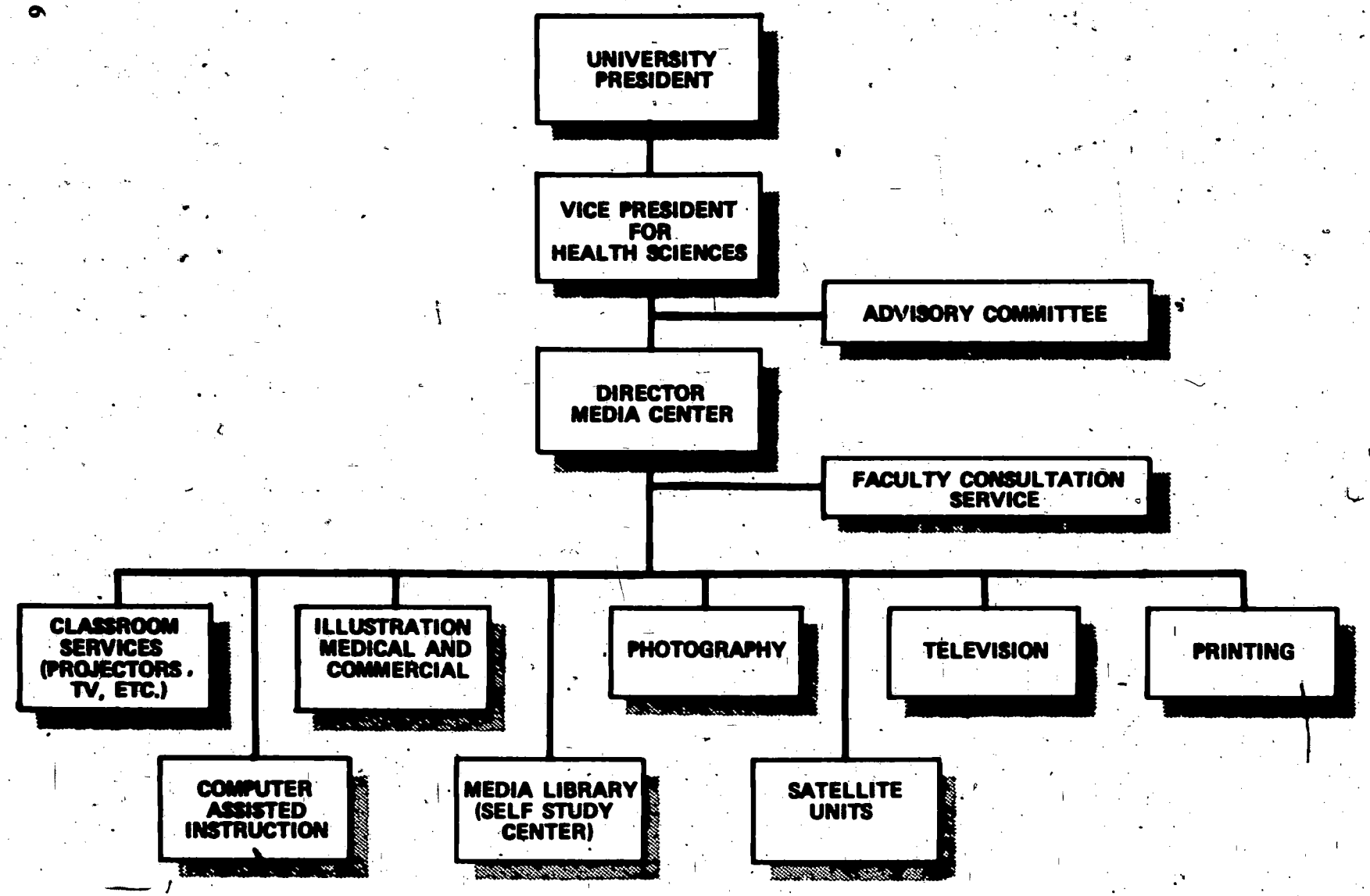
Outside services. Other outside services generally acceptable are the processing of motion picture film, cutting and printing of original motion picture film, printing of large mural-type photos in color or black and white, and possible mass duplication of slides.

The duplicating of slides is somewhat like processing color film. Unless a photo department is prepared to undertake a complex and demanding technical service, it is best to use commercial services. However, if demand is great enough, a duplicating service can be provided and can make special corrections to slides, a service not available commercially.

Unusual services. A variety of unusual services can be found in various photo units. These range from aerial photography for planners in developing university property to photographs of students receiving diplomas. Limits of service must be resolved according to the local situation taking into account the availability of commercial services, university needs, and costs.

Night and weekend service. Service must be available during these periods. Experience has shown that telephone page units serve quite well. The photographer wears a small alarm unit which is activated when a number is dialed by the hospital telepage or telephone operator. He is not restricted for the weekend as long as he remains within 20 miles and has immediate transportation available to respond to a call. Page Boy, a service of the telephone company, is available in most cities. With a staff of eight photographers, each taking calls for a one-week period, the system produces no undue hardship. In a medical center of approximately 1,000 beds, an average of five calls can be expected each week.

ORGANIZATIONAL CHART – MEDIA CENTER



ORGANIZATION

Because the media center in a university health sciences complex is primarily a service organization, it should not be attached to an academic department. The priorities and aims of an academic department do not always coincide with those of a service department. The organizational chart shown at left, reflects the ideal relationship of a photo service to a media center and of the media center to the university.

Academic department or school politics can prove disastrous to a service function. The service unit must be equally available to all and must be kept free of special loyalties and commitments.

