THE USE OF CLOSED-CIRCUIT TELEVISION FOR TEACHING VETERINARY MEDICINE AT MICHIGAN STATE UNIVERSITY FROM SEPTEMBER, 1955, THROUGH JANUARY, 1963

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ABSTRACT

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FOR TEACHING VETERINARY MEDICINE
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by Leslie F. Harcus

This thesis provides information about the use of closed-circuit television in the teaching of veterinary medicine courses at Michigan State University from fall, 1955, when closed-circuit equipment was first installed, through January, 1963. During this period, more veterinary telecasts were made at Michigan State than at any other educational institution. In this pioneer development the author participated as a television director, thereby acquiring a personal acquaintance with faculty members, facilities, and other television personnel involved.

For those unfamiliar with the process of televised instruction, the thesis provides a general description of the closed-circuit operation in Giltner Hall, home of the College of Veterinary Medicine. It then considers more specifically the kind of facilities needed for veterinary instruction, describing those presently in use and those which might be acquired in the future to extend the usefulness of the medium. Next, it discusses the various purposes for which the College has used television, including the annual Post Graduate Conference and regular courses in the departments of Anatomy, Physiology and Pharmacology, and Surgery and Medicine. Reasons are cited for the use of television in these courses. Reasons are also provided for not using television in certain other courses, particularly in the areas of Veterinary Pathology and Microbiology

and Public Health. Reactions of students to televised instruction are evinced by a questionnaire, completed by Surgery and Medicine majors in fall, 1961.

The thesis concludes that the use of television for veterinary instruction is still in the process of development. Improvements could be made in the present operation to secure more skillful television crews, more thorough preparation of the telecasts, more space in the control and originating rooms, better equipment and additional equipment which would extend the use of television to a wider range of subject matter. Nevertheless, in the words of the Dean of the College of Veterinary Medicine,

> closed-circuit television is gaining increasing acceptance as an instrument for the teaching of certain veterinary subjects -- particularly those which involve difficult, costly, or time-consuming demonstrations on a scale too small to be seen directly by a class of fifty or more students. Examples are anatomical dissection, physiological demonstrations, and operative surgery. When color equipment becomes available, television can be used even more widely and effectively in teaching diagnosis, surgery, postmortem examination, clinical pathology, and microbiology -- subjects for which accurate color perception is important.*

Noting that the Dean says "can be used" rather than "may be used," and remembering that space has already been provided for color equipment in the plans for a new Veterinary College building, one may be justified in predicting that closed-circuit television will play an increasingly significant role in the teaching of veterinary medicine at Michigan State University.

*Statement by Dean W. W. Armistead, Dean of the College of Veterinary Medicine, Michigan State University, June, 1961.

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By

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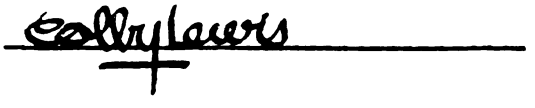
Approved: 

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INTRODUCTION

The purpose of this thesis is to provide information about the use of closed-circuit television in the teaching of veterinary medicine courses at Michigan State University. It covers the period from fall, 1955, when closed-circuit equipment was first installed on the campus, through January, 1963, when the author stopped collecting data in order to begin his writing.

During this period, the author served as television director for many of the veterinary telecasts, thereby acquiring a personal acquaintance with the faculty members, television personnel, and facilities involved in these telecasts.

These telecasts have exceeded those of any similar institution. Of the seventeen schools in the United States devoted to veterinary education, ten use no television, four use it only occasionally for conferences and short courses, and only three use it for regular instruction.[1] Besides Michigan State, these include the School of Veterinary Medicine at Texas Agricultural and Mechanical College, which uses television as an audiovisual aid, mainly in teaching surgery,[2] and the University of California School of Veterinary Medicine, which only began using closed-circuit television in the fall of 1962 and is still experimenting to determine its appropriate place in the curriculum.[3]

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[1]Compilation of questionnaire information received from 16 Schools and Colleges of Veterinary Medicine by the author, January, 1963.

[2]Ibid.

[3]Ibid.

Definition of Closed-Circuit Television

"Closed-circuit" is a means of distributing television program material to a limited number of predetermined locations. Rather than being broadcast to the general public, a closed-circuit program is destined for a particular audience with a specialized interest in its content. The signal travels from point to point, sometimes by microwave relays, more commonly by coaxial cable. As such, it is a private signal and not subject to the jurisdiction of the Federal Communications Commission. While the Commission must limit the number of broadcast channels, there is no limit on closed-circuit installations, and their number is expanding rapidly to serve many needs in industry and education.

Development of Closed-Circuit Television at Michigan State

One of the pioneer uses of closed-circuit television for instructional purposes took place at Pennsylvania State University, which received a grant in 1955 from the Fund for the Advancement of Education for a systematic evaluation of televised courses in psychology and chemistry.[4] This evaluation awakened the interest of other universities by concluding:

> Our research findings at Pennsylvania State University have been such as to give us confidence that students can be taught as effectively by means of television as by direct methods of instruction, that there are many ways of using television to achieve varied educational objectives, and that student acceptance is no serious barrier to the use of TV for regular courses where its

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[4]C. R. Carpenter and L. P. Greenhill, Instructional Television Research, Project Number One: An Investigation of Closed-Circuit Television for Teaching University Courses. (University Park, Pa.: Pennsylvania State University, July 31, 1955), pp. 10-13.

> use is justified. Finally, through its use, large numbers of students can be taught by a single teacher... at costs that are favorable to television if the enrollment in the average televised course exceeds two hundred.[5]

Prompted by this and other developing uses of instructional television around the country, Dr. John A. Hannah, President of Michigan State University, acted on August 3, 1955 to appoint a committee of administrators to investigate the feasibility of closed-circuit television on his campus. As a result, in the winter quarter of 1956, the closed-circuit system commenced its operations in Giltner Hall, site of the College of Veterinary Medicine.[6] Having already participated in televised demonstrations at national veterinary conventions, members of this college faculty were particularly interested in experimenting with the medium. Their building had a reasonably central location and sufficient room for the necessary television facilities.

These facilities were open, however, to all departments of the university. Hence early telecasts were made for Chemistry 101, Communication Skills 112 and 113, Foundations of Education 200 and 207, Nursing 202, and Russian 101, besides the veterinary courses, Pharmacology 303, Surgery and Medicine 522, and Anatomy 301b.[7]

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[5]John C. Adams, C. R. Carpenter, and Dorothy R. Smith, College Teaching by Television, Report of a Conference Sponsored Jointly by the Committee on Television of the American Council on Education and the Pennsylvania State University. (University Park, Pa.; Pennsylvania State University, October 20-23, 1957), p. 83.

[6]Interview with Dr. Armand L. Hunter, Director of Michigan State University Broadcasting Services, June, 1960

[7]J. D. Davis, "Factsheet on CCTV Facilities and Personnel," Michigan State University, 1959.

In some universities, closed-circuit systems have been administered by individual colleges and departments. At Michigan State, however, to avoid unnecessary duplication of facilities and to promote equitable use of those which existed, it was decided to place televised instruction under an administration which would serve the total university. Already there existed a university television broadcasting station, WKAR-TV (now WMSB-TV), supervised by a Director of Television who reported to the Vice President for Academic Affairs. It was logical to make use of the professional experience of this station, and to its director fell the planning, staffing, and administration of the new closed-circuit system. In time, a special manager for closed-circuit television was appointed. He reported, however, to the Director of Television, who was later designated as Director of Broadcasting Services.[8]

This administrative channel persisted until July 1, 1962, when the closed-circuit operation was divested of its connection with broadcasting services and transferred to the Office of the Provost, so that it might be more clearly recognized as a medium for on-campus instruction and more effectively coordinated with other aspects of that instruction.[9]

Since 1956, the system has undergone considerable physical expansion. In 1960, additional receiving rooms were developed in the Auditorium Building across the street from Giltner Hall.[10] In 1961, the Michigan Bell Telephone Company, while installing a new campus telephone

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[8]Hunter, loc. cit.

[9]Interview with Dr. Colby Lewis, Coordinator of CCTV, October, 1962.

[10]Interview with J. D. Davis, Manager of CCTV, September, 1961.

system, laid a network of coaxial cables through which television signals may be distributed to any building on campus which has been equipped with the necessary internal wiring.[11] In 1961, two new closed-circuit studios were opened in the College of Education Building. Free of the characteristic odors and noises of a veterinary building, these new studios are now used to originate most televised material except that of the College of Veterinary Medicine, which has thus gained almost exclusive use of the original facilities in Giltner Hall.[12]

Subsequent chapters of this thesis will be limited to this Giltner Hall operation and to its use by the College of Veterinary Medicine.

Assuming that the reader has little knowledge about television, the next chapter will explain the Giltner Hall television operation in rather general terms.

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[11] Ibid.

[12] Ibid.

CHAPTER I

A GENERAL DESCRIPTION OF THE GILTNER HALL OPERATION

When equipping a building such as Giltner Hall with facilities for closed-circuit television, decisions must be made regarding three different types of rooms. The "live" performance (the instructor's lecture or demonstration) takes place in an originating room, where it is picked up on cameras and microphones. The "video" and "audio" signals produced by these instruments are fed to a control room. Here, may be added recorded sound from discs or audio tape recordings and recorded pictures from slides or motion picture film. The strength and quality of these various sounds and pictures are regulated in various ways. They are then combined in the desired order to constitute the television program. This program is distributed to one or more loudspeakers and viewing screens in a receiving room or viewing room, where the student audience is assembled.

Regarding these rooms a number of basic questions must be asked. How many of each kind will be needed? Where will they be located? How will they be equipped? Economy will play a part in answering such questions. The university Board of Trustees approved $31,329.40 for the initial installation in Giltner Hall. (See Appendix I) By contrast, an educational broadcasting station may cost as much as $500,000.[13]

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[13]Hunter, loc. cit.

In a broadcasting station it is customary to provide studios - rooms which are especially equipped for originating television programs and are not used for any other purposes. Each of these studies may have its own set of cameras and its own control room. In the case of Giltner Hall, however, economy prescribed a single control room and a single set of cameras which could be moved from one originating room to another.

Originating Rooms

The choice of originating rooms depends, of course, upon the types of lesson to be televised and what facilities a room may offer for conducting a particular type of lesson. In Giltner Hall, the first originating room was Room 146, a 350-seat auditorium. Later, television originating facilities were installed in other rooms which were better suited to demonstrations with animals. These included two large-animal operating rooms, two small-animal operating rooms, and eventually Room 226, which was set aside and equipped more or less exclusively as a television studio.[14]

To make a television pickup, some means must be provided for transmitting certain kinds of electrical information between the originating room and the control room. For example, a cable must pass between the control room and each of the cameras. This cable carries audio circuits by which the camera operator and control room personnel may converse. It also feeds to the camera electrical power at certain voltages and pulsed in certain ways to time the operations of the camera. And from the camera it carries out the picture information in the form of a

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[14]Davis, loc. cit.

modulated electrical signal. Besides this camera cable, there must be audio cable to carry the signals originated at the microphone, which constitute the auditory portions of the program.

It is possible, of course, to string these cables through the corridors each time a program is originated. Obviously, however, this is highly inconvenient, since it disrupts traffic, consumes time, and wastes manpower. Accordingly, it is advisable to run permanent cables between the control room and each of the originating rooms, terminating them in wall outlets to which the cameras and microphones may be quickly connected. At the control room end, these cables terminate respectively in an audio and video patch panel, so that any incoming signal may be connected by means of a patch cord to the appropriate control equipment. Through the building, the cables usually pass in ducts or conduit under floors, above ceilings, or through the walls. In older buildings it may be difficult and expensive to route these cables. New buildings should be, and usually are, designed with readily accessible channels through which these and other kinds of electrical cables can be routed.

Any building which is equipped for television must be provided with an adequate supply of electrical power, not only for the cameras, but also for the illumination required by the cameras to deliver an acceptable picture. To provide this illumination, originating rooms may need to be equipped with special outlets to which may be connected the "scoops" and "spotlights" which may be required to supplement the normal room illumination. Furthermore, special means may be needed for hanging these instruments. If money permits, and if a room is to be used frequently for television originations, it will be desirable to furnish it with its own set of lighting instruments. Otherwise, like the cameras and microphones, these instruments must be moved from one originating room to

another.

In selecting lighting instruments, it is possible to choose between fluorescent and incandescent sources. It is not easy to regulate the intensity of fluorescent lighting or to control its direction so that it can be concentrated on some areas and kept off others. Fluorescent lighting is flat and diffuse. In lighting for television, however, it is often desirable to throw more emphasis on one subject than another and to achieve on the flat screen an illusion of three dimensions by "modeling" subjects with highlights and shadows. These purposes can be more effectively achieved by incandescent sources.

Besides providing outlets for lighting, an originating room should have two other kinds of outlets. Provision should be made for plugging in a "studio monitor." This is a television receiver which shows the video portion of the program. It is usually mounted on a castered stand so that it can be faced in various directions. It is useful to television production personnel for checking the appearance of lighting without looking through the cameras, and is also helpful to the television instructor, who can glance at it while a closeup is being taken to see whether he is handling the material in such a way that his audience can see it clearly.

The originating room should also be provided with microphone outlets. In professional broadcasts, microphones are often suspended from telescopic booms, controlled by operators who keep the microphones within range of the performers (but out of camera range) as they move around the setting. In educational television, it is more customary to suspend

microphones around the performers' necks. Instructors must then learn to accommodate their movements to the microphone cable which trails off their persons, unless furnished with a wireless type microphone.

Ideally, because of the heat given off by cameras and lighting instruments, originating rooms should be air conditioned, or at least capable of ventilation without admitting distracting noises. They should provide satisfactory acoustical conditions. Their walls should provide satisfactory backgrounds for camera shots - not, for example, reflecting more light than the faces of the performers. The rooms should also be as large as possible, to permit sufficient storage space for equipment and properties, sufficient distance between performers and their backgrounds, and ample room for camera deployment.

Cameras

Another decision regarding the originating room concerns the type of camera to be used there. To reach this decision, several questions must be asked. One question concerns the desired maneuverability required of the cameras. A camera equipped with a single lens is not as versatile as one with several lenses. The single lens provides a single unvarying angle of view. At additional cost, the camera may be provided with a choice of four lenses, each of which may be rotated into place as desired to embrace a wider or narrower angle (hence a greater or lesser area) of the scene. Or the camera can be equipped with a "zoom lens," a lens of variable focal length, by means of which the field of view may be widened or narrowed by degrees.

It is possible to mount a camera in a fixed position, pointed in a fixed direction. More maneuverability may be secured by mounting it on

a "pan head," by which it may be rotated from side to side or tilted up and down. Camera and pan head may be mounted in turn on a movable dolly, so that the camera may be moved across the floor to change the angle from which it views the subject and to vary its distance from the subject. This dolly may be a "tripod," which maintains the camera at a fixed height, or a "pedestal," which allows its height to be varied.

The use of a dolly requires a camera operator to push it. This operator also aims the camera, changes its lenses and keeps them in focus. So that he may see what he is doing, the camera must have a "viewfinder," a small television set that shows him the picture being taken.

If no dolly is used, it is possible to supplant the human camera operator with equipment for aiming the camera, operating the zoom lens, or rotating and focusing the standard lenses by remote control from the television control room.

Related to the question of camera maneuverability is that of how many cameras to provide. For use in an originating room, the usual number is two. While one camera is feeding its picture to the program, the other can be setting up on a different subject or getting a different shot of the same subject, either closer or wider, perhaps, or from a different angle.

It is also advisable to purchase at least one more camera - not for the originating rooms, but to be mounted in the control room or an adjacent "projection room," for picking up motion picture film and slides. This "film camera" is stationary and does not require the pan head, dolly, viewfinder, or choice of lenses which have been mentioned as desirable accessories for the originating room cameras.

One such camera was selected for the control room in Giltner Hall. For the originating rooms two other cameras were provided, each with rotating lenses, viewfinder, pan head, and tripod dolly.

