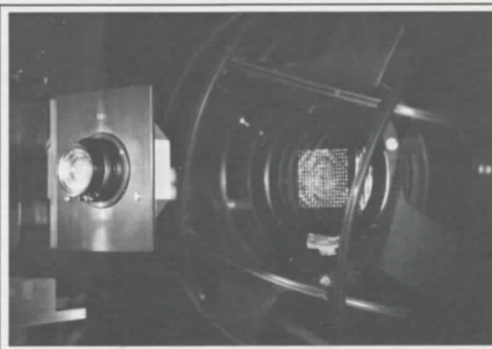
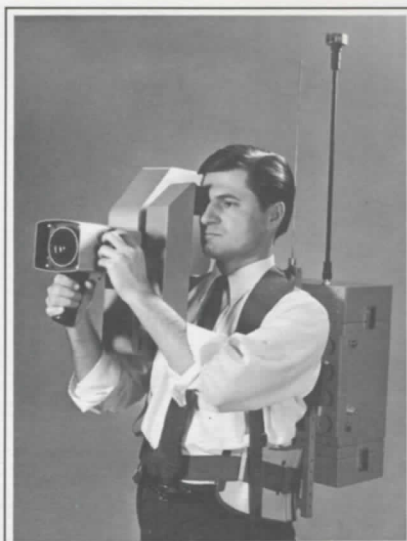




# CBS LABORATORIES

Stamford, Connecticut A Division of Columbia Broadcasting System, Inc.

**CBS LABORATORIES**

Stamford, Connecticut A Division of Columbia Broadcasting System, Inc.





This is EVR film (enlarged 3 times) consisting of two side-by-side tracks, each with a capacity of 26 minutes of black-and-white programming and an independent sound track. Notice that there are no sprocket holes to wear or damage the film.

Phase Credit

SPR LABORATORIES

Stamford, Connecticut  
A Division of Columbia Broadcasting System, Inc.

6651-669-1



This EVR cartridge, seven inches in diameter, drops on the EVR player in the manner of a long-playing record and contains up to 52 minutes of visual and audio material. The cartridge is self-feeding.

—Photo Credit—

**SECURITY INFORMATION**

Stanley, Connecticut  
A Division of Columbia Broadcasting System, Inc.

6651-669-3

1



Please Credit



**CBS LABORATORIES**

Stamford, Connecticut

A Division of Columbia Broadcasting System, Inc.

**6972-308-1**

# NEWS FROM CBS LABORATORIES

A Division of Columbia Broadcasting System, Inc.

## WHAT IS EVR?

(A Brief Description)

Electronic Video Recording, which is the result of several years of engineering and development by CBS Laboratories, promises to work a revolution in the "knowledge industry" in the home, classroom, office and factory.

In the same way that a long-playing record stores sound conveniently and inexpensively on a record for later replay on standard phonographs, EVR stores pictures with sound for playback through a standard television set. Any motion picture, videotape or live television presentation can be recorded for distribution on EVR.

Basically, there are three elements to an EVR system:

- (1) The thin EVR film is dual-tracked, and carries its sound in parallel lines on a magnetic track, along with two rows of visual frames. Although the film is miniaturized, the image reproduces with sharper definition and clarity than a conventional television picture. The film has no sprocket holes, thus eliminating the chances of tearing. As further protection against damage or deterioration, a tiny cushion of air separates the layers of pictures when stored in the cartridge.
- (2) The circular EVR cartridge, which holds the film, is seven inches in diameter and has a maximum capacity of 750 feet of film, 8.75mm (under

3/8 inch) wide. This is equivalent to 180,000 picture frames or 52 minutes of programming.

(3) The EVR player is compact, versatile and simple to operate. A lead from the player is easily attached by handclips to the external antenna terminals of the television set. Then the film cartridge is placed on the player, the television set turned on to a channel that is not broadcasting, and the player starter button pushed. The film automatically threads itself past an electronic sensor that converts the film image to electrical impulses, and then transmits these impulses -- along with the sound -- into the television set. The player features buttons for speedy forward and rewind, a fingertip adjustment for slow scanning of individual sequences, and the capability for freezing any frame on the screen without damaging the film or dimming, flickering or blurring the image.