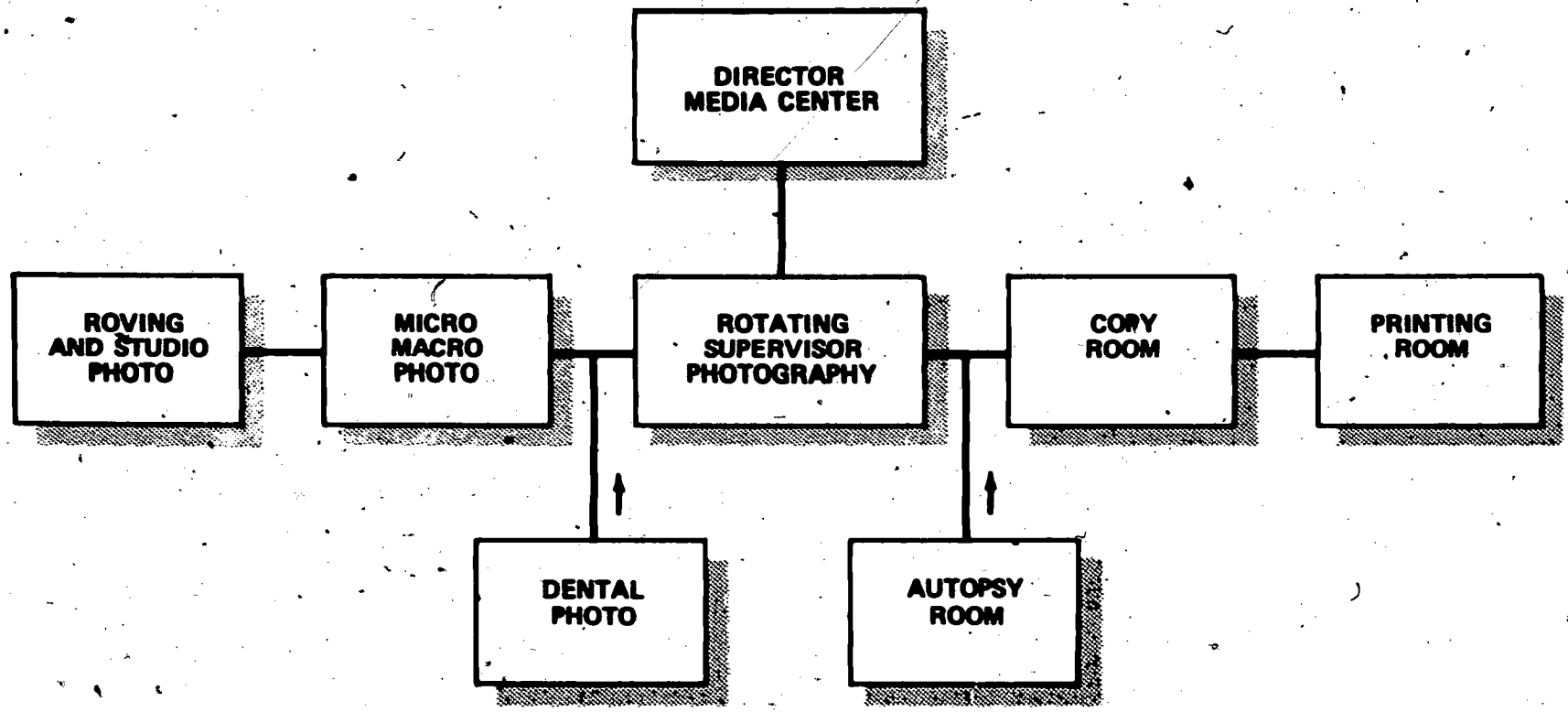
The director of the biomedical communications center and key staff members function best when they are academically qualified and when they have faculty status. A big part of their job is to interact with and advise faculty members. This is rarely successful unless the status of those offering advice is acceptable to those being advised.

Organization of a photographic department. As a basis for organizing a photography unit, it is important to recognize that there are various levels of skill and creativity involved in photographic work. In general, the routine making of slides from charts, graphs, x-rays, or books does not require a high level of photographic skill. Film production, photos for publication layouts, microphotography, and macrophotography are examples of creative and technically more difficult tasks. It is important to identify these areas and isolate them so as to furnish guidelines for personnel assignments.

The identification of work by type of product and the level of skill required to produce it is basic to a management approach that embraces two fundamental concepts: *the division of work into stations* and *the rotation of personnel.* The dividing of work into stations, as indicated in Chart 2, offers several advantages. Each station can be designed so as to be a full-time post and should be coordinated with other stations for periods of time when one station is overworked and another is slack. Each station can be clearly associated with one type of photographic service. And the station concept also permits accurate monitoring of the daily production and performance of individual employees.

Chart 2

PHOTOGRAPHIC DEPARTMENT ORGANIZATION



Enforcement of this concept can eliminate work backlogs and work being overlooked. Everything finished — every day.

The rotation of personnel enables all photographers to rotate through the various stations, including the supervisory position, on a weekly basis. Because not all photographers will be skilled in work management and supervision, assignments to that position should be scheduled in light of the workload and pressures on the entire unit during each person's tenure as supervisor.

While each photographer should be encouraged to develop special skills in areas of personal interest, the policy of rotation ensures a well-rounded staff, provides good protection for periods of vacation and illness, and serves to give each person a fair share of the interesting work as well as a share of the routine. It also serves to identify employees' special skills and abilities which might otherwise go unnoticed. Since all photographers do not have equal ability in every area, rotation of personnel gives an opportunity to identify and strengthen areas of weakness.

Photographers should be encouraged to develop special areas of interest. For example, the photomicrographer might assist other staff members in their skill development, and he might also help out in especially difficult photomicro jobs. This would be, however, over and above his involvement in other tasks, and he would still be required to work in the station to which he had been assigned for the week. The best photo printer would train and advise others doing printing but would also be responsible to whichever station he was assigned at the time.

This system tends to produce a staff, each member of which can perform all photo tasks satisfactorily, and each member of which has a specialty.

Staff meetings. Essential to the management of a photo unit is a regular staff meeting. This gives each person a chance to air gripes, review policy and procedures, and alter the makeup of station assignments. These meetings can also be useful in presenting new techniques and ideas.

Standardization of procedures. All procedures should be standardized so that each task can be performed in the same way by each member of the staff. A procedural manual is useful and can be updated as changes are deemed necessary. Thus slides made of x-rays one day will look like the same product made on another day. Exposures are uniform, negative sizes are standard, and so on.

Standardized procedures applied to the routine work areas also permit rapid training of personnel, and, in fact, many procedures can be performed by untrained persons if a careful work analysis is made and skill levels identified.

Nonskilled help. There is no real need for a trained photographer to mix chemicals, dry prints, or bind slides. Nonskilled help can supplement photographers at all stations in the system.

Hourly help can be obtained from employment agencies during rush periods, and if work is well-organized, clerical or day workers can perform many photo tasks without training of any kind.

Satellite units. In areas where the need is justified, satellite units can be established either full-time or part-time. Examples of this are a dental photo unit to operate during clinic hours or a specimen photo unit in the autopsy room.

Darkrooms are generally not advisable in satellite units. Such units should be restricted to the taking of photos, with processing being accomplished in the main facility.

Production coordinator. An essential feature of a good service is a production coordinator to interview clients, specify the work to be done, and route it through the proper channels. The coordinator should also determine that the work is done correctly and on schedule.

A coordinator needs to be well-trained and experienced in all phases of illustration, and he must be able to deal with faculty and staff of the center. A working knowledge of health sciences is essential and a good relationship with the photo staff is desirable.

Such a person also serves as liaison between faculty and photo staff. Generally, contact between these groups is not productive and leads to entanglements over the relative importance of work and priorities, matters over which the photo staff has no jurisdiction and little knowledge. A closed shop resolves debates very handily and enables the photo staff to deal with faculty clientele on the basis of need, not status.