Before these cameras could be selected, however, other basic questions had to be answered. For example, were the cameras to transmit in monochrome (black-and-white) or full color? When Giltner Hall was equipped, color television was out of question because of its high cost, which is reflected not only in the initial investment, but in the cost of upkeep, the amount of skilled engineering personnel required, the bright illumination necessary, the consequent need for air conditioning, and the cost of color receiving sets.

Even so, a choice was necessary between two general types of monochrome equipment, distinguished by the type of pickup tube employed. On one hand were image orthicon cameras, already in use at WKAR-TV and at most other television broadcasting stations. On the other, were vidicon cameras, relatively new in 1956, but since then widely used for closed-circuit operations and for some broadcasting applications as well.

Image orthicons are generally conceded to provide the higher quality signal necessary for broadcast transmission. They can reproduce an acceptable picture at lower illumination levels than can vidicons, and they can accommodate a wider contrast range from dark to light tones. Their output signal level is more stable under changing light conditions. And unlike the vidicons, they can reproduce fast-moving objects without showing a smear behind them on the screen.[15]

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[15]Interview with Herman Rudolph, CCTV Engineer, September, 1961.

Nevertheless, vidicon cameras were chosen for Giltner Hall for the following reasons: Compared to image orthicons, vidicons are much smaller and lighter in weight. Hence they take up less studio space, are more maneuverable, and can be used to get pictures in cramped places. They require less time than image orthicons for warm-up and check-out before use. The simplicity of their circuitry makes for easier maintenance and requires less skillful operating personnel. Unlike image orthicons, they can be focused on a stationary subject for long periods with minimum danger that the image of the subject will "burn in" and remain visible when the camera is pointed onto a new subject.[16] This is another reason why they may be entrusted to less skillful operating personnel. Thus they can be operated by students, working for experience or on low student wage scales.

Besides lower labor costs, vidicons permit several other economies. A vidicon pickup tube (the principal tube in the camera) costs about one quarter as much as an image orthicon tube and lasts three to five times as long. All other equipment is correspondingly cheaper, including lenses, pan heads, and camera dollies. A complete vidicon chain costs about one third as much as an image orthicon chain.[17]

Control Room

By "chain" is meant not only the camera, but the other electronic equipment needed to make the camera operate. This includes its power supply,

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[16] Ibid.

[17] Ibid.

a synchronizing genrator which times its operations, and a camera control unit wherewith to adjust the strength and quality of the picture signal. This supporting equipment is installed in the control room.

Also in the control room is the "film camera" already mentioned, with its 2" x 2" slide projector and 16mm file projector. The film projector is not the same as one used for non-television purposes; the rate at which its exposes the film must be especially synchronized to the rate at which the television camera "scans" its pictures.

The control room is also equipped with sources of recorded audio, such as the sound system of the film projector, one or more turntables for playing phonograph records, or one or more audio tape recorders. There is also an audio control console, whereby the sound from these sources and from the microphones in the originating rooms may be routed into the program and made louder or softer as desired.

Similarly, the pictures from the various cameras must be routed into program in the sequence to be viewed by the audience. In the control room, these pictures appear, each on its separate camera monitor. (See Figure 1.) The television director watches these monitors, meanwhile talking via a telephone headset system to the camera operators, telling them what pictures to take. Seeing a desired picture ready, he switches it into the program by operating the buttons and levers of a "switching panel," and views the resultant change on a "master monitor," which shows the program in the sequence viewed by the audience.

Sometimes the switching panel may be operated by another person, who takes his cues from the director. Still other persons may be used to operate the film and slide projectors and the audio console. In any case, there will be need for an engineer to see to the proper functioning of the

equipment and to control the quality of the video signals, an operation known as "shading." In the Giltner Hall control room, the equipment has been arranged so compactly, and the programs have usually been so simple that all operations have been usually handled by only two persons, the director and the engineer.

Distribution

From the control room, the program signal is distributed to the receiving rooms. For closed-circuit operations two types of distribution are available: video distribution and RF (radio frequency). In video distribution, picture and sound are transmitted separately - the sound through its own wire to its own loudspeaker, the picture through coaxial cable to "jeeped" monitors, receivers which can receive only this one video source.[18] Video distribution provides a picture of maximum quality and fine detail. It was the system used as long as distribution was limited to Giltner Hall. When new receiving rooms were activated in another building, however, a change was made to RF distribution.

For multi-building operations, RF is more economical than video distribution to install and operate. It is also more versatile, since it allows one cable to carry several programs and permits the same receiving set to display a choice of several programs. In the RF system, use is made of RF-VHF (Very High Frequency) carrier waves, vibrating at the same frequencies as those of standard broadcast VHF television channels. The video and audio program signals are combined and used to modulate one of these waves, which carries them through the coaxial cable

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[18] Ibid.

Figure 1. The television director in the control room observes the operation and, following the instructor's lead, takes the picture offering the most advantageous view of the operation.

to standard VHF television receiving sets. Just as with home reception, these sets may be turned to receive a number of incoming channels - not only a program originating in Giltner Hall, but others originating on different channels from the Education Building studios, for example, or broadcast programs which have been picked up off the air and distributed through the closed-circuit system.[19]

Normally, programs originated by the College of Veterinary Medicine are distributed only to classrooms within Giltner Hall. Occasionally they are routed to a video tape recorder in the College of Education studios so that they may be preserved for future use. Sometimes they are distributed to convention audiences assembled elsewhere on campus. It is possible to route them to any receiving building on the campus network.

Within a building such as Giltner Hall, the distribution facilities include a number of items: the modulator in the control room which impresses the program signals onto the selected channel frequency; the coaxial cable which carries the program to the receiving room; distribution amplifiers, which may be necessary to strengthen the signal at points along its path; and the outlets in the receiving rooms, into which the receiving sets are plugged.[20]

Receiving Rooms

Leading manufacturers of television receiving sets sell models especially designed for classroom use. The picture tubes in such sets vary from 17 to 24 inches. They should have glare-resistant screens and

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[19] Ibid.

[20] Ibid.

front-mounted audio speakers with more power than those of the usual domestic models. They may be mounted in various ways - suspended from the ceiling, attached to wall brackets, or rested on rolling stands. If on stands, they should have lead wires of up to 20 feet in length in order to permit them being placed in a variety of locations. They should be high enough off the floor to be visible over several rows of students, yet not so high that viewers must crane their necks unduly or move them through too great an angle when looking down to their notebooks and back to the screen again. They should be tilted down somewhat to be perpendicular to the average angle of vision and to help eliminate glare from the ceiling lights that may be reflected in them. In Giltner Hall receiving rooms, there is one 24-inch set for every 30 students, so arranged that no student has to view the screen from a horizontal angle of more than 45°.[21]

There are five receiving rooms in Giltner Hall, with 20, 72, 96, 60, and 350 seats respectively, totaling 548 seats.[22] (For illustrations of these rooms see Figures 2, 3, and 4.)

In the 350-seat auditorium, use is sometimes made of a large-screen television projector to supplement the ordinary receiving sets. With this projector the image from a television picture tube (kinescope tube) is reflected by a mirror system onto a screen, forming a maximum image 9 feet by 12 feet. Although this machine has the advantage of magnifying the television picture for a large audience, it is not ideal, since it

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[21] Ibid.

[22] Ibid.

requires an operator in constant attendance and does not show sufficient tonal contrast unless the room is darkened.[23]

Besides viewing facilities, the rooms in Giltner Hall are equipped with an audio talkback system, which helps to overcome criticism that television is a one-way channel, with all of the output from the instructor and no chance of response from the student. By means of a talkback system, students can recite or ask questions. In some closed-circuit installations, they speak through microphones mounted on the ceiling of the receiving rooms. In the latest system employed at Michigan State, they speak through telephone instruments passed to them by a proctor. In front of the instructor in the originating room is a small panel containing four red lights, which flash on to indicate an incoming call, it being possible to have questions from as many as four receiving rooms simultaneously. At a convenient place in his lesson, the instructor acknowledges these questions in order. The questions are patched through the program distribution system so that they may be heard in all receiving rooms.

Since 1961, the distribution facilities in Giltner Hall, as in other buildings on the Michigan State closed-circuit network, have been installed and maintained by the Michigan Bell Telephone Company, which rents its service on a monthly basis. The university installs the conduit through which the cables are run within receiving buildings. It owns the receiving sets and their stands. But the Telephone Company supplies the RF modulators, the cable, any necessary distribution amplifiers, the

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[23] Ibid.

Figure 2. Veterinary medicine students observing the operation in the viewing room have a "front seat" view of the operation enabling them to clearly observe the demonstration and the doctor's operating techniques.

Figure 3. Students viewing a veterinary medicine class.

Figure 4. Another view of viewing room. The class sits in a semi-darkened room.

terminal outlets in the receiving rooms, and the talkback system.[24]

Closed-Circuit Television Personnel

Having described for the uninitiated the general arrangement of facilities which are included in a closed-circuit television operation, it might be well to enumerate the personnel who are needed to operate these facilities. Some of these have already been mentioned.

Certainly there will be need of an engineer to maintain the electronic facilities and, if the operation is modest, perhaps the lights and other staging facilities as well. Before the start of the day's telecasting, the engineer turns on the cameras and checks them for proper performance. During the telecast, he operates the video controls. He maintains an inventory of electronic tubes and other replacement parts. He advises regarding special uses of the technical equipment to accomplish unusual instructional problems. He designs special equipment, orders and installs new equipment. If he has assistants, he schedules their assignments, supervises their performance, and processes their payroll.

Mention has also been made of the television director. The director is responsible for translating the instructor's presentation into a pattern of sounds and pictures which will effectively convey the instructor's message to the television audience. Before the telecast, he consults with the instructor to learn what the instructor intends to say and do, in what order, and for what purpose. He helps the instructor to organize his presentation to suit the conditions of the television medium. He sees that the necessary television materials and facilities are at

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[24] Ibid.

hand for the telecast and in their proper places. If time permits, he conducts a rehearsal in advance of the telecast. During the telecast, he tells the camera men what shots to get; he cues the opening and closing of microphones; he decides what pictures will be switched into the program, and when.

While the closed-circuit system at Michigan State was under the supervision of the university broadcasting services, directors from the broadcasting station were assigned to direct closed-circuit telecourses. Staff cameramen from this station sometimes volunteered as directors in order to acquire experience. Later, the closed-circuit operation hired its own full-time director, who is now supplemented by a graduate student, working half-time, and occasionally by senior Television and Radio Department majors who volunteer their services after having completed a course in television directing.

The work of the director will be more effective to the extent that the television instructor with whom he works has been trained in television techniques. Normally, however, the veterinarians who present closed-circuit telecasts at Michigan State have had very little advance orientation to the medium except, perhaps, for observing the work of colleagues who are already using it.

The telecasts would also benefit from more advance consultation between instructor and director, and from more rehearsal than is provided. Usually, as a matter of fact, there is no rehearsal before the veterinary telecasts. The director may have a written outline to guide him. Otherwise, he follows the instructor's verbal leads, hoping to have his cameras on the right view at the right time. If the same director and instructor

work together during successive terms, of course, the procedure becomes more familiar to them both. The instructor may only have to mention that he is going to repeat the "heart-lever demonstration," for example, and the director will know what to do from past experience.

In the originating room, the director is sometimes represented by a floor director, who is in charge of setting and lighting the performance area, of displaying any visual aids which are not handled by the instructor himself, and of relaying from the director to the instructor any necessary cues which will help him to start and conclude his presentation on time and relate his delivery properly to cameras and microphones.

Floor directors and camera operators in Giltner Hall are students, usually majors in the Television and Radio Department, who are discharging their duties to fulfill a course requirement or are working part-time for a small student wage. Other students are used to transport receiving sets, cameras, microphones, and lights from one location to another, or to turn receiving sets on and off, or to perform various simple maintenance and housekeeping duties. In the control room, they may serve on occasion as projectionists, audio operators, switchers, or assistant engineers.

The practice of using students, particularly those who are working to discharge a course requirement, hardly contributes to the quality of the closed-circuit telecasts, particularly if these students are assigned as camera operators. At the beginning of each quarter, there will be a new crew of them, almost totally inexperienced. Each of them may work only two hours a week. Because they are not on the payroll, there is

little administrative control over them. Because they have classes of their own to attend, they are usually unable to report early enough before a telecast to make rehearsal possible. It is hoped to include some full-time cameramen on the closed-circuit television staff as soon as its budget permits.[25]

Over all of the personnel who have been mentioned so far, there will, of course, be need of a manager. The manager oversees the entire operation, scheduling programs, viewing rooms, and originating rooms, hiring personnel, developing new uses for the system, and planning for its expansion and development. He also administers the budget.

Prior to 1961, while the closed circuit system was confined to Giltner Hall, its budget was $6,000.00 per year, divided into the following categories:

Equipment	$ 500.00
Student Labor	3,000.00
Supplies and Services (lamps, tubes, and other consumable materials, including an allowance of $50.00 to $60.00 per program for visual aids or other television teaching materials)	2,500.00[26]

Other funds have occasionally been made available to supplement this budget. For example, the Accounting Department gave $600.00 in 1959 to purchase additional receiving sets,[27] and the Surgery and Medicine Department provided funds for purchasing small spotlights, used

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[25]Davis, loc. cit.

[26]Ibid.

[27]Ibid.

in lighting small-animal surgery.[28] From the University Development Fund, the Department of Anatomy received $250.00 in 1955 to develop visual aids for Applied Anatomy, and $270.00 in 1958 for the preparation of cadaver materials.[29]

The salaries of the closed-circuit television manager and engineer were carried separately in the budget of WMSB-TV.[30]

Such, then, are the funds, personnel, and facilities used to operate the closed-circuit television system in Giltner Hall. The next chapter will describe in more detail the facilities needed for televising programs in veterinary medicine - both those which are now available in Giltner Hall, and those which would be desirable for future acquisition.

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[28] Ibid.

[29] Interview with Dr. C. W. Titkemeyer, Associate Professor in the Department of Anatomy, Fall, 1959.

[30] Davis, loc. cit.

CHAPTER II

SPECIFIC FACILITIES FOR TELEVISION VETERINARY MATERIAL

A More Detailed Look at the Giltner Hall Facilities

Having explained the general operation of the Giltner Hall closed-circuit system, it will now be possible to describe some of its facilities in greater detail. In doing so, reference will be made to floor plans and photographs which show the personnel and their equipment at work in the originating rooms and the control room.

The Control Room

The control room (Room 37) is on the ground floor of the building. It is approximately 10 feet wide and 16 feet long, with a 10 foot ceiling. As shown in the floor plan (Figure 5), it is small and confined, but conveniently arranged for operating the equipment it contains. At the top of the plan is shown a work bench for equipment maintenance, which is equipped with storage room for tools, tubes, and spare parts. Below this, running out from the left wall, is a desk-type camera control console, which has mounted on it a six-channel switching panel; master monitor; camera monitors, waveform monitors, and controls for two Dage #320 originating-room cameras and one Dage #300 camera for picking up film and slides. The engineer sits in the left chair, the director in the one on the right. Behind them (indicated by the rectangle just below the chairs on the plan) are three metal racks, containing the synchronizing

generator, video patch panel, video distribution amplifiers, camera power supplies, audio pre-amplifiers, program and monitor amplifiers, microphone speaker control relays, and audio patch panel. The controls for opening and closing audio channels and adjusting their volume are mounted in these racks, where they may be reached by either the director or the engineer. To the right of the director's chair is the film and slide projection assembly, consisting of four units. The Dage #300 camera is at the bottom. The circular unit at the left is a Selectoslide Junior 2" x 2" automatic slide projector. The unit at the top is a Holmes 16mm film projector. Between this and the camera is a multiplexer. A multiplexer is an arrangement of mirrors or prisms which allows two or more projectors to be aimed at a single camera.

A photograph (Figure 6) shows the author at the director's console, seated next to Donald Dombrausky, video engineer. Before them are the camera control units; behind them, the video and audio racks with the audio control unit in the center.

