

greatly increase their value and utility. Attempting to use 16mm in this manner would be out of the question economically.

#### Editing Film with TV Switcher

With the purchase of two 8mm sound-on-film projectors synchronized and modified for the TV system, a special type of editing could be used. For example, if a person who is scheduled for an interview doesn't have the time to make a special trip to the studio, he can be interviewed on film. If he makes references to landmarks, buildings, etc., corresponding scenes can be shot. If there is not time to edit cut-away segments into the film, redub the sound, etc.,

the sound-on-film interview is put in one projector, which can be part of the film chain; and the cut-away scenes are put on a studio camera. Watching both images, the director can choose between them at will. What might result in an otherwise monotonous interview can be made immeasurably more interesting.

#### Compatible Utilization of Film-TV in an Instructional Situation — Evaluation Requirements

Solving some of the more critical 8mm TV technical problems is only the beginning. The usefulness of 8mm production material as it relates to ETV and other instructional situations must be evaluated. Much research has already

been done on the effectiveness of educational audio-visual techniques, and we feel little need to prove further the effectiveness of TV or the motion picture as a teaching medium. But in spite of this research, practical applications must still be investigated.

How to utilize known, effective ETV techniques economically is the question. Educational motion pictures or TV must be highly accessible and they must be versatile enough to be called upon to do a teaching job at a moment's notice. Through use in closed- and open-circuit TV, 8mm, along with continuous-loop cartridge projection, shows promise of filling the bill. Practical solutions remain to be researched.

## Double-System 8mm Sound Cinematography in Education

By ARTHUR G. EVANS

**A double-system 8mm recording capability has been devised and is in use at Orange Coast College. With this method, costs have been reduced to about 50¢/min, including materials and labor. Complete equipment was developed for about \$5,000. The system is used to record lectures in large class groups after which the films are placed in the library. Students who have missed a lecture, or wish to review, can view the films at look-listen stations. A research program is in progress to assess the effectiveness in terms of increased learning.**

**A** NEED HAD ARISEN at Orange Coast College for an inexpensive synchronous sound and picture capability. To cope with the growing number of college students, some classes are extremely large. For a number of years, some of these lectures have been sound tape recorded. Several listening stations equipped with playback machines and earphones are located in the library. Students who miss a lecture, enroll late or wish to review may check out tapes and listen to them. This arrangement has proven highly successful in terms of increased instructional effectiveness, although an obvious drawback of this method was the lack of visual recording.

Large group instruction, lends itself to audio-visual techniques. Presentations, largely visual, negate the effectiveness of mere sound recording, and psychological experiments have shown that the largest percentage of human learning occurs through the sense of sight.

#### Development

Criteria for such a sight-sound synchronous recording system included:

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(1) continuous recording of at least 50 minutes (normal length of a college class), (2) low cost in terms of materials, (3) ease in transport, (4) relative quiet during operation, (5) inexpensive and simple playback facilities for individual student use, (6) trouble-free operation, (7) low initial equipment cost, (8) equipment capable of operation and maintenance by technicians with no more than two years of formal training (junior college level), (9) no additional room lighting and (10) color if necessary to make instructional points.

An initial reaction to such criteria might be to use videotape; however, television fails to meet the criteria. Cost of playback is high. Each playback station would cost at least \$12,000. The cost of color for this application would be prohibitive. Additional room lighting and resulting instructor discomfort would probably be necessary without the use of image orthicon cameras. While television and videotape recording is certainly possible, it was eliminated from consideration for this application.

This left film; 16mm single systems were investigated. The college had two single system 16mm cameras. All criteria could be met, more or less, with 16mm. The college also has its own black-and-white

film processing facility; therefore, the per-minute cost of single system 16mm optical recording is reasonable. But while inexpensive for many purposes, costs would mount rapidly when many hours each week were required.

In terms of film cost and ease of playback, 8mm seemed to be ideal. Black-and-white 8mm film with a magnetic sound stripe can be produced, without editing, for less than fifty cents per minute.

The problem remained that there was no equipment on the market that met all the criteria. Playback was no problem. A number of excellent 8mm magnetic machines are on the market. One even provides cartridge loading. The problem was the 8mm synchronous filming capability.

The one single system camera available failed to meet the criteria. It is capable of only short continuous runs. The cost of prestriped film is high.

Because of the cost of applying magnetic coating to raw stock, and because of the unavailability of an optical sound system of any sort in 8mm, a double system utilizing magnetic sound was decided on.

(7) *Camera:* An 8mm H-8 Bolex Rex (reflex) was purchased. The body of this camera is almost identical to the 16mm model. The 16mm cameras have often been modified to accept magazines. It was no trouble to adapt the H-8 to accept Mitchell magazines. A 1,200 ft magazine is used and more than meets the time requirement. At 24 frames/sec, 8mm consumes only 18 ft of film per minute. A magazine load yields over 65 min; 1200 ft of 16mm film perforated

for 8mm yields over 130 min of filming. A torque motor to take up exposed film was mounted on the magazine itself. A Bodine synchronous motor was acquired to drive the camera itself. The Sonex Cinema Engineering Co. has recently developed an inexpensive sound blimp for the 16mm Bolex, and the 8mm model fits as well. The Mitchell magazine was mounted on top of the blimp rather than the camera because of the increased weight of the 1,200 ft capacity. Mr. Allan Sillaphant of Sonex provided additional modifications. This combination produced a double 8 camera driven by a synchronous motor capable of continuous operation for periods of over an hour.