STAFFING AND TRAINING

Number of staff required. In a medical center one fully qualified photographer and photo helper for each 100 full-time faculty and staff members seems to be adequate. This ratio will vary depending on the local situation but is not likely to be less than one nor more than three per one hundred.

Staff development. Attendance at meetings and participation in organizations such as the Biological Photographic Association add to the skill and motivation of personnel. The response of the staff to these activities also gives insight into the potential of each employee.

Training programs. Some progress has been made in training programs for biological photographers. Currently the Rochester Institute of Technology offers a two-year certificate course in biomedical photography which also can be used as part of a four-year program leading to the B.S. degree in photo science. Approximately twenty-five students are certified each year in biomedical photography.

Sources of personnel. Well-trained and experienced commercial photographers generally do well in medical photography, particularly where a trained biomedical photographer is available to assist in such things as microphotography and hospital procedures.

Several universities offer excellent courses in film production and graduates of these schools have been outstanding in medical film making.

Art schools frequently have students well-qualified in photography. People with an art background are especially useful in photography for publications and exhibit designs.

The military services offer good, basic photo training, including medical. Potential personnel may be contacted through the local service separation facility.

Some audiovisual courses in colleges provide basic photo training. Many graduates have the additional advantage of education courses and can interact with faculty in the design of teaching elements.

Staff may be secured from other centers. Most biomedical directors are pleased to have members of their staff recognized by others and advanced to better jobs.

Precautions in hiring. There is a fairly constant supply of itinerant personnel available. These people form a large group that migrates between television stations, newspapers, and photography studios. For the most part they are poorly trained and unreliable. They can be spotted by a lack of training on their resumes and a list of jobs lasting from six months to a year and sometimes including several intermittent associations with the same employer. Unfortunately, photography attracts a high number of unqualified applicants who are difficult to spot. Photography appears to some as a quick and easy way to enter a creative occupation. The fascination of photo gadgetry and the relative ease with which the basics can be learned produce an oversupply of people who never function at a level above the routine.

Psychological testing, particularly of motivation and stability, might well be employed in selecting personnel.

Biology majors as potential source. With the advent of easy-to-use color film and excellently designed equipment, biology majors can be given on-the-job training. Their biology background makes such people particularly adept at the more complex types of photography such as tissue culture and phase microscopy.

POSITION DESCRIPTIONS AND SALARIES

The following job descriptions identify the principal personnel needed in a typical photography unit.

Photo Laboratory Specialist. Operates a service lab for preparing for photography and photographing a wide variety of laboratory and biological specimens. Prepares tissue slides, cell culture materials for time-phase observation, and criminological specimens for specialized photography. Instructs personnel in phases of electron microscopy and other specialized areas. Assumes full responsibility for this work and supervises laboratory assistants. Keeps abreast of the state of the art in laboratory medicine and scientific photography, including time-lapse photography and high-speed motion photography.

Salary: $8,000 to $10,000

Hospital Photographer. Makes still and motion photographs of patients in color and black and white. Photographs are used for teaching and research.

Photographs activities within the health sciences campus for public relations purposes.

Acts as television cameraman and does lighting for television sets.

Takes and processes photographs in color and black and white of specimens, patients, buildings, personnel, microscopic slides, experimental animals, and research equipment.

Acts as projectionist when the departmental workload demands it.

Salary: $7,000 to $10,000

Photographic Assistant. Processes film, both color and black and white.

Mounts and binds slides of various sizes and types.

Makes photoprints and print projection slides.

Uses photocopy camera to produce copy negatives and color positives.

Photographs patients with studio camera.

Salary: $5,000 to $6,500

Motion Picture and Television Producer. Must be creative. Is responsible for the esthetic and technical production of a program whether on film or still shots.

Produces 16mm motion pictures on an assigned basis and assumes responsibility for the total production.

Produces television programs for classroom use. Responsible for planning, setting up equipment, producing the program, and dismantling the gear.

Produces sound filmstrips including planning, art direction, and photography.

Does still photography in color and black and white particularly as related to any of the above.

Consults with faculty members on the uses of photography in their teaching.

Expected to be fully competent and capable of performing to a high level of professional proficiency.

Salary: $9,000 to $12,000

BUDGET AND FINANCE

The budgeting and financial considerations of operating a photography service in a Biomedical Communications program revolve around three basic items: the *capital outlay* for equipment and space required to establish the service; the determination of *charges* for services; and selecting the basic *formula* for financing the service.

Basic concept of finance. There are several different strategies that might be employed to finance a photography service ranging from total budget allocation on the one hand to total reliance on charging for services on the other. A budgeting procedure found advantageous in many communications units is for the salaries of photographic personnel to be paid as a line item in the budget of the Health Sciences Center while operating expenses are recouped by charging for the products and services completed by the photo unit. This procedure permits accurate budgeting for salaries, which are constant, and provides for the establishment of a revolving fund which is continually fed by the revenue from completed projects. Having this fund provides the department with some flexibility in times of fluctuating workloads.

This procedure helps keep to a minimum charges against departmental budgets, which usually do not contain large allocations for photographic materials, and also furnishes some protection against abuse.

Charges for service. Experience indicates that in operating a photographic service approximately two-thirds of the cost is salary and one-third is operating expenses. Thus, in the formula presented above, one-third of the total budget would have to be obtained through charges for work completed.

Nearly all photo departments in health science centers will receive requests for scientific photography from persons outside the university. In cases where such requests are honored, charges should be levied at three times the "in-house" rate in order to offset both labor and operating expenses.

Capital outlay. Capital outlay will vary greatly from one institution to another but certain items are basic and essential to any photography department. The next two chapters deal with the two most important of those items, *space* and *equipment*.