A second photograph (Figure 7) is an earlier view of the control room, showing Alvin Murphy (wearing headset), the director, and William Schwartje, video engineer. Beyond them is the Dage #300 camera and the original projection equipment, a Bell and Howell 16mmfilm projector and a manually operated 2" x 2" slide projector.

There is no provision in this control room for originating recorded music or sound. Were a turntable - or any other equipment - required, it is difficult to imagine where it could be located. The room has reached its capacity.

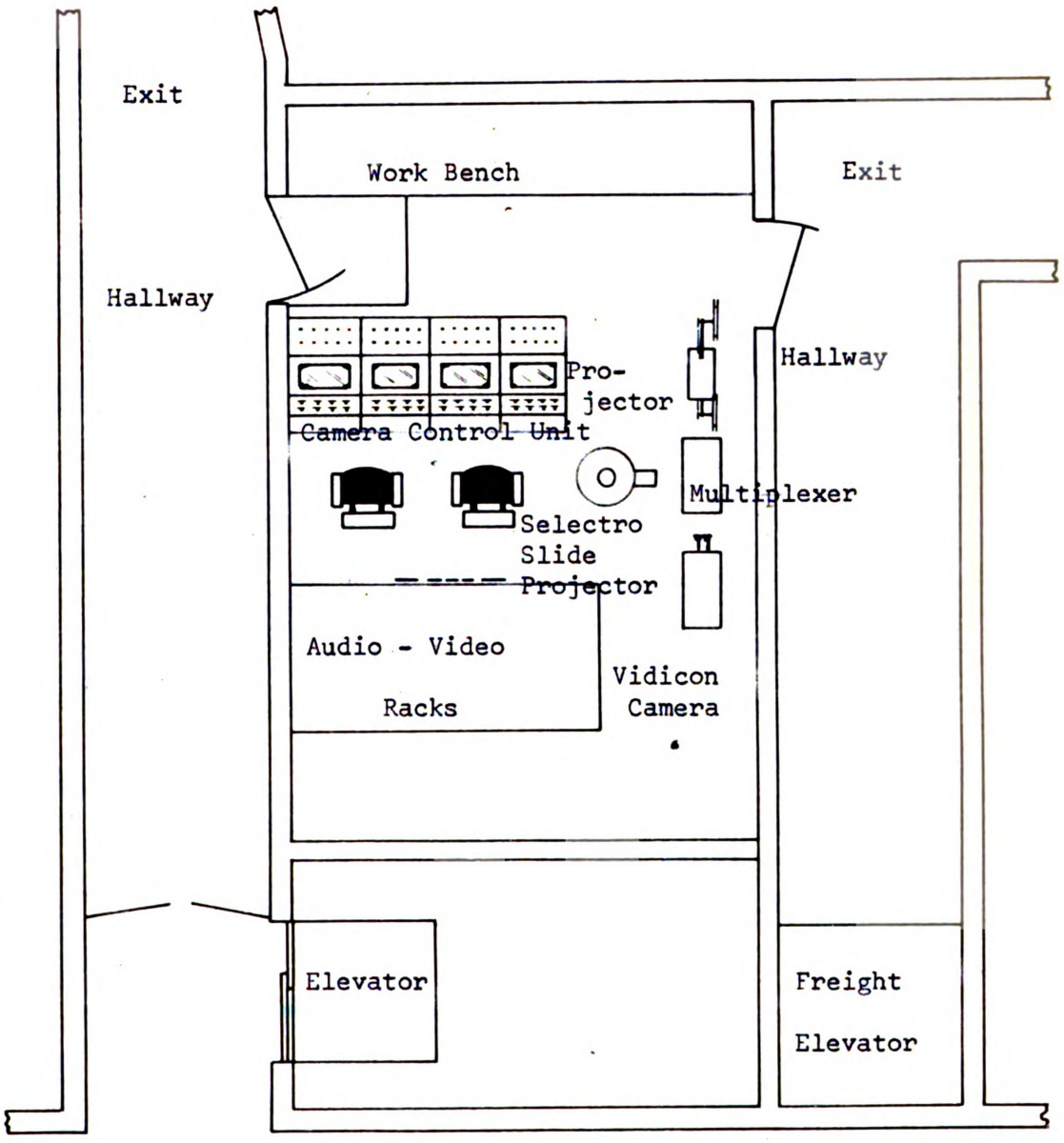

Figure 5. Control Room

Scale - 1/4" = 1'

Figure 6. The author and engineer in the Giltner Hall Control Room. Behind us are the audio console and audio and video racks.

Figure 7. An earlier view of the CCTV control room. On the left are the early Bell & Howell 16mm. projector and manual 2" x 2" slide projector.

In some respects, the room is conveniently located within the building. It is close to two outside doors for ready entrance of personnel and equipment. It is also convenient to a flight of stairs, a personnel elevator, and a freight elevator which lead to the upper floors where the originating rooms are located. But the distance of these rooms from the control rooms is a definite inconvenience, both for the director and the engineer. In setting up and rehearsing a telecast, a director finds many occasions for being in the originating room where he may talk face to face with the instructor and with members of his crew. During the telecast, it is advantageous for him to view the originating room through a window between this room and the control room. In Giltner Hall, however, he must rely completely on his camera monitors to see what is going on, and must relay all instructions through his cameramen or a floor director. As for the engineer, if there is a malfunction of equipment in the originating room, he may not be able to correct it without dashing up two flights of stairs to the far end of the building, and the program may be interrupted until he gets there.

Originating Rooms

Figures 8 and 9 show Room 146, a 350-seat auditorium on the first floor of Giltner Hall, which was used as the first originating room. The room was satisfactory for lectures, but was not functional for surgical demonstrations. Even for lectures, it is questionable whether the cameras should be located in a large room, with students present, viewing the instructor directly, while other students, located in other rooms, watch the lecture only on television receiving sets. The students in the originating room are liable to be distracted by the presence of the camera

Figure 8. A lecture being conducted in room 146.

Figure 9. Students in foreground observe a lecture in room 146. They can alternate their viewing between the live demonstration and the televised demonstration as viewed on studio monitors.

operators. But the students in other rooms may have an even less satisfactory experience: the instructor is very likely to pay more attention to the students in the room with him than he does to the television cameras; therefore, the students who are watching the lecture through these cameras may feel that they are not being addressed directly, but are only looking in on a lesson intended for someone else.

If a live audience is not to be present, however, the use of such a large originating room is a waste of space. For this reason, Room 146 came in time to be used exclusively as a viewing room, and a new all-purpose originating room was developed by converting Room 226.

A floor plan of this room (Figure 10) shows features of this conversion. The two cameras are connected to a patch board, which also provides connections for two microphones, a studio monitor, and a talk-back speaker. Other improvements are concerned with lighting. In order to create controlled lighting, black shades were installed on the three windows to shut out all outside light. From the ceiling was suspended a T-shaped pipe batten to which lighting instruments could be attached and swiveled to face any part of the room used as a performance area. The lights are controlled from a switch panel to the left of the entrance door. The cost of this conversion was $2,600.[31]

The room is not an ideal originating room. Its walls are constructed of glazed bricks, which glare unless covered with theatrical flats. Furthermore, the room has no air conditioning and becomes uncomfortably hot when the lights are on, adversely affecting the performance

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[31] Ibid.

of both personnel and television equipment. Since the room is small (approximately 20 feet square), there is insufficient room for the cameras to draw back from the performance area; hence wide shots must be taken with an extreme wide-angle lens, which causes perspective distortion in the picture. Also because the room is small, instructors must work close to the background. Therefore, there is no way to make them stand out by keeping them in sharp focus while rendering the background in soft focus. Nor is there room to angle light on them from behind, which would separate them from the background by rimming them with backlight. Furthermore, the room is too small for storing the various kinds of furniture which may be used in telecasting - rostrum, tables of various heights, easels for supplementary picture material, lights on floor stands, and so forth; nor is there storage for such items in nearby rooms.

Despite its limitations, Room 226 is the scene of most of the veterinary telecasts. There is an advantage in keeping most of these telecasts in a room where adequate lights are already installed and where the cameras and microphones can remain from period to period instead of having to be moved from one location to another. Not only does this save labor, but it also permits one telecast to follow another in successive class periods. If the equipment has to be moved and set up in another location, one class period is wasted in setting it, and another in striking it.

On the other hand, some of the television instructors have objected when one telecast follows another in this room with only ten-minutes intervening. This interval is hardly sufficient for allowing the first instructor to remove his materials and clean up his equipment; nor does

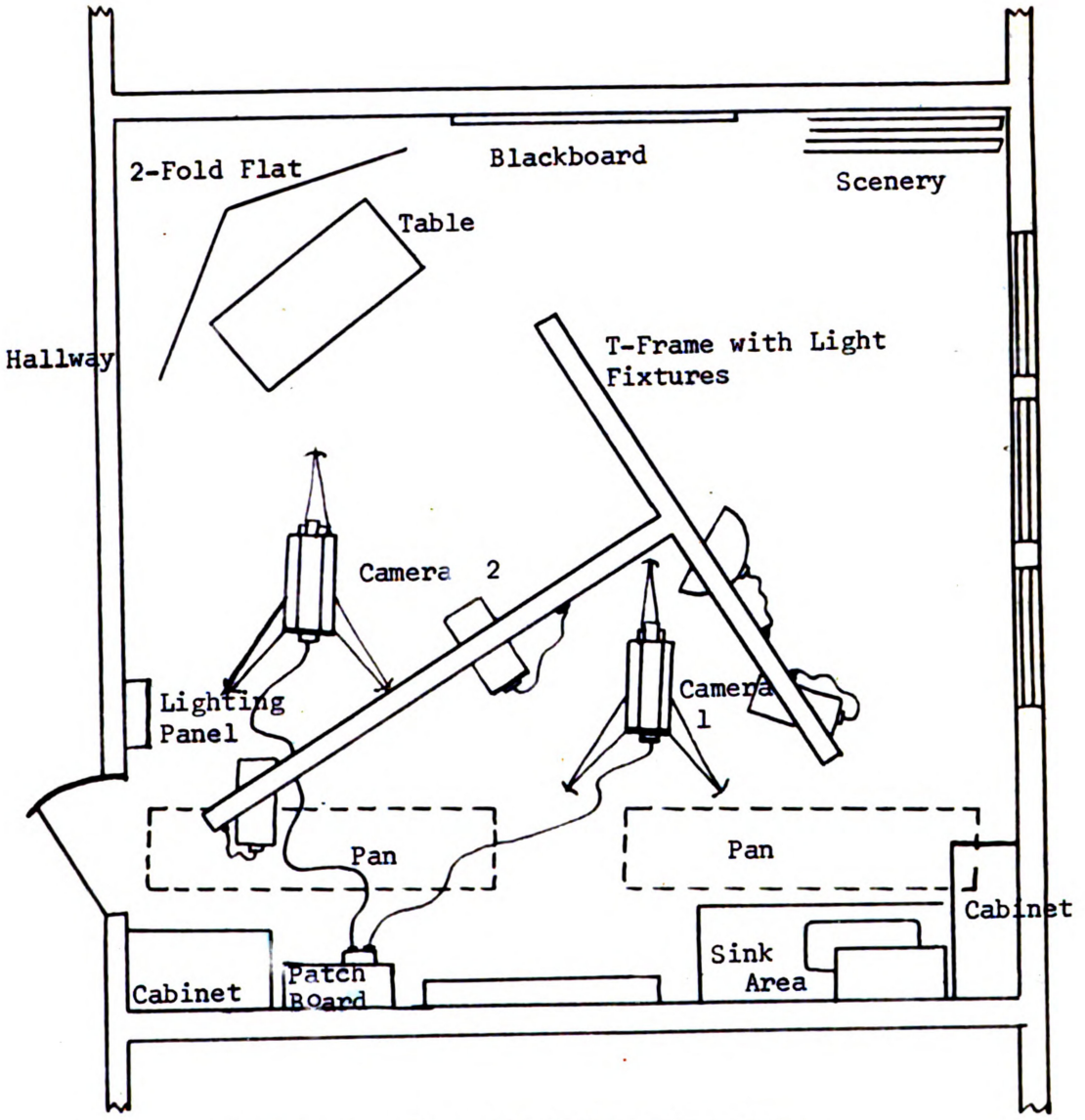

Figure 10. Room 226 Originating Room

Scale 1/4" = 1'

it allow the second instructor enough time to set up his demonstration; nor does it allow time for the television personnel to change a camera from a fixed mount to a tripod, or vice versa, or to check shots before the second telecast begins.

Room 226 has been used for all kinds of veterinary programs except those dealing with large animals. For this purpose, two larger rooms have been equipped for television pick-ups. One of these is the Equine Treatment Room. Immediately above it, and equal in size, is the Cattle Clinic. Diagrams of these rooms are reproduced in Figures 11 and 12. On one wall of the Equine Treatment Room is a metal box containing the audio and video terminals. Directly above this box and leading up through the ceiling, are two four-inch pipes through which cables can be led from the terminals to any television equipment which might be used in the Cattle Clinic. This clinic has never been used for telecasts, however, since it is easier to conduct all large-animal demonstrations in the Equine Treatment Room.

When the Equine Treatment Room is used for television, it is necessary to block off its windows with monks cloth or stage scenery in order to eliminate uncontrolled outside light. When lighting the room, a long pipe batten is chained to the overhead steam and water pipes, and to this batten are clamped the lighting instruments, which can be swiveled to cover two demonstration areas with overhead illumination. Occasionally, as when lighting the under side of an animal, these instruments are supplemented by spotlights mounted on floor stands. Figures 13, 14, and 15 show the appearance of the Equine Treatment Room during television pickups.

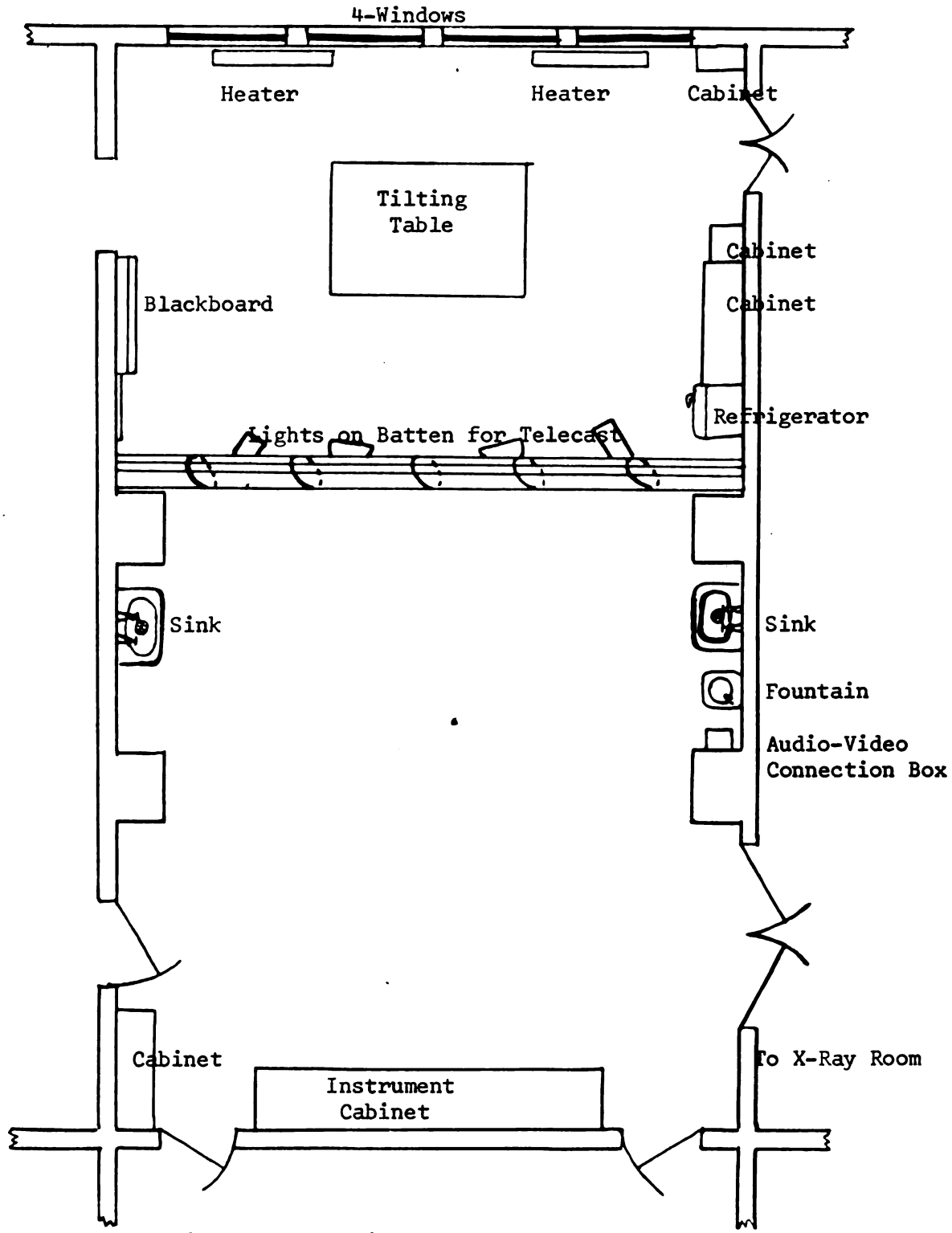

Figure 11. Equine Treatment Room

Scale 1/8" = 1'