(2) *Lens:* To center attention and to avoid monotony, a zoom lens seemed logical. It would be inconvenient to dolly the camera during a class. The camera must be placed in the rear of the classroom so that it does not attract attention. In addition, the lens is required to photograph such various things as maps, charts, projected slides and overhead transparencies, the blackboard and the instructor. Paillard has recently introduced a zoom lens with a built-in light meter, which was used.

(3) *Sound Recording:* An Amega 16mm magnetic film recorder was purchased and modified at Amega to operate at a synchronous speed of 18 ft/min rather than the standard 36 ft/min. With camera and recorder both operating from available 110-v current, conventional double system sound photography is possible.

(4) *Microphone:* A lavelier type of microphone is worn by the instructor. Student questions are repeated by the instructor so that they too will be on the soundtrack. This type of microphone yields good quality sound without picking up much extraneous noise. Sound absorbing materials are not needed about the room.

(5) *Synchronism:* Before each lecture, camera and recorder are started. One of the technicians is photographed and recorded. He counts to ten while holding the corresponding number of fingers in front of his face. This footage is later edited out. To hold costs at a minimum, original reversal film is projected. The film is processed, slit and magnetic oxide is applied to the edge. A synchronous motor was attached to an 8mm magnetic projector. The sound is played back through the 16mm recorder and dubbed onto the 8mm edge stripe. To obtain initial synchronization, either the recorder or the projector is lagged by momentarily turning off the motor until sound and picture match up.



Fig. 1. The sound and cameramen recording at the back of a classroom.

### Conclusion

For an equipment investment of around \$6,000, all design criteria were met. This cost includes an inexpensive reversal processor and two playback facilities located in the college library.

Materials needed for this operation cost less than fifty cents per minute. Materials actually consumed are film, chemicals, and magnetic oxide. The 16mm magnetic recording film is de-gaussed and reused.

Students majoring in photography perform all physical operations. At present, approximately four man-hours are consumed for each hour recorded. This time can be reduced with the addition of processing and striping equipment which operates at increased speeds. But even at the present rate, the cost per student served is low.

A research program begun in the Spring 1965 Semester at Orange Coast College to collect data on student utilization and learning effectiveness of this system should provide conclusions to be presented at a future SMPTE Conference.

It is anticipated that the filming of lectures will be only one of many uses for this system. Additional applications in education readily suggest themselves: filmed field trips, student presentations in such classes as drama and speech, recorded guest lectures, television playback through an 8mm film chain, 8mm kinescope recording, and sports analysis.

### Discussion

*Mauro H. Zambuto (Newark College of Engineering):* How much color do you use?

*Mr. Evans:* We have not photographed anything in color yet.

*Mr. Zambuto:* You made a point that this was possible — do you find that most things do not need color?

*Mr. Evans:* Well, I wouldn't use color unless it was important to the learning involved. Plenty of tests have shown that it is not necessary except as to the learning itself. The Reeves Co. informed me that they can stripe any of the ER emulsions in 1200 foot rolls. Before I go any further with what we've done so far I'd want to explore the implications of the new format, because I'm hoping that this will be greatly improved. The next obvious thing to do, of course, would be to install a sound head in the camera itself, so we could go single system. One reason that we haven't is that at present we have a modular design — you know you can have another tape recorder around — something happens you just replace it, or another Bolex camera around and the whole system doesn't go out if one thing goes wrong, which is an advantage to the double system I think.

*Martin Hansen (Bank of America):* Did you say that you make no prints? Is that correct? You use original camera footage to project? Do you find that since most of these people don't know how to use a projector, there is a film repair problem?

*Mr. Evans:* Well, we use Mylar tape and the librarians have quick splicers there and make repairs — there has been a need for repairs. As I say, the playback is not ideal. I think probably the Fairchild machine would be an ideal playback system — as I say, I was holding off because of the new format — if there was not a new format on the horizon I would just go with the Fairchild system in cartridges and then we wouldn't have the problem.

We will have the problem. Next year we are going to use this for something approaching 3000 students who take the same class every semester — Psychology 1A. Now we have a problem of two or three playback stations not being enough — so we're investigating various possibilities — we could go film chain on monitors, or we were thinking in terms of having a special room available, at various times during the week with a projectionist and students who missed a class or wanted to see it again could just go to this room.

*Mr. Hansen:* What was the life of one lesson? Did you keep it until the end of the semester and then discard it, or did you file it away somewhere?

*Mr. Evans:* We discard it in February — I don't know what we're going to do about this. Some instructors feel that we might replace them with film. In the class that we're using right now — Electronic Technology — the state of the art changes so rapidly that we might as well throw it away at the end of the semester — it's so inexpensive that it really doesn't matter I think.