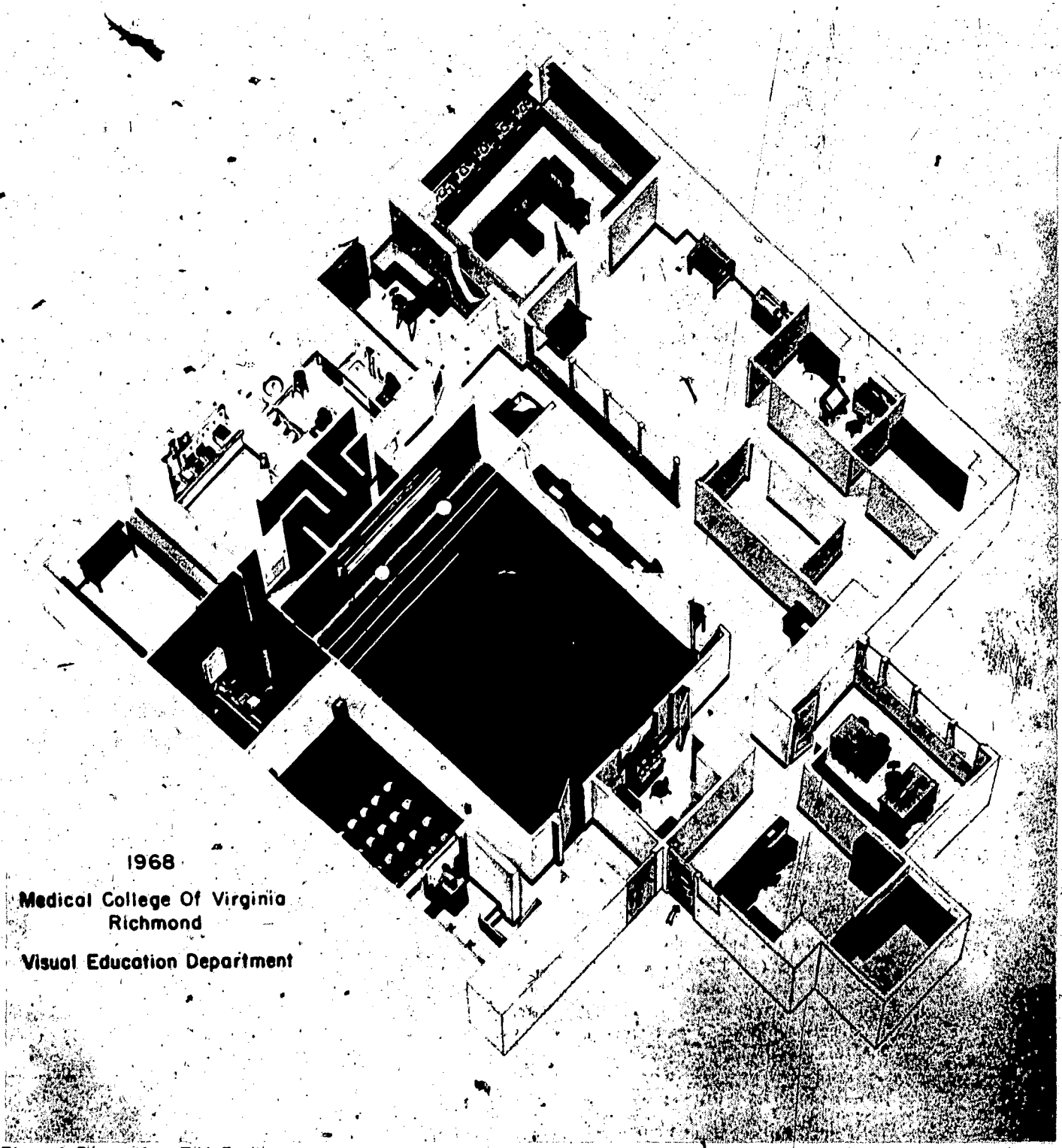


Figure 1. Photo–Art–T.V. Facility

SPACE REQUIREMENTS

Figure 1 shows a well-planned photo-art-TV facility designed as an integrated unit. Current costs for this type of construction run from $40.00 to $50.00 per square foot. Costs for this report are figured at $45.00 per square foot.

FIGURE 2 -	BASIC STUDIO 28' x 14' minimum	392'	$17,640.
FIGURE 3 -	FILM PROCESSING 10' x 12'	120'	5,400.
FIGURE 4 -	PHOTO PRINTING 10' x 12'	120'	5,400.
FIGURE 5 -	PHOTO COPY ROOM 14' x 14'	196'	8,820.
FIGURE 6 -	PHOTO WORK AREA 8' x 20'	160'	7,200.
FIGURE 7 -	MICRO PHOTO AREA 10' x 12'	120'	5,400.
FIGURE 8 -	SLIDE DUPLICATION AREA 8' x 10'	80'	3,600.
FIGURE 9 -	FILM EDITING AREA 10' x 12'	120'	5,400.
FIGURE 10 -	SATELLITE PHOTO UNIT 10' x 16'	160'	7,200.
FIGURE 11 -	CORNER SPACE (AUTOPSY ROOM) 8' x 10'	80'	3,600.
	TOTAL	1,548'	$69,660