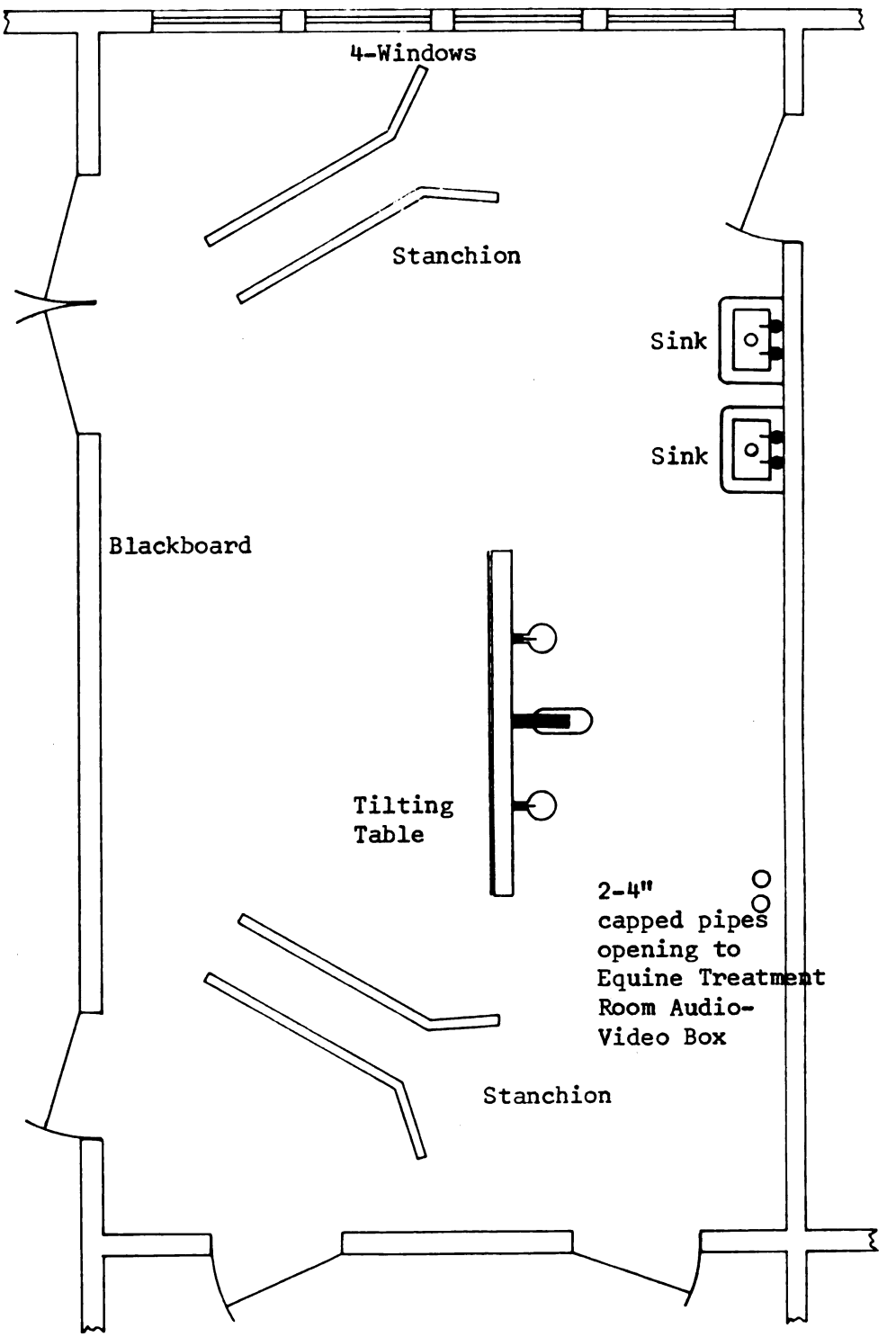

Figure 12. Cattle Clinic

Scale 1/8" = 1'

Just off this room, through double doors, is the X-Ray Laboratory, which can also serve as an originating room.

Around the corner from the X-Ray Laboratory are two small-animal operating rooms (134 and 135), diagrammed in Figure 16 and Figure 17 shows a portion of one of these rooms during a televised operation. The rooms have not been used for many telecasts, however, since Room 226 was activated. Being only 15 feet square, when two cameras, two camera operators, an operating table, a doctor, and one or two assistants are squeezed in, these rooms become altogether too congested for comfort and efficiency.

Supplementary Equipment

When telecasts are made of operations on small animals, use is frequently made of a special pipe frame, devised by Dr. Wade O. Brinker of the Department of Surgery and Medicine and Herman Rudolph, closed-circuit television engineer. The frame rolls over the operating table, holding baby spotlights and a vidicon television camera, which is pointed down to provide a "doctor's view" of the operation. Watching this shot on the studio monitor, the surgeon adjusts his patient in relation to the camera until he obtains the best operating and viewing position. The other camera is mounted on a tripod and dolly and is manned by an operator to provide horizontal coverage of the proceedings. Figures 18, 19, 20, and 21 show this set-up in use.

Were more funds available, it would be possible to equip the overhead camera so that its lenses could be remotely changed and focused from the control room. Television equipment manufacturers have also designed a special ceiling mount for overhead cameras, which, unlike the pipe frame,

Figure 13. Two image orthicon cameras are trained on a sheep demonstration. The camera on the right is on a tripod; the one on the left on a pedestal. Light is provided mainly by the large overhead scoops and two spotlights just to the right and left of the two cameras. Note that the windows in the background are draped to block out outside light. This picture was taken at the 1959 Veterinary Medicine Conference.

Figure 14. While the 1959 conference was in session an unusual case was brought into the clinic. Dr. G. H. Connor felt the audience would benefit from watching the type of operation that had to be performed for this animal and so he operated on television for the viewing veterinarians. This is one good example of why the television facilities have to be flexible and able to cope with unusual situations.

Figure 15. Part of the overflow audience watching Dr. Connor operate on the animal. In this view it is also possible to note how the spotlights are trained on the operation to provide maximum lighting.

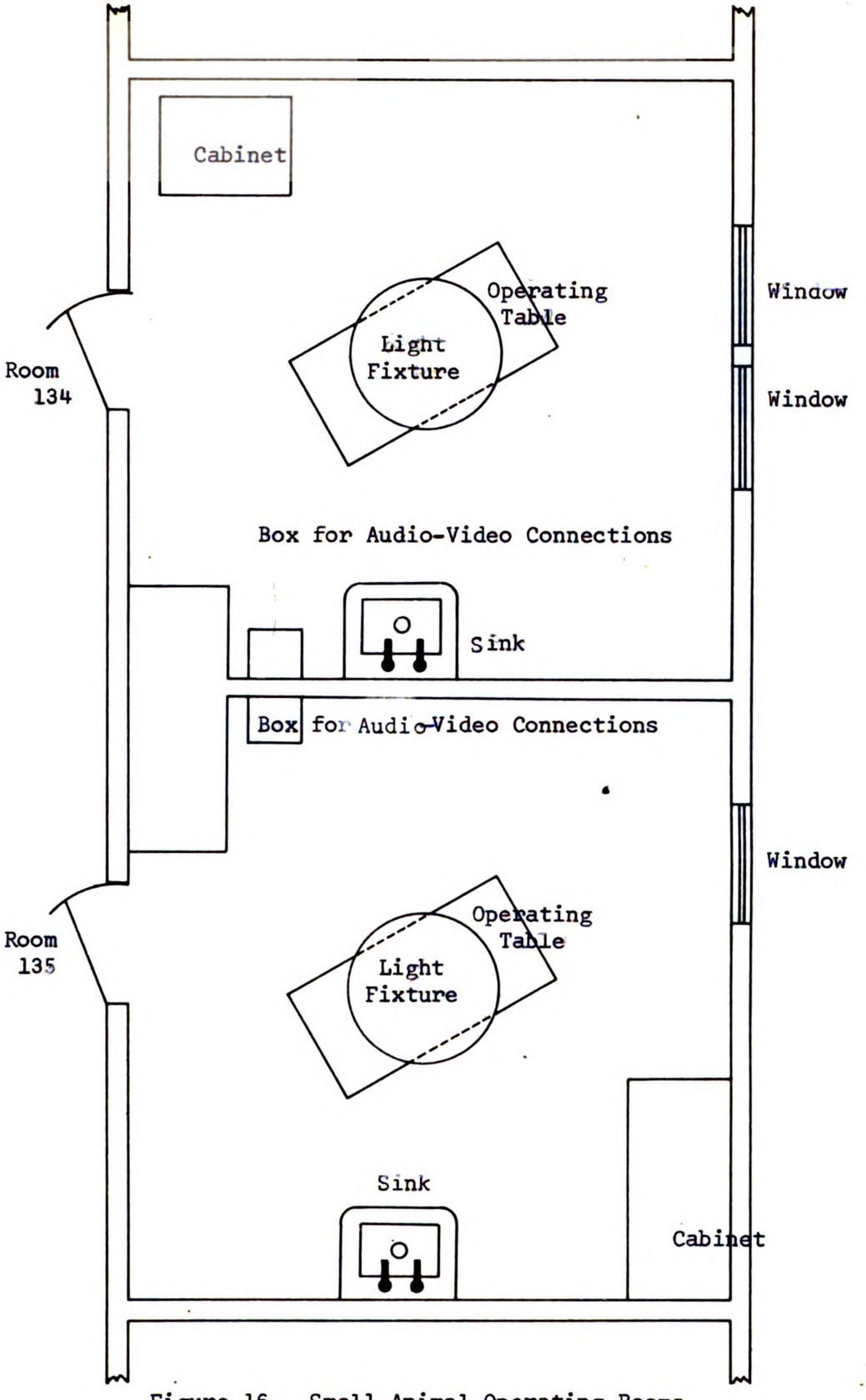

Figure 16. Small Animal Operating Rooms

Scale 1/4" = 1'

Figure 17. The Dage vidicon cameras were used during the 1959 conference also, televising demonstrations from the small animal operating room. In this view the doctors are working on a large goose.

has no obstructions on the floor to hamper the surgeon's movement around the operating table. With this device, the camera is mounted in relation to a movable surgical lighting fixture. The camera is focused on a mirror that looks down on the operating field through an opening in the surgical light. As the surgeon moves the light to focus on the operating field, the mirror and camera also move, with the camera always pointing where the light is pointing.[32]

There is one other piece of equipment, recently acquired by the closed-circuit television system, which should prove increasingly useful to the College of Veterinary Medicine. This is a standard broadcast-type video tape recorder. Although this machine is installed in the College of Education Studios, it is possible to feed signals from Giltner Hall for recording on this machine, thus preserving them for playback on any desired future occasion.

Video taping has many advantages for the educator. It allows him to record his material in advance of class time, taking all the time he needs to make his presentation effective. He can play back immediately whatever he has recorded and, if dissatisfied, erase it and re-record. He can use the tape to observe his own teaching technique and its results on students. He can use it to record demonstrations which are difficult or expensive to repeat. He can use it to preserve for future classes presentations made by guest authorities who visit the campus only once. And by means of tape he can show his classes teaching presentations which have been recorded at other universities.

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[32]P. A. Greenmeyer, A. F. Inglis, L. L. Lewis, and V. S. Mattison, Television as a Teaching Medium, (College and University Business, April, 1957), pp. 30-31.

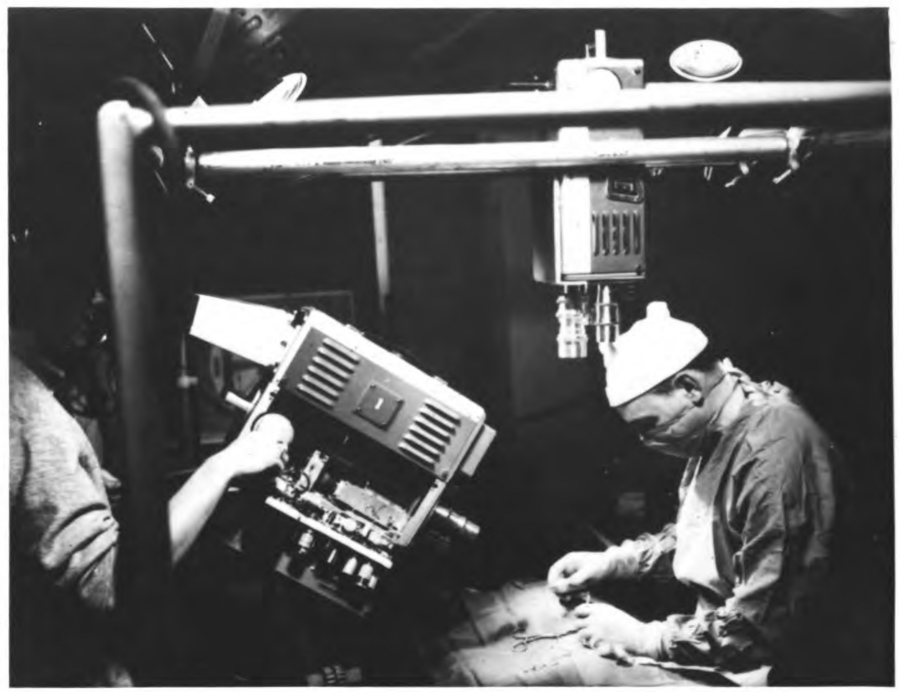

Figure 18. Dr. Cairy has employed two Dage cameras for this demonstration. One is mounted on the pipe frame shooting straight down on the operation. The other camera is on a tripod mount. Four small "baby" spotlights illuminate the center of operation.

Figure 19. The placement of cameras for this operation are such as to transmit the best possible picture to the viewing rooms.

Figure 20. This picture shows the close cooperation between the instructor and his assistant and the close observation of the operation by the cameras.

Figure 21. By observing their progress on the studio monitor the instructors are able to present the operation to the viewers in the best visual manner.

Although standard video tape recorders are expensive ($40,000 to $45,000 at current prices), the closed-circuit operation expects to acquire new portable models which sell for a quarter of these prices and will therefore make wider use of videotaped instruction more feasible.[33]

Another item of equipment sometimes used in televising veterinary medicine courses is the microscope. In Giltner Hall, however, attempts to televise microscopic views have not been very successful. Dr. M. J. Dark of the Department of Anatomy cites one early experiment where the camera blocked light from the specimen, a bacteria-laden slide. When the lighting was finally adjusted to illuminate the specimen, it was found that the intense heat generated by lights had killed the bacteria. An adapter was purchases to enable the camera to view through the microscope without danger of destroying the bacteria, but this did not satisfy the needs of the instructor and the experiment was abandoned.[34]

These experiments took place in 1956 and 1957. Since then, effective equipment for televised microscopy has appeared on the market. Indeed, a great variety of special electronic equipment has been developed to serve the needs of both veterinary and human medicine, not only in microscopy but in various other ways. Some of this equipment will now be described.