Figure 2. Basic Studio

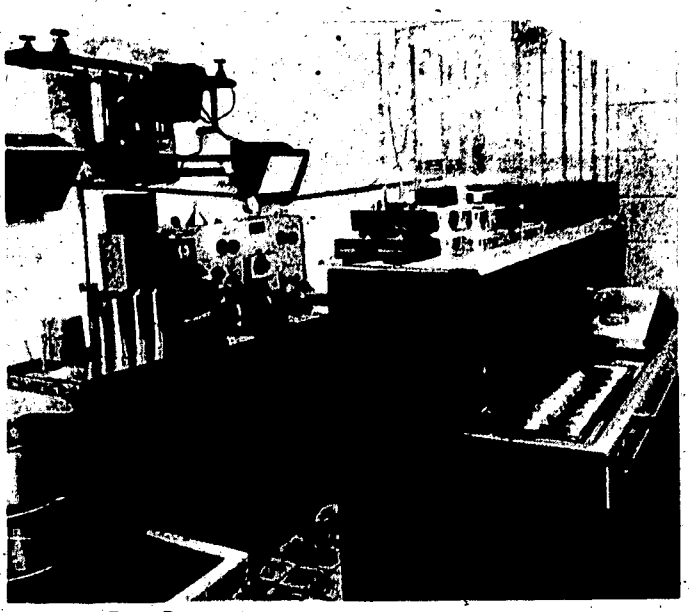


Figure 3. Film Processing

Figure 4. Photo Printing

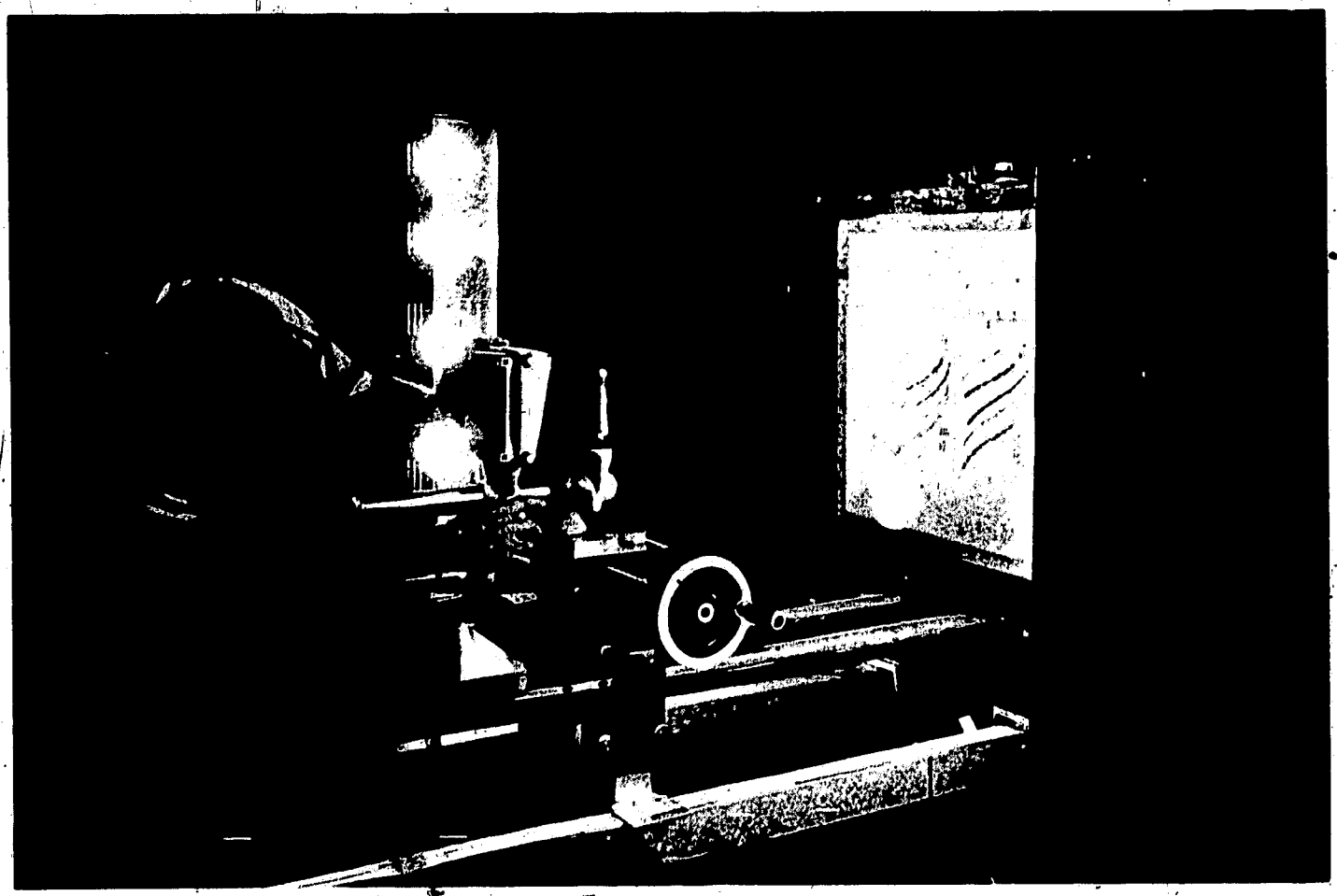


Figure 5. Photo Copy Room

Figure 6. Photo Work Area

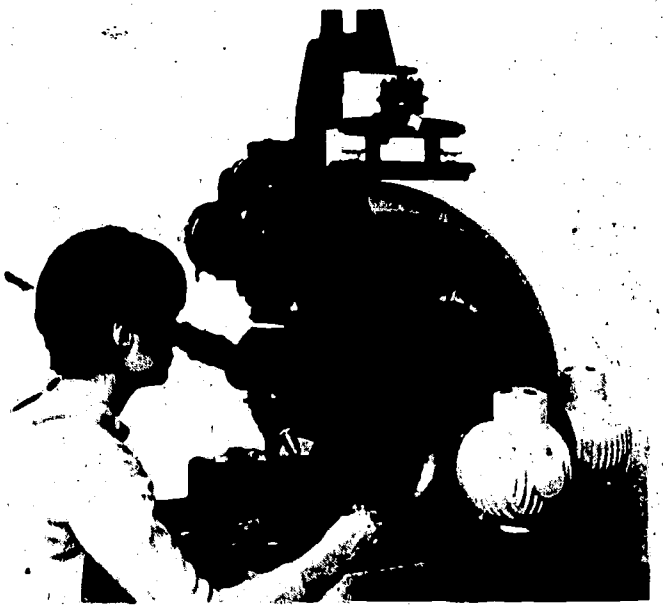


Figure 7. Micro Photo

Figure 8. Slide Duplicator

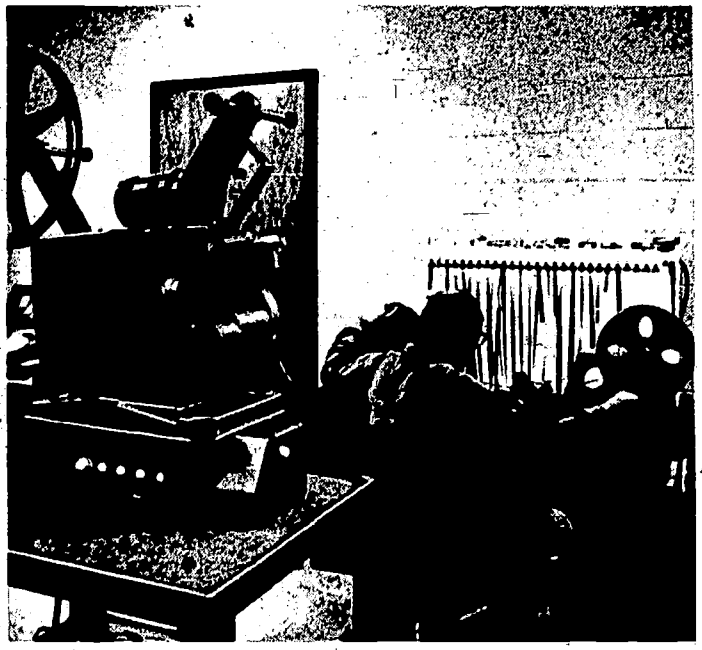


Figure 9. Movie Editing

Figure 10. Satellite Photo Unit

Figure 11. "Corner Space" (Autopsy Room)

EQUIPMENT REQUIREMENTS

Basic equipment needs are shown first and can be acquired in the order listed. The list of equipment assumes the space requirements have been met in the different categories. Processing sinks and safelights are a part of the space requirements.