Special Electronic Equipment Useful in Veterinary Medicine

In the plans for a new College of Veterinary Medicine building, which is expected to be ready for classes in 1964, provision has been

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[33]Davis, loc. cit.

[34]Interview with Dr. M. J. Dark, Instructor in the Department of Anatomy, November, 1959.

made for color television, including color cameras and a color video tape recorder. This equipment would serve the needs of courses such as Post Mortem and Lymphatics where color distinctions are important. Funds for this installation have not yet been procured, and there will need to be funds in plenty.[35] An estimate for this installation, using image orthicon color cameras, amounts to $513,490.00. This estimate, made by the closed-circuit television chief engineer, includes camera, audio, terminal, video tape, film chain, lighting, and studio equipment. It excludes receiving sets for the viewing rooms and also excludes a master control room (planned for an adjacent building).[36] A breakdown of this estimate may be consulted in Appendix II.

Besides image orthicon color systems, there are more economical systems using vidicon tubes. RCA (Radio Corporation of America) lists a vidicon color camera for equipping an operating or autopsy room, with remote control of focus and lens changes so that no television personnel are required in the room. It is claimed that this camera can remain on a static shot without the image burning in on its tubes and that it can function acceptably without intensified illumination.[37] Institutions using this camera include Smith, Kline, and French Laboratories, Walter Reed Hospital, and the University of Indiana Medical School.[38]

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[35]Interview with Dr. R. G. Schirmer, Associate Professor and Director of the Small Animal Clinic, Department of Surgery and Medicine, January, 1963.

[36]Interview with Herman Rudolph, CCTV Engineer, January, 1963.

[37]"TV Cameras for Surgical Colorcasts," Radio and TV News, April, 1957, 57:121.

[38]Ibid.

One RCA plan offers a vidicon camera for televised microscopy in color. This will produce enlargements of specimens on the order of 25,000 diameters on the screen of a 21-inch color receiving set. Regular microscopy dark field and phase microscopy can be incorporated.[39]

The advantages to research of television microscopy over direct microscopy are threefold: (1) Specimens in motion can be followed more easily, even at high degrees of magnification. (2) Details of particular importance can be emphasized by tubes of special gamma which increase the contrast between adjacent tones. (3) Specimens can be observed with illumination to which the eye is insensitive, thanks to a camera tube which responds to ultraviolet light.[40]

This camera tube is incorporated in the UCTM (Ultraviolet Color Translating Microscope). This device depends on the phenomenon that the chemical substances in cells absorb varying amounts of ultraviolet light, depending on its wavelength. By using three ultraviolet sources, each in a slightly different part of the spectrum, these variations can be translated through an ultraviolet-sensitive television camera into three sets of electrical signals to control the red, green, and blue elements of a standard color television picture tube. The result is a single picture of the living specimen, in which the various chemical constituents appear in different colors.[41]

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[39]Greenmeyer, loc. cit.

[40]Zworykin, op. cit., pp. 206-207.

[41]V.K. Zworykin, "Magic Eyes for Medicine," Saturday Evening Post, (May 31, 1958), 230:26-71.

Television has found another use in laboratory studies of blood counts. The Sanguinometer combines the TV microscope with a small simple computer to record an almost instantaneous count of blood cells in a counting chamber, taking into account variations in the size of red blood cells.[42]

Another instrument is the Cytoanalyzer, an electronic device which examines a smear through the microscope and presents on a TV picture screen only the information wanted - the size and density of the cell nuclei. The cytoanalyzer, scanning the smear with a small beam of light can spot the genuine nuclei by their special light absorbing characteristics. The machine is able to distinguish between genuine nuclei and other dense areas of the specimen formed by debris and folded or overlapping cells.[43]

Decisions Regarding the Purchase of Television Equipment

Much of the equipment described in the pages immediately preceding is relatively expensive and is intended for specialized uses. Before purchasing this - or any television equipment, for that matter - one must obviously evaluate whether the function it performs is worth the cost. Before deciding to install any television equipment whatever, one must ask: Will any economic gains be achieved thereby? And will there be any improvement thereby in the quality of instruction?

In certain ways, the College of Veterinary Medicine believes that closed-circuit television has improved the quality of its instruction. This will be discussed in the next chapter.

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[42] Ibid.

[43] Zworykin, op. cit., p. 46.

CHAPTER III

THE USES OF TELEVISION IN VETERINARY INSTRUCTION

Television has been used by the College of Veterinary Medicine as an aid to its work in Continuing Education. During the annual Farmer's Week, television is used to familiarize rural visitors to the campus with some of the latest developments in the treatment of farm animals. It is also used during the annual Post Graduate Conference on Veterinary Medicine to demonstrate new and improved techniques to hundreds of visiting practitioners assembled in viewing rooms, either in Giltner Hall, the Auditorium, or the Kellogg Center for Continuing Education.

The Post Graduate Conference

The first conference to incorporate television, in 1956, employed the campus broadcasting station's remote unit, consisting of two tripod-mounted image orthicon cameras, controlled from a mobile van. Response to the telecasts was favorable, and thr remote unit was again employed in 1957.

In 1958, a more complex program required two sets of cameras: those from the remote unit working with large-animal demonstrations in the Equine Treatment Room, while the vidicon closed-circuit cameras worked in one of the small-animal operating rooms. Programs alternated between these rooms, each lasting from 15 to 25 minutes. The two directors, working from separate control rooms with separate crews, were connected

by telephone. While one was telecasting, the other would be checking details and setting up shots with the demonstrator to follow. This plan was used again in 1959.

In 1960, it became possible to use only the closed-circuit vidicon cameras by scheduling all large-animal demonstrations on one day and all small-animal demonstrations the next. This plan was repeated in 1961 and 1962.[44]

In 1963 came a new development: all televised demonstrations were pre-recorded on video tape. This made possible the inclusion of programs recorded on other campuses. It also allowed programs to be scheduled at more opportune times during the conference. And it allowed somewhat more thorough advance preparation of the television productions.[45]

One fault of the previous conferences had been a tendency of the veterinarians to plan their programs without sufficient advance consultation with the television personnel. Various problems of lighting, camera location, poor backgrounds, and insufficient time to move equipment might have been eliminated by working more closely with the director, engineer, lighting supervisor, and staging supervisor prior to the day of performance. With video taping, it was at least possible to correct the difficulties in advance of transmission.

Figures 22 and 23 show typical uses of television at the conferences.

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[44]The author, having directed most of the CCTV demonstrations for the yearly conferences, has written from personal experience and from information gathered from Dr. Waldo F. Keller and Dr. Donald Piermattai, both of whom have worked on the Annual Post Graduate Conference planning committee.

[45]Interview with Dr. Waldo F. Keller, January, 1963.

Reactions to the conference telecasts are obtained from questionnaires, which have been distributed at the end of each conference to those attending, asking them for comments on all aspects of the event. (See Appendix III for a sample questionnaire.) In general, the telecasts have elicited such favorable comments as "A picture or demonstration is worth 100,000 words" or "Interest was high for both large and small animal televised demonstrations." But there have also been negative reactions. Some found the programs hard to see or hear. Others complained that no method was provided for asking questions and clearing up misunderstandings. A few protested the use of television for lectures or the reading of papers which included no visual material. One interesting suggestion for the 1963 conference read as follows:

> More televised small animal material that can be filmed at the time and film copies made available for restudy when we get home. One exposure is not enough. Even film strips would be a good start. A film library should be established. MSU has a unique opportunity to lead in TV teaching. 5 to 10 vets could get together with such films for perfection of techniques. Dr. Keller's demonstrations are an excellent example.[46]

Use of Television for Regular Courses

The year of the first televised conference also marked the first use of television in a regular course of instruction. Doctors J. F. Smithcors and C. W. Titkemeyer were the pioneers, aiming to discover whether television could help to teach certain aspects of Anatomy 302 (Applied Anatomy).[47] For the first few lessons, instruction proceeded haltingly

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[46]Compilation of answers and commentary on the Conference Reaction Sheet for the Annual Post Graduate Conference, January, 1962.

[47]Titkemeyer, loc. cit.

Figure 22. Dr. R. W. VanPelt is shown demonstrating the position for intra-articular injections in the equine. By circling the spot on the horse where the injections would be made the director was able to concentrate his cameras on the area and present a better view with extreme close-up views of the actual demonstration.

Figure 23. Dr. W. D. Pounden is showing the television audience how he uses a rubber tube to obtain rumen samplings for diagnosis. Unfortunately on this picture, and the previous one, the photographer did not show the location of television equipment in relation to the demonstration.

while the instructor described for the director what he wanted his students to see, while the director maneuvered his cameras and the instructor adjusted his subject until the proper view was obtained.[48] But the experiment was successful enough so that other faculty members of the College of Veterinary Medicine followed suit and, during the next six years, made their college one of the principal users of televised instruction. In the academic year, 1961-62, of 45 university courses utilizing the closed-circuit system, 15 were in the area of veterinary medicine.[49]

Even now, however, the use of television is still experimental, and there are many areas where it has not yet been used. There are courses where it is inappropriate because their learning goals must be achieved mainly by individual projects and problem-solving. In the Department of Veterinary Pathology, for example, and th Department of Microbiology and Public Health, students are largely involved in laboratory work, using the microscope to gain firsthand knowledge of their subjects.

Dr. C. C. Morrill, chairman of the department of Veterinary Pathology, has found that monochrome television does not reveal the slight changes in tissue that occur, for instance, in the autopsy examination for poisoning which is conducted in Gross Pathology. Pinks, yellows, and grays all tend to appear in the same shade and density on

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[48] Ibid.

[49] Compilation of data from Closed-Circuit Television term schedules, 1961-62.

the television screen. Were color television available, perhaps the department might use it. Meanwhile, it prefers such visual aids as color slides and color motion pictures.[50]

Dr. J. J. Stockton, chairman of the Department of Microbiology and Public Health, would also prefer color to monochrome television. Furthermore, much of his students' training depends upon individual work with the microscope; and, as has already been discussed in Chapter II, experiments in Giltner Hall with televised microscopy have not proved very successful.[51]

Certain graduate-level courses in the College have too small enrollments to justify the use of television, or consist mainly of individual research projects.

Courses in Pathology which are concerned with infectious diseases are not televised because of the danger of contaminating the television personnel and equipment or the instructor who might conduct the following telecast from the originating room.[52]

Dr. C. W. Titkemeyer, although using television for Anatomy, does not consider it appropriate for his basic courses, since these require that the instructor work closely with students to provide proper guidance and answers to their questions.[53]

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[50]Interview with Dr. C. C. Morrill, Head of the Department of Veterinary Pathology, February, 1962.

[51]Interview with Dr. J. J. Stockton, Head of the Department of Microbiology and Public Health, February, 1962.

[52]Keller, loc. cit.

[53]Titkemeyer, loc. cit.

Despite these areas where television is not used, the following rather impressive list of courses have used television since 1956:

Department of Anatomy:

312 A-Gross Anatomy: Fundamental body plan of the dog. (Fall)

312 B-Gross Anatomy: Continuation of 312 A; Terminating with dissection of horse. (winter)

312-C-Gross Anatomy: Dissection of the cow, sheep, chicken and nervous system of the dog. (Spring)

316 - General Anatomy: Designed to impart the basic concepts of the broad field of anatomy. Special requirements of the various disciplines will be met in their respective laboratories. (Fall-Spring)

512 - Applied Anatomy: Anatomy of areas of surgical and clinical importance in domestic animals. (Winter)[54]

Department of Physiology and Pharmacology:

240 - Introductory Physiology: Survey of the physiology of circulatory system, excretion, nervous system and special senses, digestion, metabolism and endocrinology. (Fall-Winter-Spring-Summer)

241 - Introductory Physiology: Continuation of 240. Physiology of muscle function and neuro-muscular relationships; exercise; respiration; changes in organ systems in relation to muscular exercise. (Fall-Winter-Spring-Summer).

407 - Veterinary Physiology: (Formerly utilizing CCTV as 307). Fundamentals of nerve and muscle; organization of the nervous system; physiology of blood and circulation; respiration. (Fall)

409 - Veterinary Physiology: (Formerly utilizing CCTV at 309). Endocrinology and reproduction. (Spring)

551 - Pharmacotherapeutics: (Formerly utilizing CCTV as 351 and 303). Laboratory work to acquaint students with fundamentals of pharmacodynamics. Lecture material to integrate these principles with therapeutic uses of veterinary drugs. Toxicity, absorption, elimination, pharmaceutic preparations, dosage and methods of administration also covered. (Fall)

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[54]Michigan State University Catalog, 1962-63 (Michigan State University Publication, Vol. 56; No. 12, May, 1962), p. A-10.

552 - Pharmacotherapeutics: (Formerly utilizing CCTV as 352 and 304). Continuation of 551. (Winter)

806 - Mammalian Physiology: Heart and circulation, respiration, digestion, metabolism, and excretion. Endocrinology. (Winter)[55]

Department of Surgery and Medicine:

526 - Small Animal Surgery: (Formerly utilizing CCTV as 323). Indications and techniques in treatment of surgical diseases. (Winter)

621 - Large and Small Animal Surgery: (Formerly utilizing CCTV as 421). Occurrence, diagnosis, and treatment of surgical diseases of large animals. Surgical techniques on small animals. (Fall)

822 - Bone and Joint Surgery: Fundamentals, theory and practice covering the various conditions and surgery of bones and joints. (Winter)[56]

In none of these courses has television been used for total teaching. Rather, it has been used for some particular aspect of instruction for which it is uniquely qualified, and it is supplemented by conventional lectures and laboratories. In Small Animal Surgery, for example, Dr. Waldo Keller uses it once a week to demonstrate surgical techniques which, a few days later, his students will perform for themselves in the laboratory.[57] In Gross Anatomy, which explores the structure of six species of animals, Dr. R. E. Brown uses the television cameras for about one tenth of his instruction, turning them on visible elements such as bones, nerves, glands, arteries, and organs. In another course, Applied Anatomy, he uses television for approximately one sixth of the course meeting time to examine areas of animal structure for students

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[55] Ibid., pp. A-122-123

[56] Ibid., pp. A-150-151

[57] Keller, loc. cit.

who will be performing surgery.[58] In Animal Physiology, Dr. W. D. Collings televises key classical experiments, using the cameras for one two-hour period during each of the ten weeks of the quarter.[59] Dr. R. G. Schirmer restricts his use of them to three or four times per quarter, to demonstrate surgical and diagnostic techniques in opthalmology.[60]

In none of these courses has administrative pressure been exercised to use television. The instructor makes the decision, knowing that if he does use it, he will receive no extra monetary compensation or even compensatory time, although the presentation of a telecast may take three to four times as long as the preparation of a conventional lesson. His decision is made solely because of the advantages which television can contribute to the improvement of instruction.

Advantages of Television for Instruction in Veterinary Medicine

How does television improve instruction in veterinary medicine? The author asked this question of all available faculty members of the College who have used the medium in their teaching. They agreed on the following answers:

Television can magnify. Thus it can reveal elements which are difficult to see with the naked eye. For example, a dog's eyeball, which is approximately the size of a quarter of a dollar, can be magnified to fill a 24-inch receiver screen.

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[58]Interview with Dr. R. E. Brown, Instructor in the Department of Anatomy, February, 1962.

[59]Interview with Dr. W. D. Collings, Professor in the Department of Physiology and Pharmacology, February, 1962.

[60]Schirmer, loc. cit.

For this reason, a demonstration which hitherto had to be repeated several times because it was visible to only three to six students at a time can now be performed only once for a class of sixty (the maximum number of students in any class in the College).

This means a saving of faculty time.

It also means a saving in the cost of demonstration materials. For example, prior to television, it was necessary to repeat an operation on as many as four different dogs, each costing about $20.00 for procurement, feeding, and housing. Now only one animal need be used.