PHASE I BASIC:		
FIGURE 12 -	SINGLE LENS REFLEX CAMERA	$ 1,800.00
FIGURE 13 -	BASIC VIEW CAMERA	700,00
FIGURE 7 -	MICRO-MACRO CAMERA INCLUDING CINE AND PHASE	20,000.00
PHASE II COMPLETE:		
FIGURES 8 & 14	SLIDE DUPLICATING AND MOUNTING CAMERA	10,000.00
FIGURE 5 -	COPYSTAND – HORIZONTAL	2,000.00
FIGURE 15 -	COPYSTAND - VERTICAL VIEW BOX	2,000.00
FIGURE 16 -	STUDIO CAMERA AND STAND	600.00
FIGURE 11 -	AUTOPSY SPECIMEN STAND (NO CAMERA)	600.00
FIGURE 17 -	DENTAL CAMERA	1,000.00
FIGURE 9 -	FILM EDITING AND SOUND RECORDING	7,000.00
FIGURE 18 -	DIAZO MACHINE (COLOR SLIDES)	400.00
FIGURE 19 -	MOTION PICTURE CAMERA & ACCESSORIES	7,000.00
FIGURE 20 -	STUDENT IDENTIFICATION CARD CAMERA	5,000.00
	TOTAL	$58,100.00

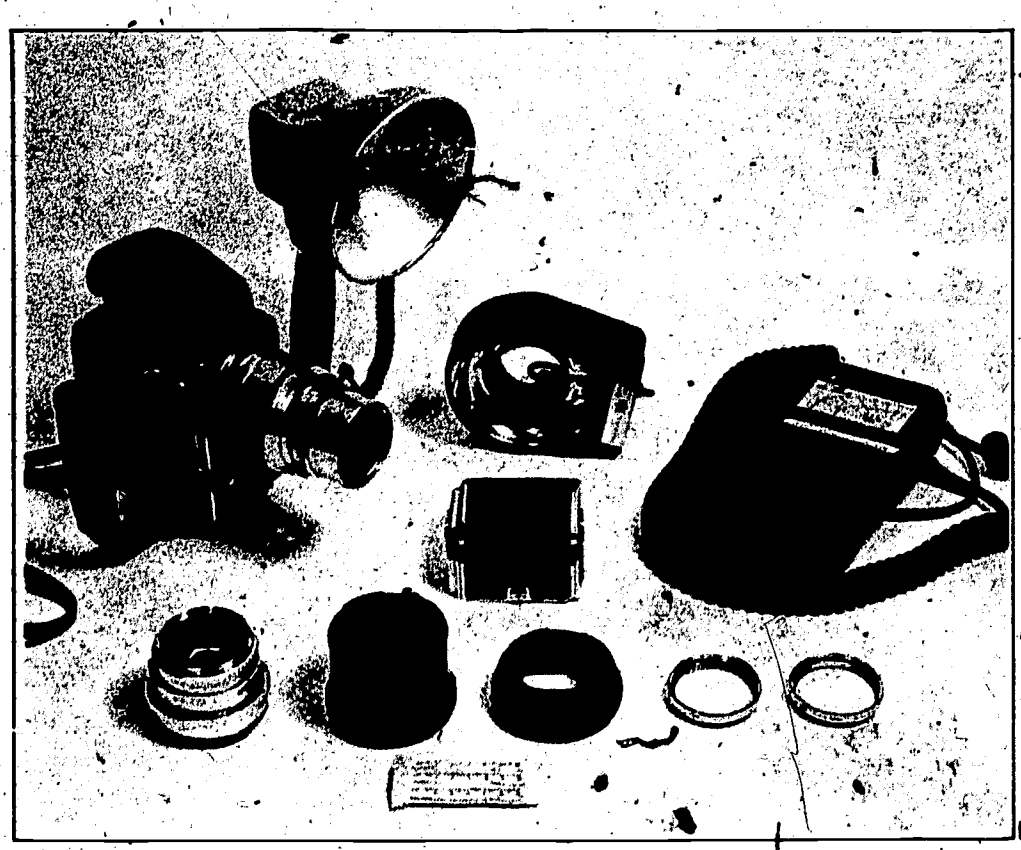


Figure 12. Single Lens Reflex Camera

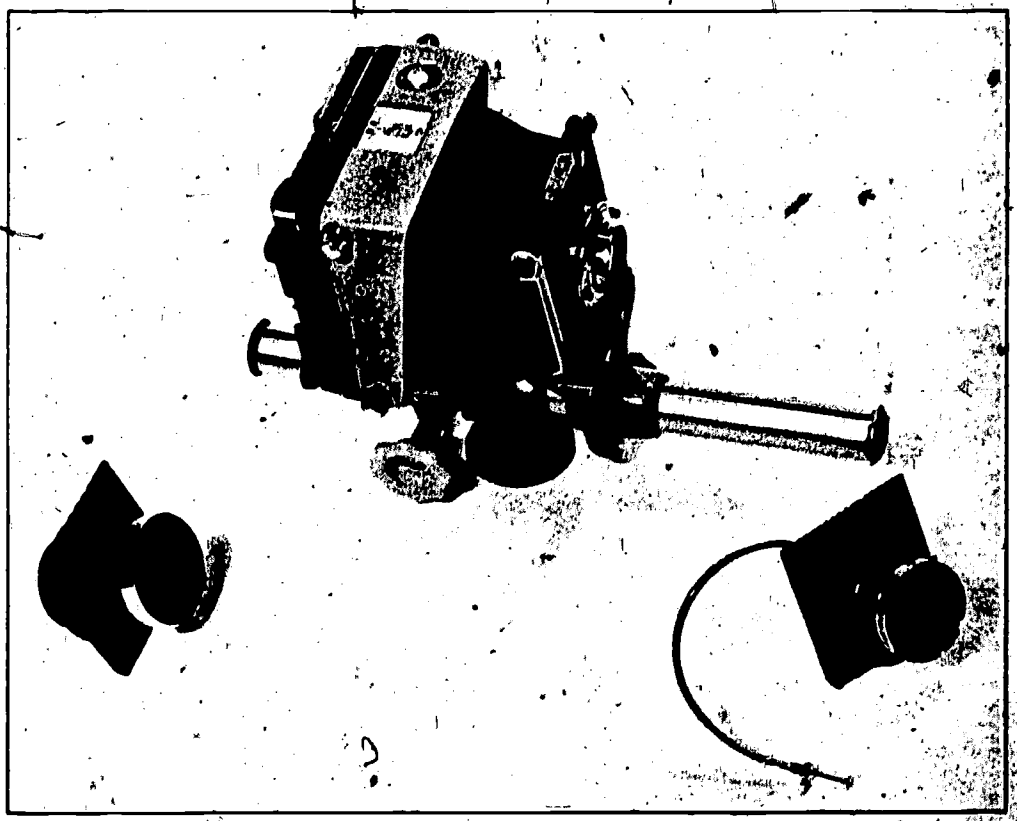


Figure 13. Basic View Camera

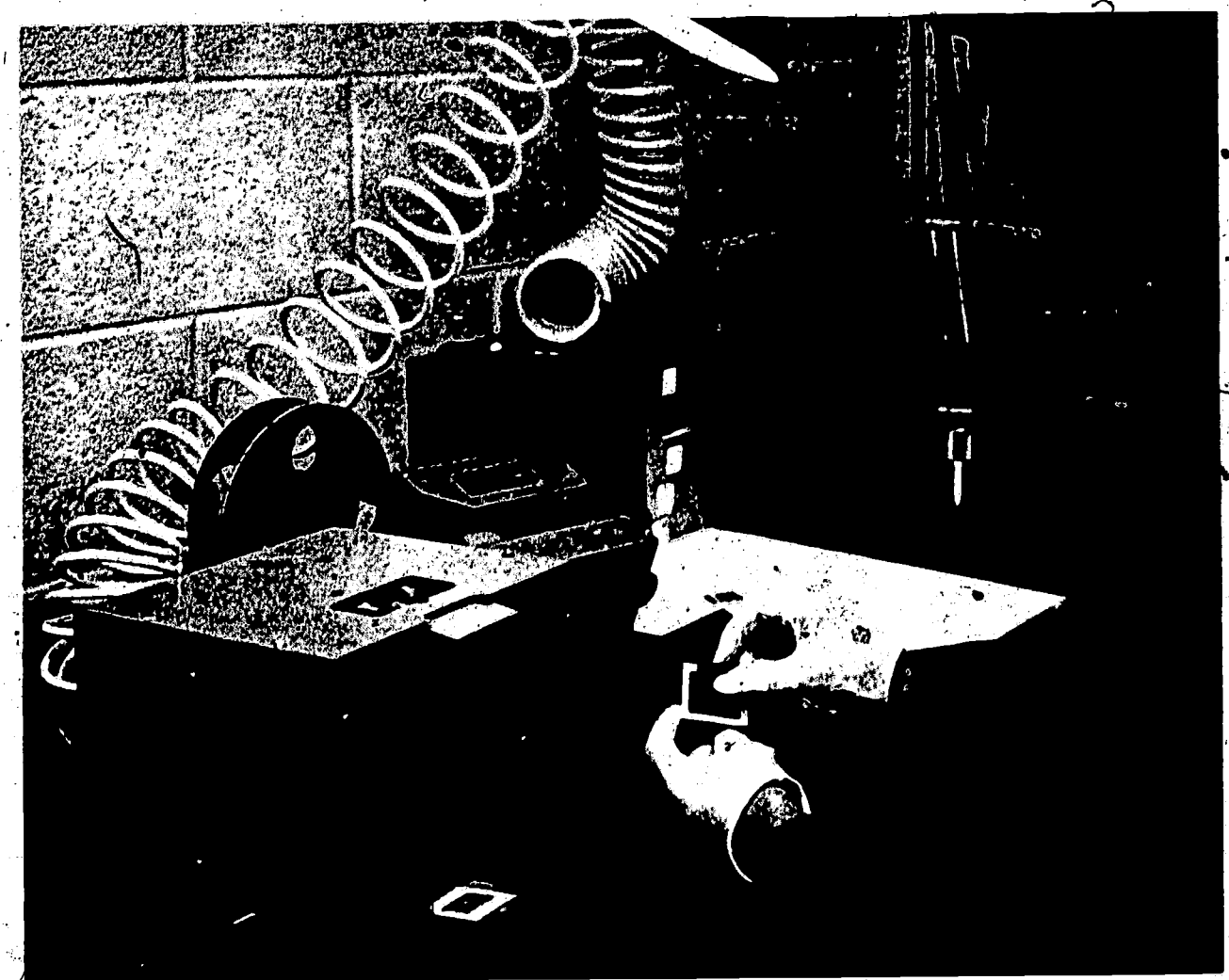


Figure 14. Mounting Camera

Figure 15. Copystand–Vertical View Box

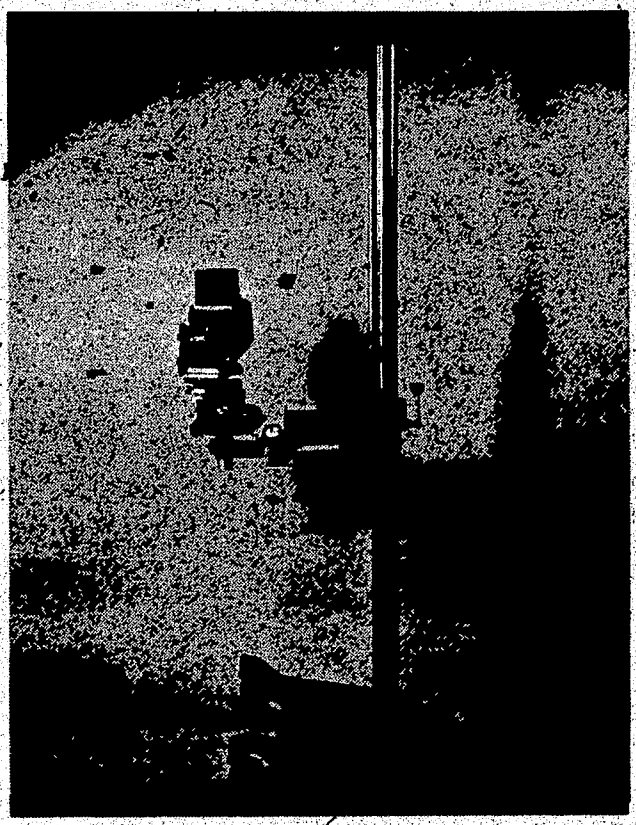