Since all students watch the same demonstration, there is no chance that biological variations in the specimens will produce different results. All students receive precisely the same information.

Furthermore, they all watch from precisely the same point of view, seeing what the camera sees, all from the same advantageous angle.

Because the camera can frame closely, students' attention can be better concentrated on the essential information.

Television facilitates the inclusion of visual aids such as slides to supplement the live demonstration material. And through the technique of superimposure, it sometimes permits two foci of attention to be concentrated within the same area of vision. Thus, during an operation on a dog's heart, the heartbeat graph can be superimposed over the picture of the operating field.

Because a telecast is, in a sense, something special, instructors are likely to plan it more carefully than they would a regular face-to-face lesson, eliminating digressions, seeking more cogent methods of expression, improved coherence and emphasis, better means of visualization.

This is likely to result not only in improved learning, but also in a saving of time, making it possible to transmit more information on television than in a traditional class of equal duration.

As more and more lessons are recorded on video tape, other benefits will accrue. Difficult demonstrations need to be performed only once. During their taping they can be perfected to communicate precisely what is intended, with all errors eliminated. It will be possible to build up a library of lessons on videotape. And as these tapes are repeated, quarter after quarter, even more savings in faculty time and demonstration materials will be possible than are presently effected by live television.[61]

Evaluation of Televised Instruction

The advantages just cited have appeared so self-evident to faculty members who have used television in their courses that they have not considered it necessary to conduct any extensive, systematic evaluations of the effect of televised instruction on the learning of their students. There have been some attempts, however, to survey the attitude of the students towards this instruction. The University has an evaluation sheet which it requests faculty members to have their students complete at least once a year at the conclusion of every course they teach. The students' comments are anonymous and are intended for no one but their instructor, who is supposed to be guided by them in making improvements to his course. Dr. Waldo Keller, who uses television in teaching Surgery and Medicine, has distributed these evaluation sheets to his television

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[61]A compilation of answers regarding the merits of television in veterinary course instruction, February, 1962.

students and reports that they show unanimous acceptance of television.[62]

Only Dr. R. E. Brown of the Department of Anatomy seems to have issued a written questionnaire specifically concerned with students' reaction to televised instruction. When interviewed by the author, Dr. Brown had disposed of all copies of his questionnaire except one, which may be found in Appendix IV. He reported, however, that responses had been favorable, that the televised sections of his course had always received favorable response, that he had never had any negative reactions from his students regarding televised instruction. Furthermore, he said, since using television, he found that his students retained information better as demonstrated by their ability to apply it in their laboratory exercises.[63]

His comments were supported by all the other television instructors interviewed by the author. They all felt that the students seemed to do better with television, that they paid closer attention and retained more information.

Although little systematic evaluation of television teaching has been conducted by the College of Veterinary Medicine, some knowledge of its effects can be gained from a questionnaire prepared and circulated in Fall Quarter, 1961, by the university Office of Institutional Research. By means of this questionnaire, Dr. Paul Dressel, Director of Institutional Research, endeavored to sample the attitudes of students towards televised instruction. The questions were formulated by Dr. Joseph L. Saupe,

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[62]Keller, loc. cit.

[63]Brown, loc. cit.

Assistant Director of Institutional Research, and Dr. Colby Lewis, a professor in the Department of Television and Radio.[64] Two weeks prior to the end of the term it was given to all students who were enrolled that term in courses which used television. These included 45 students taking Dr. Waldo Keller's course, Surgery and Medicine 621.

These students were asked to write their answers, not signing their names. They responded in all to 33 questions, the first 28 of which were asked of students in all television courses, the last 5 being specifically designed for SM 261 by Dr. Keller. (For a copy of this questionnaire see Appendix V.)

To answer the first 28 questions, students were asked to check one of four boxes, box 1 meaning "definitely a true statement;" box 2, "A somewhat or partially true statement;" box 3, "Not a true statement;" box 4, "Just the opposite is true."

In tabulating the results of the questionnaire, the questions were regrouped under the following categories:

> Organization and presentation of material. (Questions listed under this heading aimed to establish whether students thought that the televised material was well organized and presented.)
>
> Motivational factors. (How well were students motivated to pay attention to the presentation, to become interested in it?)
>
> Confirmation of learning. (Were sufficient opportunities provided for students to ask questions or otherwise confirm their grasp or understanding of the material?)

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[64] Lewis, loc. cit.

Student participation in the learning process. (Since television viewing is alleged to be a passive experience, were sufficient opportunities provided by the course for students to exercise and demonstrate their learning?)

Television reception. (How well could students see and hear the televised material?)

Learning results of TV. (How well did they learn from the televised presentation?)

Responses to each question were then tabulated in the following example:

	1	2	3	4	1-2	3-4
2. In the TV presentations I miss the stimulation provided by the physical presence of the instructor.	7	33	44	16		40-60

This means that:

7% of the class thought the statement definitely true.

33% thought it somewhat or partially true.

44% thought it not true.

16% thought just the opposite to be true.

By adding the checks for boxes 1 and 2 together, it is found that 40% agreed with the statement either completely or at least to some extent. By adding the checks for boxes 3 and 4 together, it is found that 60% disagreed with it.

In the example just given, the percentages in boxes 1 through 4 total 100%. In some of the questions, they total less than 100% since some of the students failed to check any box, or in other words neglected to answer the question.

Here, then are the tabulated results of questions 1 through 28:

Organizational and presentation of material.	1	2	3	4	1+2	3+4
1. During the TV presentation, the instructor normally takes time enough to clarify one aspect of the subject before moving on to the next one.	69	31	-	-	100-0	
6. TV has made it possible to present more effective demonstrations of the subject than would have been practicable in the usual classroom.	89	7	2	2	96-4	
12. Because of TV I sometimes don't know what is going on in this course with regard to assignments, lecture topics, examinations, etc.	7	11	67	16	18-83	
9. More demonstrations and illustrative material would have improved the TV presentations.	7	22	56	13	29-69	
15. I have been able to perceive the physical details of the presentation more clearly on TV than I probably would have in a regular classroom presentation.	71	40	11	2	89-11	
27. The TV presentations in this course are generally better planned and organized than are presentations in ordinary non-TV courses.	40	40	11	2	80-13	
Motivational Factors						
2. In the TV presentations I miss the stimulation provided by the physical presence of the instructor.	7	33	44	16	40-60	
4. This course has been at least as interesting as many of the other courses I have taken (or am taking).	71	27	2	-	98-0	

	1	2	3	4	1+2	3+4
7. Because the TV presentation seems detached from me, I don't feel as involved in the lesson as I do in a regular class.	20	13	42	22	33	64
10. There usually aren't enough things going on on the TV screen to hold my consistent attention.	11	11	58	20	22	78
14. The instructor's personality seems closer and clearer to me on the TV screen.	7	18	56	20	15	76
19. I feel that I know my TV instructor as well as I would in a non-TV class of 50-60 students.	53	24	16	7	77	23
Confirmation of learning						
5. Because of TV I have not been able to ask questions at the time I needed to ask them.	2	24	44	27	26	71
8. I have had a satisfactory opportunity to contact my instructor face-to-face when I have had problems that required his personal attention.	82	13	2	2	95	4
18. Because of TV I don't have enough opportunity to find out whether I understand the subject the way I should.	9	11	73	7	20	80
28. I am more hesitant about asking questions over th talk-back system than if I could ask them face-to-face.	40	20	38	2	60	40
Student participation in the learning process						
16. The use of TV in this course has prevented me from having enough opportunity to practice what I am learning.	4	4	67	22	8	89
21. The use of TV has forced me to do more of the learning myself, instead of relying on the instructor.	16	29	51	4	45	55

	1	2	3	4	1+2	3+4
Television reception						
3. The picture on the TV screen is consistently sharp and clear.	22	51	26	-	73-26	
11. The sound from the TV loudspeaker is sufficiently clear.	71	22	7	-	93-7	
13. I experience more eye fatigue from watching TV than from watching a face-to-face presentation.	11	24	60	4	35-64	
20. The placement of receivers in the room is satisfactory.	71	22	7	-	93-7	
Learning results of TV						
17. I feel that I have learned more in this course than I would have if TV had not been used.	71	18	9	-	89-9	
22. TV can be effectively used to teach facts and information.	67	18	7	-	85-7	
23. TV can be effectively used to teach general principles and generalizations.	49	33	4	2	82-6	
24. TV can be effectively used to teach application and problem solving skills.	60	20	4	-	80-4	
25. TV can be effectively used to teach attitudes and appreciations.	29	20	13	7	49-20	
26. TV can be effectively used to instill a desire for further learning.	47	27	4	4	74-8[65]	

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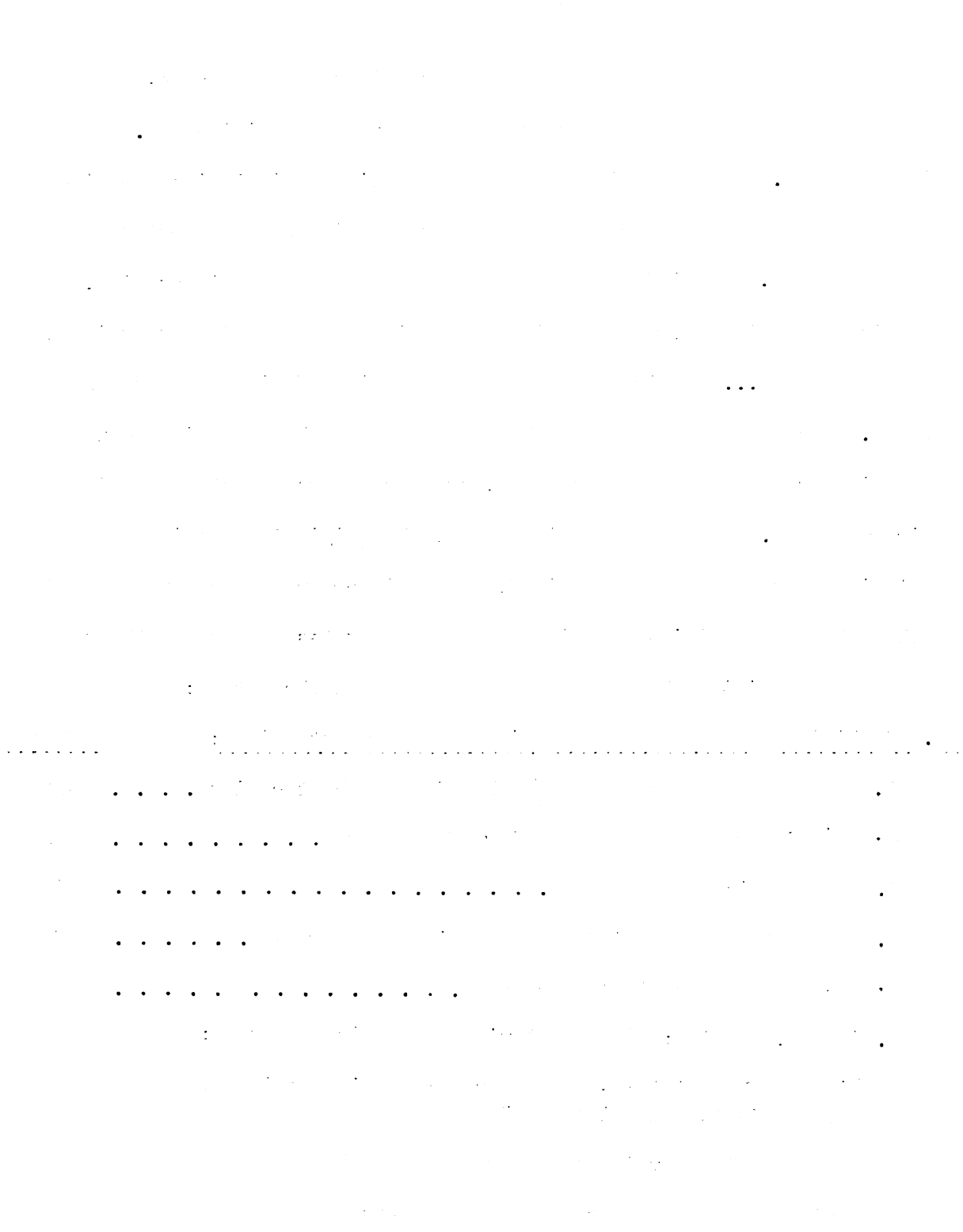
65 Ibid.

Next are the tabulated answers to questions 29 through 33, which were designed especially for students of Surgery and Medicine 621. In this course Dr. Keller had introduced the practice of including a review of the anatomical structure of the animal upon which he was about to perform surgery. To find out how students reacted to this innovation, he devised question 29, which begins "Combining Surgery and Anatomy in the TV demonstration..." This is followed by a choice of different numbered phrases. Students were asked to check one or more phrases which most appropriately completed the statement, or to complete the statement in their own words. In the tabulation below, the original numbering of the completing phrases has been retained, but their order has been rearranged so that the one receiving the highest number of votes appears at the top and the one receiving the lowest number appears at the bottom:

29. Combining Surgery and Anatomy in the TV demonstrations:	NUMBER OF VOTES
1. promotes more complete comprehension of the technique. . . .	42
4. stimulates a desire for review of anatomy	24
5. makes review unnecessary	2
3. does not help nor hinder the surgical procedure	1
2. confuses the surgical procedure	2
6. (other, specify:) (The following are typical answers:)	
"is very beneficial - greater understanding as it gives both subjects added interest"	
"have specimen available before and after"	
"brings the departments closer together"	



30. Switching the picture from patient to cadaver:	NUMBER OF VOTES
3. stimulates concentration on the technique.	27
2. keeps the viewer alert	17
1. makes orientation difficult	8
4. is confusing enough to create disinterest in the technique . .	2

5. (other, specify;)

"switching is too fast oftentimes"

"makes orientation easier"

"good anatomy review"

"promotes comprehension"

"eases orientation"

"o.k. if oriented each time of switch"

"aids reviewing anatomy"

The purpose of the next question should be self-evident:

31. The inability to completely follow a demonstration results from:	NUMBER OF VOTES
5. student's lack of preparation by incomplete survey of procedure	24
1. improper view of the tissues	19
4. lack of visual aids for review	9
2. poorly organized procedure	2
3. Poor narration	1

6. (other, specify:)

"fine details (suture technique, etc.) are sometimes hard to see on TV"

"lack of attention"

"never have had this problem"

"in many cases, because of minute details involved in surgery, no possible way to see all phases

"going too fast"

"uncontrolled conduct of viewers (noise, etc.)"

"difficulty of showing tissues as they are via TV"

"lack of color"

Questions 32 and 33 were designed to let students express themselves freely about the advantages or disadvantages of television for teaching the particular course. The following are answers to these questions, grouped into categories for more ready comprehension:

32. Any additional comments on advantages of TV for this course?

Provides closer view:

TV gives unrestricted viewing to many more people than any other method of demonstration could in surgery - ideal means of surgical demonstrations.

Get a much closer look.

The only way to present surgery so all students can view it "close up."

Very satisfactory - better viewing of surgery.

Think TV is especially adapted to surgery classes since it allows the student a much better view than could be achieved by direct observation in surgery room.

Easier to see procedures than if 60 students tried to crowd around table.

Course couldn't be adequately demonstrated if techniques had to be demonstrated to a large class.

Best thing that could possibly be as one couldn't see anything if all students were crowded around the surgery table.

Specific advantage is obtained by closer scrutiny of the subject matter.

The main advantage is closer view of a surgical area for a large class.

Provides equal view for all:

Students all get the same view, it is not restricted to a few.

TV allows all to see about the same, where demonstration allows first row the advantage.

TV plays an important part in larger instructional system:

Gives more time for student to learn procedure. We see it, then study at night, and do it the following week.

Allows us to see what we are going to do before we do it.

General approval:

It is the only way to teach this course (that is, TV and Lab).

Numerous and obvious.

It's the most effective demonstration and presentation of all courses taken in college.

No answers: 25

33. Any additional comments on disadvantages of TV for this course?

Deficiencies of present equipment for rendering form and detail:

Sometimes difficult to visualize depth and differentiate tissue on TV viewer.

The arrangements of the receivers are not good, and picture is too small to see detail, and the picture on the screen is not distinct, and tires the eyes.

I believe that the relationship to normal surgery would be greatly enhanced by color TV.

The demonstrations on TV do not show contrast vividly enough.

Deficiencies of TV operating and control personnel:

TV crew needs to improve their technique. They seem slow in switching views and achieving proper angle for best visualization.

In several cases the operators of the cameras are inadequate in their work and hence make it aggravating to both students and instructors - have to be trained cameramen.

TV presentation too brief:

> Not enough time - an hour and a half or 2 hour TV presentation would be better.

General comment:

> I would personally rather have the course in a small room such as 104, in which I believe everyone could see.[66]

As can be seen from this last comment and from some of the responses to other parts of the questionnaire, not all students in Surgery and Medicine 621 were completely satisfied with the use of television in this course. On the whole, however, the response of a large majority of students was sufficiently favorable to justify continued use of the medium for surgical instruction.

Instructor's Attitude Towards Television Teaching

Besides wanting to know the attitude of students in classes which used television, the Office of Institutional Research wanted to survey the attitudes of the faculty members who were teaching these classes. On November 1, 1961, therefore, Dr. Colby Lewis addressed a letter to these teachers, among whom was Dr. Waldo Keller, instructor of Surgery and Medicine 621.[67] Following are the questions asked in this letter and Dr. Keller's written answers:

1. Q. What learning objectives do you delegate to TV instruction in the course? Why?

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[66] Ibid.

[67] Ibid.

A. To demonstrate surgery that students will perform themselves the following week in lab. To acquaint students with exact surgical technique and applicable variations.

2. Q. What learning situations do you use to supplement the TV instruction?

A. Lectures reviewing anatomy concerned in the surgical demonstration. These are also on CCTV. Surgery performed in laboratory by students themselves.

3. Q. Do you contemplate any changed role for TV in future "editions" of the course?

A. Further integration with Anatomy and Physiology departments; slides allowing schematic demonstration of suture patterns (which do not show up well on TV), followed by actual tying technique; are considering use of TV in lab, having students follow demonstration with immediate application.

4. Q. How does the TV instruction differ in content and teaching technique from the instruction as it would be carried out face-to-face?

A. There would be no other way to have 60 students with a closeup of a small surgical field. Because of the availability of talk-back, the TV demonstration is far superior to presentation of film.

5. Q. How many quarters, including this one, has the course been offered on TV?

A. Five years.

6. Q. Will it be taught again on TV? Why? or why not?

A. Certainly.

7. Q. In what respects may the example of this course have influenced your department for or against TV as a useful resource for other courses?

A. Winter term, TV will be used every other Wednesday in Small Animal Surgery 526. Dr. Brinker will use TV for lecture portion of Bone and Joint Surgery 822. By spring hope to use TV in regular afternoon clinics if scheduling can be solved.

8. Q. Have you systematically tested the learning results obtained by the use of TV in this course? If so, what do the tests indicate?

A. Evaluation sheets show unanimous acceptance. Students have offered valuable suggestions for improvement.

9. Q. What help do you receive from the CCTV staff now that the course is running? Do you consider this help useful and sufficient?

A. Cooperation ideal.

10. Q. What kind of help did you receive from the CCTV staff when preparing the course for TV? Was it ample and satisfactory?

A. The staff is working out details of changes contemplated.

11. Q. What arrangement has been made between you and your camera director so that shots taken of your lessons will be satisfactory? Are you satisfied with this arrangement?

A. Because of scheduling problems the director and myself discuss the surgery just before going on the air. This is satisfactory as long as I have previously decided approximately what shots I want at a certain time. These are many times altered because of technical difficulties in switching from the overhead to the side camera, but the director has accomplished these things usually to the advantage of the demonstration.

12. Q. What improvements in studio facilities would enable you to teach the course more effectively?

A. Top of list: color TV. Foot operated switch to allow me to talk to the director without my voice going out to the viewing rooms. This would allow us to quickly change views, if necessary, without breaking the student's trend of thought as they observe the surgery. Overhead camera with remote lens and focus changing.

13. Q. How did you get into TV teaching?

A. Took course over from Dr. Brinker.

14. Q. What satisfaction do you derive from it?

A. I am in a position to watch students' work in the surgical lab, and it is certainly satisfying to see them apply the information I have presented to them on TV.

15. Q. What dissatisfactions?

A. I have never experienced a feeling of dissatisfaction as far as the TV is concerned mechanically. There are days when a demonstration does not go exactly as planned and I realize that it could have been improved by the addition of a slide, etc.

16. Q. What recommendations have you for encouraging greater use of TV by other members of the faculty?

A. Most of our faculty have been exposed to TV, either in the classroom or during our winter conferences. I feel at a loss when considering other possibilities for its use among faculty members. If people were able to review a course, sit down with the TV personnel and try producing new material, I would certainly think that faculty members could be stimulated in their thinking toward TV in the classroom. The

A. (continued)

evaluation board would have to come from the Dean and the heads of the various departments. If the technical advisors were available for consultation, I am sure that an improved curriculum would result.

17. Q. What provisions should be made to ensure that course taught on TV attain the highest possible state of teaching effectiveness in terms of the medium?

A. An evaluation board of faculty members knowledgeable in a given area should review the material presented to see if TV is being utilized properly.

And thus end Dr. Keller's observations.[68]

Observations on Television by the Dean of the College

This chapter has presented the reactions of students to the use of television for teaching veterinary medicine. It has reported the opinions of faculty members, citing why they use the medium as an aid in some courses and not in others.

Previous chapters have described the present operation of closed-circuit television in Giltner Hall, revealing that improvements could be made in various aspects of the operation to secure more skillful television crews, more thorough preparation of the telecasts, more space in the control and originating rooms, better equipment and additional equipment which would extend the use of television to a wider range of subject matter.

These improvements may come in time if the need for them can be proved to justify their expense. Even now, however, closed-circuit television has become a regular and valued adjunct in some areas of instruction. In future, it may extend its usefulness.

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[68] Ibid.

This situation is summarized in a statement by Willis W. Armistead, Dean of the College of Veterinary Medicine:

> Closed-circuit television is enjoying increasing acceptance in higher education as a means of spreading the talents of outstanding teachers over a large number of students and at the same time effecting budgetary economies. However, enrollment in veterinary colleges probably never will become large enough to justify the use of television on these grounds in veterinary education. Nevertheless, closed-circuit television is gaining increasing acceptance as an instrument for the teaching of certain veterinary subjects -- particularly those which involve difficult, costly, or time-consuming demonstrations on a scale too small to be seen directly by a class of fifty or more students. Examples are anatomical dissection, physiological demonstration, and operative surgery. When color equipment becomes available, television can be used even more widely and effectively in teaching diagnosis, surgery, postmortem examination, clinical pathology, and microbiology -- subjects for which accurate color perception is important.[69]

Noting that Dean Armistead says "can be used" rather than "may be used," and remembering that space has already been provided for color equipment in the plans for the new home of his college, one may be justified in predicting that closed-circuit television will play an increasingly significant role in the teaching of veterinary medicine at Michigan State University.

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[69]Statement by Dean W. W. Armistead, Dean of the College of Veterinary Medicine, Michigan State University, June, 1961.

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Other Sources

Compilation of questionnaire information received from 16 Schools and Colleges of Veterinary Medicine in the United States. January, 1963.

Michigan State University. Personal interviews with the Dean of the College of Veterinary Medicine, Heads of the Departments, Veterinary Instructors utilizing Closed-Circuit Television, and Members of the University Closed-Circuit Television Operation. June, 1960; January, 1963.

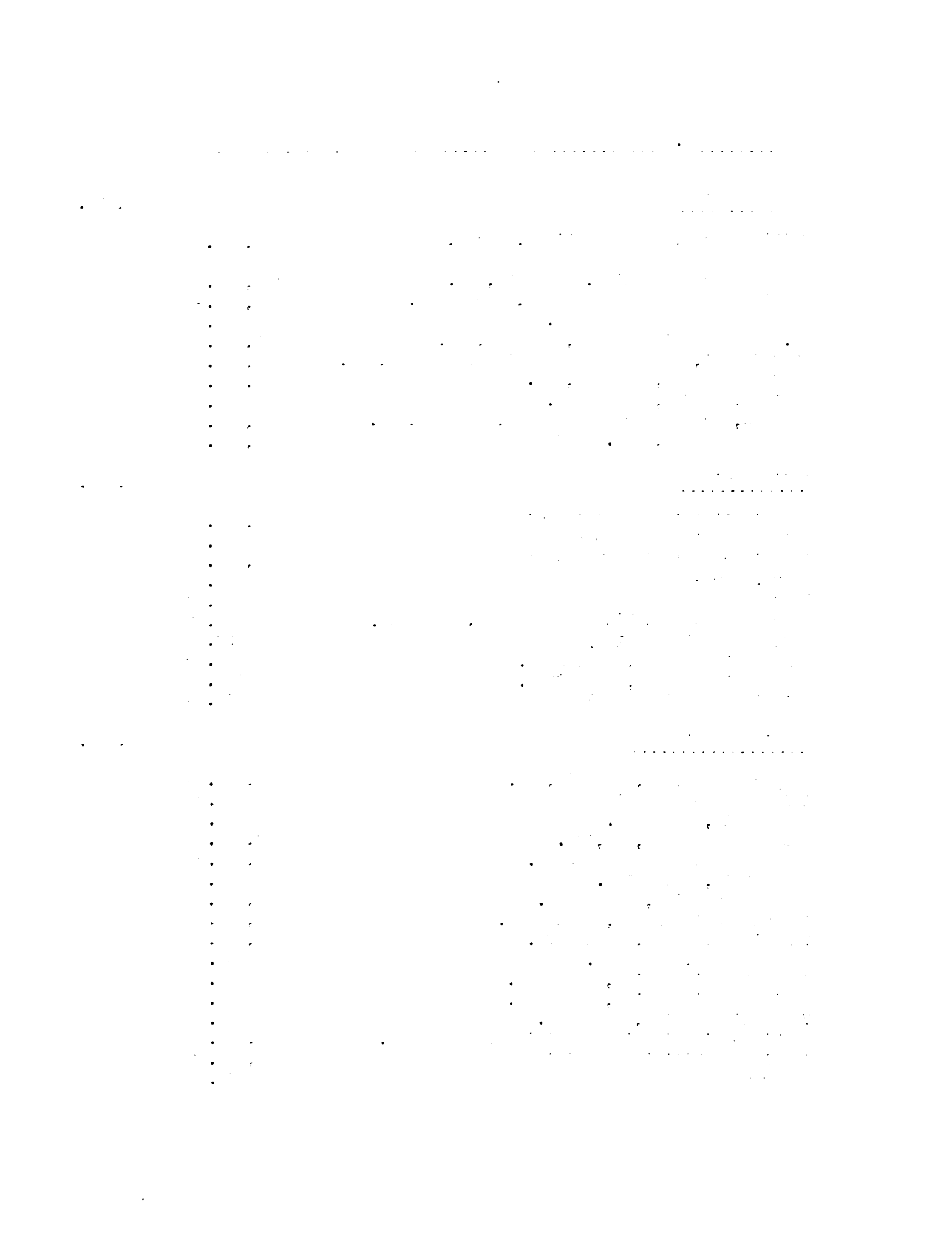
APPENDICES

APPENDIX I. CLOSED-CIRCUIT EQUIPMENT AND COSTS

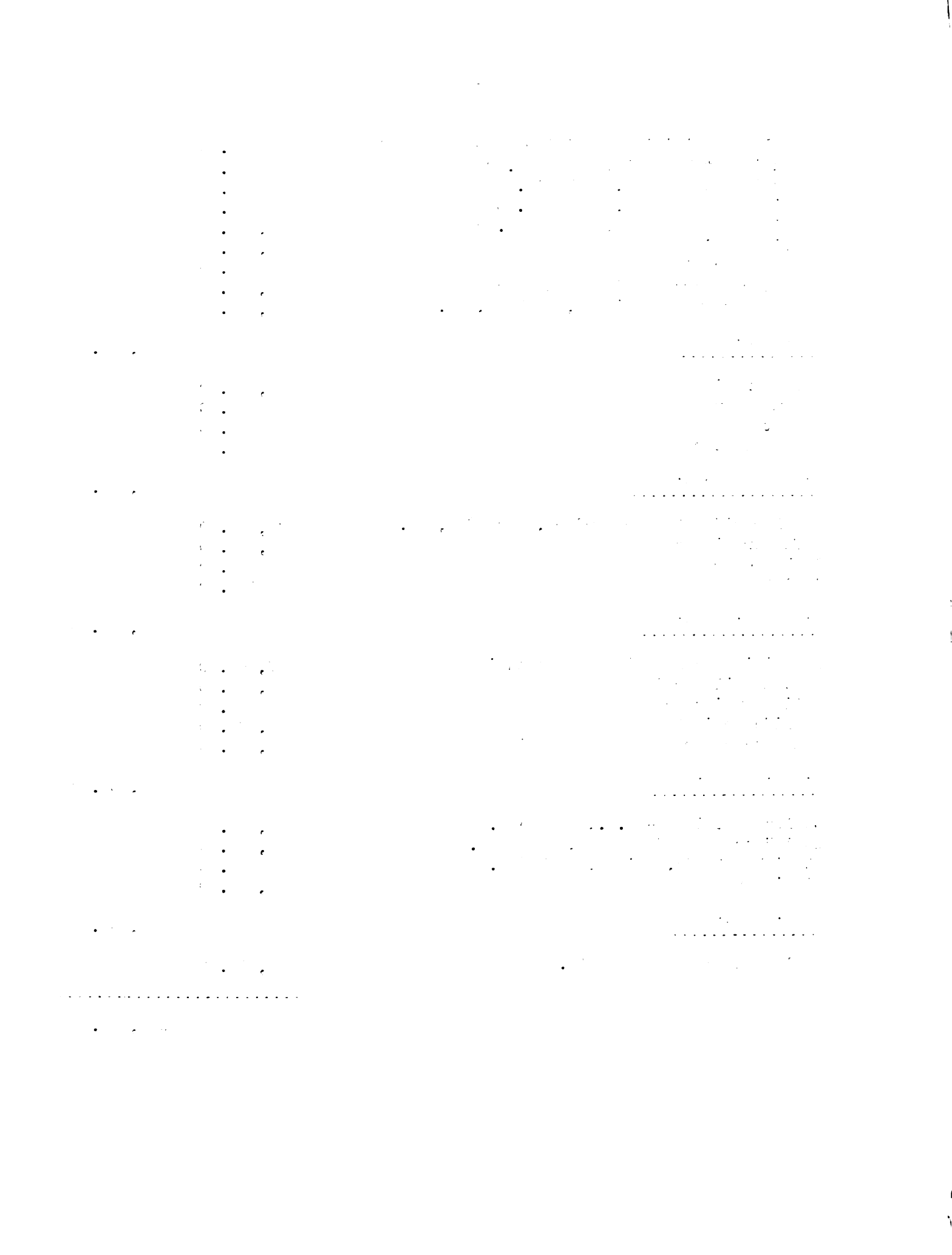
2 Dage model 320 cameras and complete chain, consisting of switching and fading system for six channels with live monitors and wave form monitor, sync generator and necessary power supplies	$17,500.00
Dage Model 300 film chain Model 300D camera Power supply Camera control Console Monitor Camera Pedestal Multiplexer w/stand Bell and Howell projector	5,585.00
Video Distribution System Patch Panel/cords Rack 2 VDA-2A-UG video amp. Power supply 8-24" monitors/stands 1-17" monitor	4,270.00
Audio System 7 Speakers/baffles Rack Patch panel cords Amplifier Microphones Preamps Power supply and relays Mike stands	1,730.75
Hardware, conduit wire, boxes, video cable, sockets, plugs, labor (contract) 358 hrs. @ $4.50 (actual, 712 1/2 hrs., $3,206.25)	632.65
	1,611.00
	$31,329.40