Figure 16. Studio Camera and Stand

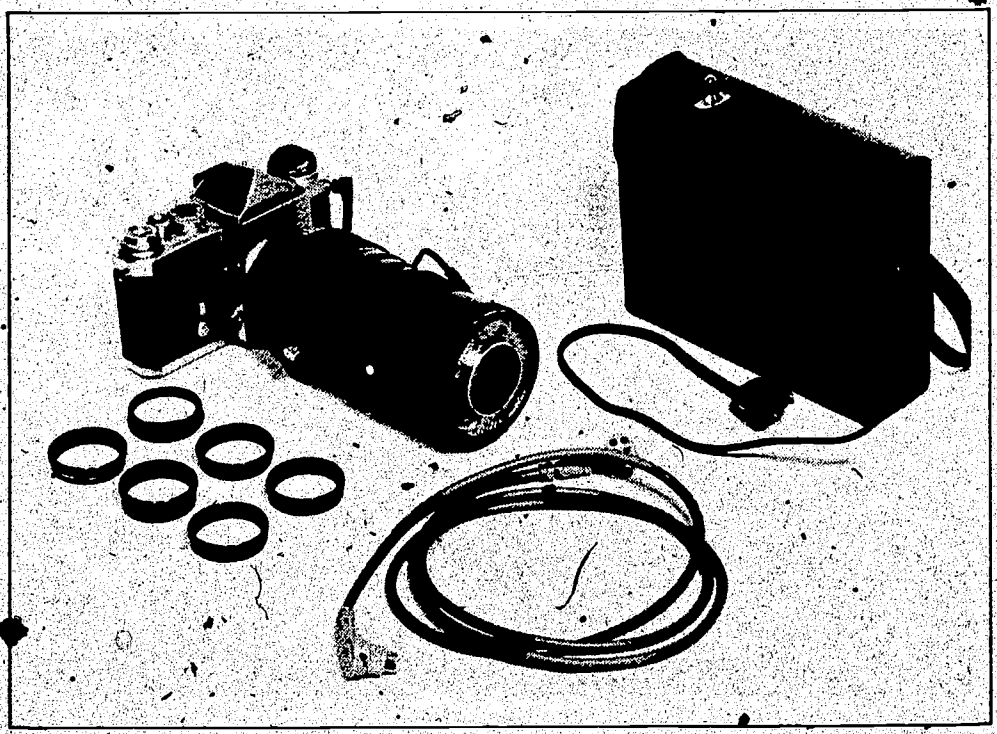


Figure 17. Dental Camera

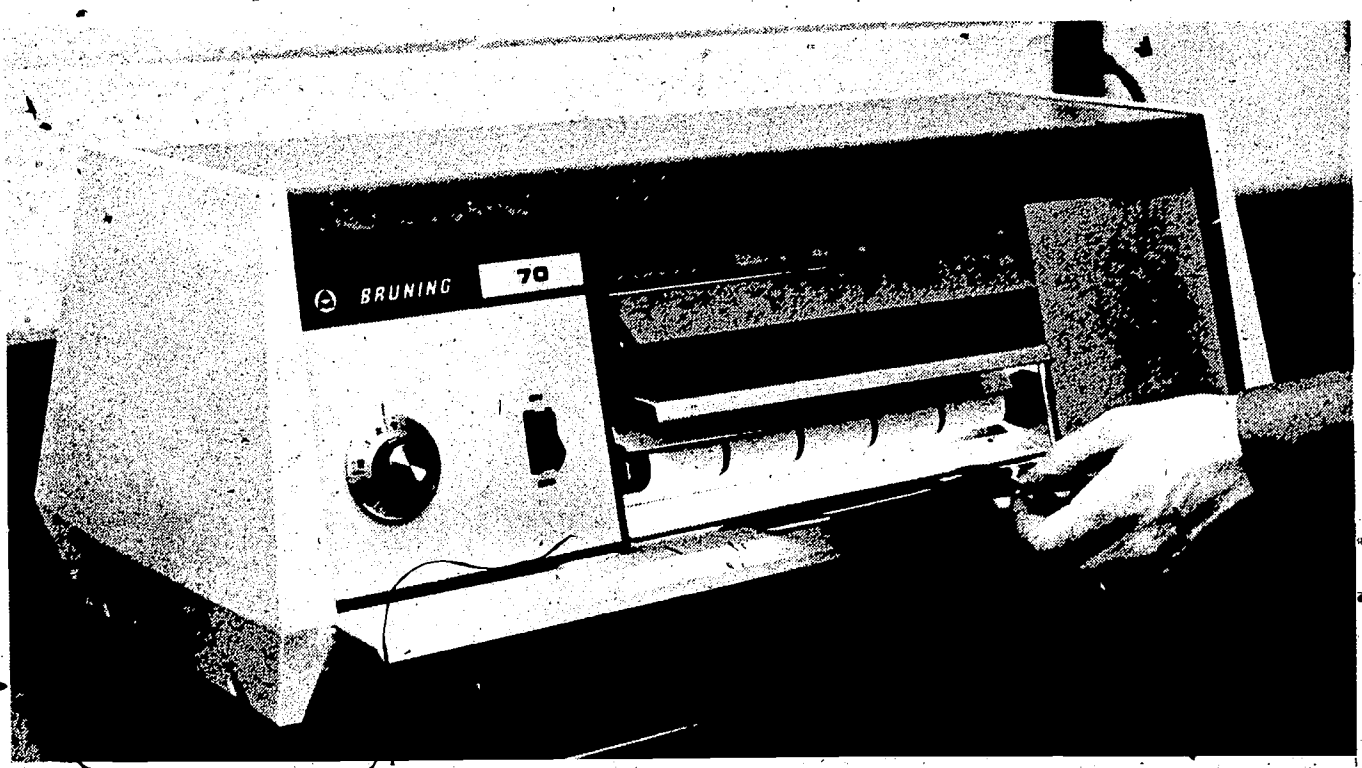


Figure 18. Diazo Machine (Colored Slides)

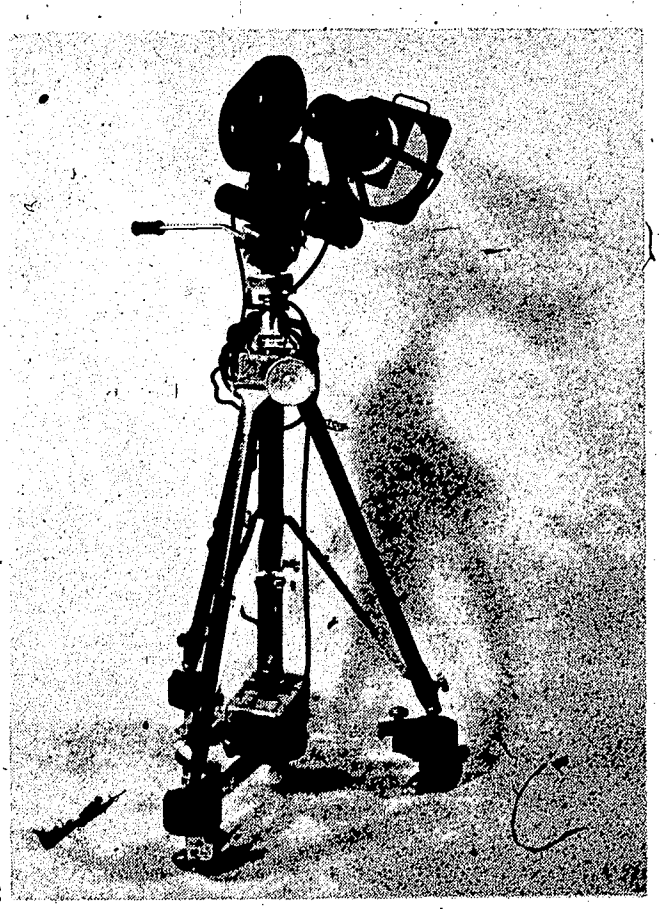


Figure 19. Motion Picture Camera & ACC

Figure 20. Student Identification Card