APPENDIX II. ESTIMATED COST OF COLOR TELEVISION FACILITIES

Camera Equipment		$235,875.00
Ceiling mount, includes light, mount, remote control	$12,000.00	
3 Camera color chains, each $60,000.00	180,000.00	
3 Video level control panels, each $400.00	1,200.00	
5 Test patterns, each $10.00	50.00	
12. Image orthicon tubes, each $1,800.00	21,600.00	
2 Pedestal, electric motor driven, each $2,700.00	5,400.00	
3 Cradle heads, each $1,675.00	5,025.00	
2 Lens, 8 1/2", each $300.00	600.00	
2 Lens, Super Universal Zoomar, each $9,500.00	19,000.00	
Camera cable, etc. (1600 ft)	3,000.00	
Audio Equipment		13,510.00
1 Audio limiting amplifier with power supply	10,000.00	
1 Ampex audio recorder (601)	600.00	
1 Audio console (The Yard-Gates)	1,200.00	
1 Extra pre-amp	60.00	
1 Audio desk	50.00	
3 Speaker and matching transformer, each $50.00	150.00	
1 Turntable (Gates 16")	650.00	
3 BK6B microphones, each $100.00	300.00	
2 BK1A microphones, each $100.00	200.00	
Audio cable (3000 ft) and connectors	300.00	
Terminal Equipment		51,325.00
2 Sync generators, each $4,150.00	8,300.00	
1 Changeover machanism	600.00	
2 Crystals, each $60.00	120.00	
2 Color standards, $1,100.00	2,200.00	
2 Flag burst generators $900.00	1,800.00	
2 Crystals, each $100.00	200.00	
2 Power supplies, each $850.00	1,700.00	
10 Pulse delay lines, each $200.00	2,000.00	
7 Equipment racks, each $175.00	1,225.00	
2 End panels, each $50.00	100.00	
6 Double trim strips, each $30.00	180.00	
2 Single trim strips, each $25.00	50.00	
7 Mounting angles, each $40.00	280.00	
20 Video distribution amplifiers, each $325.00	6,500.00	
1 Color stabilizing amplifier	1,420.00	
1 Power supply	850.00	



1 Color stabilizing amplifier remote control	$ 100.00	
2 Audio patch panels, each $65.00	130.00	
12 Audio patch cords, each $10.00	120.00	
20 Video patch cords, each $25.00	500.00	
4 Video patch panels, each $275.00	1,100.00	
1 Video switcher system	8,000.00	
1 Power supply	850.00	
1 Intercom system with head sets	1,000.00	
3 Color control monitors, each $4,000.00	12,000.00	
Test Equipment		$ 2,450.00
1 Techtronic scope	2,000.00	
1 Ohm meter	100.00	
1 Plate current meter	100.00	
1 Tube tester	250.00	
Video Tape Equipment		132,200.00
2 Color video tape recorders, each $65,000.00	130,000.00	
1 Techtronic scope	2,000.00	
1 Ohm meter	100.00	
1 Plate meter	100.00	
Film Chain Equipment		52,800.00
1 3 vidicon color film camera chain	37,000.00	
1 16 mm film projector	11,000.00	
1 film projector lens	300.00	
1 Slide projector	3,500.00	
1 Remote control panel for chain	1,000.00	
Lighting Equipment		8,330.00
30 10" spotlight - B.P., each $75.00	2,250.00	
20 18" scoops and difuser, each $50.00	1,000.00	
4 Light stands, tripod, each $20.00	80.00	
1 Dimmer board	5,000.00	
Studio Equipment		5,000.00
Cyclorama and track 150 ft.	5,000.00	
		$513,490.00



APPENDIX III. CONFERENCE REACTION SHEET

Your personal reactions to the program can help the planning committee to improve the next program. We would appreciate your candid opinions.

Please read the following statements and then check all the statements that most closely describe your impression of this conference:

_____a. Exactly what I wanted.
_____b. I hope we can have another one in the near future.
_____c. It provided the kind of experience that I can apply to my own situation.
_____d. It helped me personally.
_____e. It solved some problems for me.
_____f. I think it served its purpose.
_____g. It had some merits.
_____h. It was fair.
_____i. I was mildly disappointed.
_____j. It was not exactly what I needed.
_____k. It was too general.
_____l. I am not taking any new ideas away.
_____m. It didn't hold my interest.
_____n. It was much too superficial.
_____o. I leave dissatisfied.
_____p. It was very poorly planned.
_____q. It was a complete waste of time.

For each session attended, please indicate how valuable it was for you.

	Much	Some	Little
Small Animal Morning	____	____	____
Small Animal TV	____	____	____
Mixed Practice Morning	____	____	____
Hermatology Symposium	____	____	____
Large Animal Morning	____	____	____
Large Animal TV	____	____	____

Comments on any of the above items _____

_____

_____

Comments on symposium: Should they be continued? Suggest topics.

_____

Suggestions for improving anything about the over-all program:

_____

_____

_____

APPENDIX IV. APPLIED ANATOMY QUESTIONNAIRE

To aid us in improving the course, we would appreciate your opinions on:

TV Demonstrations

1. What 2 or 3 subjects (may be only part of one session) were done best (good subject matter plus good presentation)?

2. Which were handled least well? (we know some were lousy)

3. What topics might be added another year?

4. What topics could be deleted if time were needed for others (or just deleted)?

Laboratory

1. What would you have liked to have more of?

2. Less of?

General comment:

In terms of an efficient and effective medium of instruction, what is your reaction to the use of television for this particular course?

APPENDIX V. QUESTIONNAIRE ON CLOSED CIRCUIT TELEVISION

Colby Lewis

By answering this questionnaire you will be helping the University in a very important way to evaluate the effectiveness of closed circuit television. You do not need to sign your name, but please give serious thought to your answers, trying to separate out any bias you may have which has nothing to do with the question at hand.

Fall Quarter 1961

Your help is sincerely appreciated. Now, fill in the following spaces:

COURSE NUMBER_____ SECTION NUMBER _____ TELEVISION RECEIVING ROOM_____

CLASS (Freshman, etc.) _____ GRADE POINT AVERAGE (if known) ____

MAJOR (of subject in which you think you may major) _____

Write the SERIAL NUMBER from the top of this page in the NAME space of your answer sheet, but do not write any other information in the heading of the answer sheet.

Respond to the following statements by blackening the space on the answer sheet which, according to the key at the right, you think is most appropriate.

1- Definitely a true statement
2- A somewhat or partially true statement
3- Not a true statement
4- Just the opposite is true

1. During the TV presentation, the instructor normally takes time enough to clarify one aspect of the subject before moving on to the next one.

2. In the TV presentations I miss the stimulation provided by the physical presence of the instructor.

3. The picture on the TV screen is consistently sharp and clear.

4. This course has been at least as interesting as many of the other courses I have taken (or am taking).

5. Because of TV I have not been able to ask questions at the time I needed to ask them.

6. TV has made it possible to present more effective demonstrations of the subject than would have been practicable in the usual classroom.

7. Because the TV presentation seems detached from me, I don't feel as involved in the lesson as I do in a regular class.

8. I have had a satisfactory opportunity to contact my instructor face-to-face when I have had problems that required his personal attention.

9. More demonstrations and illustrative material would have improved the TV presentations.

10. There usually aren't enough things going on on the TV screen to hold my consistent attention.

11. The sound from the TV loudspeaker is sufficiently clear.

12. Because of TV I sometimes don't know what is going on in this course with regard to assignments, lecture topics, examinations, etc.

13. I experience more eye fatigue from watching TV than from watching a face-to-face presentation.

14. The instructor's personality seems closer and clearer to me on the TV screen.

15. I have been able to perceive the physical details of the presentation more clearly on TV than I probably would have in a regular classroom presentation.

16. The use of TV in this course has prevented me from having enough opportunity to practice what I am learning.

17. I feel that I have learned more in this course than I would have if TV had not been used.

18. Because of TV I don't have enough opportunity to find out whether I understand the subject the way I should.

19. I feel that I know my TV instructor as well as I would in a non-TV class of 50-60 students.

20. The placement of receivers in the room is satisfactory.

21. The use of TV has forced me to do more of the learning myself, instead of relying on the instructor.

For the questions 22 to 28 continue to use the same key, unless you think that the way TV has been used in your course does not help you to reach a conclusion about the question - in which case, darken space "5".

22. TV can be effectively used to teach facts and information.

23. TV can be effectively used to teach general principles and generalization.

24. TV can be effectively used to teach application and problem solving skills.

25. TV can be effectively used to teach attitudes and appreciations.

26. TV can be effectively used to instill a desire for further learning.

27. The TV presentations in this course are generally better planned and organized than are presentations in ordinary non-TV courses.

28. I am more hesitant about asking questions over the talk-back system than if I could ask them face-to-face.

For questions 29 to 31 mark your answers on this page, not on the answer sheet. Circle the number(s) of the response(s) you select. You may choose more than one response for each of these questions.

29. Combining Surgery and Anatomy in the TV demonstration --

    1. promotes more complete comprehension of the technique
    2. confuses the surgical procedure
    3. does not help nor hinder the surgical procedure
    4. stimulates a desire for review of anatomy
    5. makes review unnecessary
    6. (other, specify:) _____

30. Switching the picture from patient to cadaver, etc., --

    1. makes orientation difficult
    2. keeps the viewer alert
    3. stimulates concentration on the technique
    4. is confusing enough to create disinterest in the technique
    5. (other, specify:) _____

31. The inability to completely follow a demonstration results from --

    1. improper view of the tissues
    2. poorly organized procedure
    3. poor narration
    4. lack of visual aids for review
    5. student's lack of preparation by incomplete survey of procedure
    6. (other, specify:) _____

32. Any additional comments on advantages of TV for this course? (Use space below and back of the page, if necessary.)

33. Any additional comments on disadvantages of TV for this course? (Use space below and back of this page, if necessary.)

APPENDIX VI. CLOSED-CIRCUIT TELEVISION SYSTEM MANUFACTURERS

Ameco Incorporated
3499 W. Osborn Rd.
Phoenix, Arizona

Ampex Corporation
934 Charter St.
Redwood City, California
(also video-tape recorders)

Blonder-Tongue Laboratories, Incorporated
9 Alling Street
Newark 2, New Jersey

Cable T-V Construction Incorporated
P.O. Box 307
Iola, Kansas

Canadian General Electric Company, Ltd.
830 Lansdowne Avenue
Toronto 4, Ontario

Canadian Marconi Company
2442 Trenton Avenue
Montreal 16, Quebec

CAS Manufacturing
400 N. Oak Avenue
Mineral Wells, Texas

CBS Laboratories
High Ridge Road
Stamford, Connecticut

Collegiate Broadcasting Network, Incorporated
700 Rebecca Avenue
Wilkinsburg, Pennsylvania

Dynair Electronics Incorporated
7564 Broadway
Lemon Grove, California

Allen B. DuMont Laboratories
750 Bloomfield Avenue
Clifton, New Jersey

Electro-Find Company
440 Columbus Avenue
New York 24, New York

Entron Incorporated
2141 Industrial Parkway
Silver Spring, Maryland

Gates Radio Company
123 Hampshire Street
Quincy, Illinois

General Electric Company
Technical Products Department
212 W. Division Street
Syracuse 3, New York

Harvey Radio Company
103 West 43rd Street
New York 36, New York

International Telephone & Telegraph Corporation
320 Park Avenue
New York 23, New York

ITA Electronics Corporation
130 E. Baltimore Avenue
Lansdowne, Pennsylvania

Jerrold Corporation
15th & Lehigh A.enue
Philadelphia 32, Pennsylvania

Katona Electronics Company
140 Forsythia Drive
North Levittown, Pennsylvania

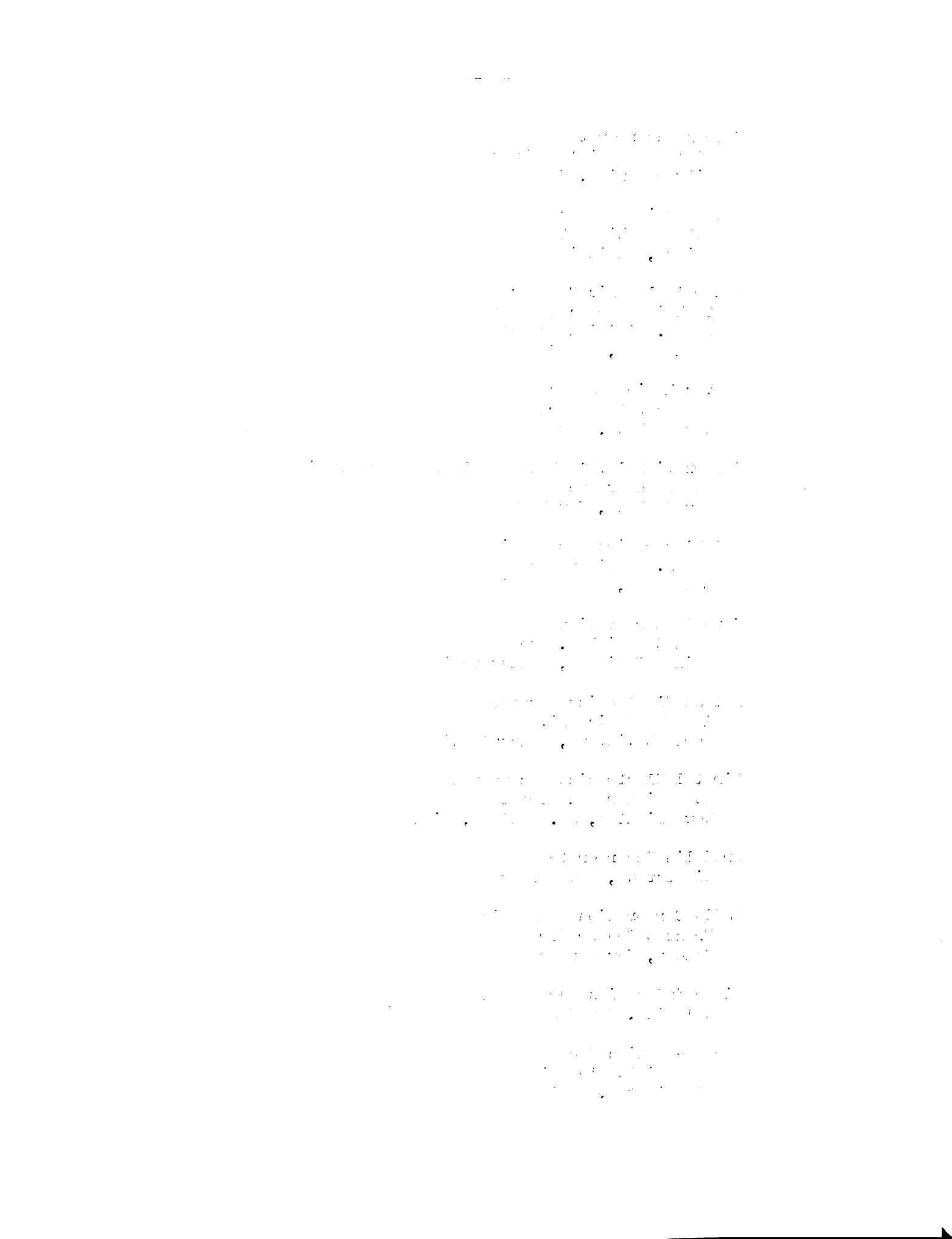
Miratel Electronics Incorporated
3600 Richardson Street
New Brighton, St. Paul 12, Minnesota

Prodelin Incorporated
Hightstown, New Jersey

Radio Corporation of America
Front & Cooper Streets
Camden, New Jersey

Riker Industries Incorporated
Halesite, New York

Sarkes-Tarzian Incorporated
East Hillsdale Drive
Bloomington, Indiana



Visual Electronics Corporation
356 W. 40th Street
New York 18, New York