Since transmission to the set is direct and there are no buildings or other interference to contend with, there is no ghost image or other picture or sound distortion. Nor is there any projector noise to distract the viewer, or interfere with concentration, conversation, comment or supplementary instruction. The system can also be operated in normal light without lowering the shades.

Although much of the EVR technology was developed by Dr. Peter C. Goldmark, president and director of research at CBS Laboratories, as an offshoot of the Division's space research programs with the U. S. Government, the Company will not manufacture the system itself. CBS will license its production among leading manufacturers. At first, players will appear as attachment units, styled and built by manufacturers of home entertainment equipment. Once manufacturers get into full production, customers

will be offered a variety of models with complete cartridge interchangeability. The film, however, will be recorded, printed and inserted in cartridges at CBS plants.

The CBS Electronic Video Recording Division will develop an EVR market among the television, publishing and motion picture industries; videotape libraries; educational institutions; and suppliers of informational, training and recreational materials. With these outlets as a start, EVR should eventually revolutionize the storage and exchange of information in education, industry, the arts and the home.

#### The Classroom

Electronic Video Recording will give new scope to television's immense potential in education. As the Carnegie Commission for Educational Television noted, a more versatile playback technology in educational television is the one thing needed to return to the classroom the flexibility that the present uses of broadcasting deny it. With such a technology, according to the commission, "the teacher can select the program, play it at the moment of his own choosing, replay it at will in whole or in part, interrupt it for comments." By providing this technology, EVR can help educational television make the "massive contribution to formal education" that the Carnegie Commission feels is not only possible, but is imperative.

Today, teachers must schedule classwork around broadcast hours, and they have no control over what appears on the screen -- or when. With EVR, the teacher can integrate educational films more effectively into the smooth flow of his classwork. He can preview and choose. He can stop the program for comment or for general discussion. He can schedule lessons at his own

discretion, and show his films either to individual students or to large groups simply by linking a single EVR player into as many television sets as he needs. He can even play them in several classrooms at once. Because the equipment is so easy to operate, even the teacher's youngest pupils can benefit from EVR, with or without supervision. Since the room need not be dark, students can also take notes. With this overall convenience and versatility, EVR will thus supplement, and not interrupt, the teaching process.

Because EVR cartridges are considerably more economical than conventional film, schools will no longer need to depend on central or outside audiovisual libraries -- frequently at distant points. They can build up their own libraries.

#### Home Use

The process of education does not end when one leaves school. It is only just beginning. The swift pace of change in science, technology, the arts and industry forces millions of Americans to study at home, and many actually enroll in formal correspondence courses to sharpen and extend their skills.

Whether young or old, a high school or college graduate, an individual must study to keep up, to adapt, to increase his competence. Since 95 percent of America's 69 million homes have television sets, EVR is the logical key to home study. Wherever in the world they may be, the most inspired educators and other leading authorities in their fields will now be able to appear on film and give the student the next best thing to face-to-face lectures. And he will be able to study at his own learning pace -- in

the calm and privacy of his own home.

When not being used for home study, EVR will also provide hours of exciting and stimulating recreation. Before that Saturday morning round of golf, the EVR owner can drop a cartridge on the player and get a quick lesson from Jack Nicklaus. Or he can settle down for an evening of Hamlet or some other film selection from his library of Shakespeare. Or perhaps he will be in the mood for the Horowitz concert at Carnegie Hall, or Marianne Moore, Robert Lowell or some other favorite poet, reading from his own works.

#### Industry, Government and the Professions

On the job, EVR will become a major management and training tool. With its low dollar-per-minute cost for creating, disseminating and displaying training programs, EVR will sharply reduce the teaching load on overworked instructors. Whether they are studying to be salesmen, dental technicians, lathe operators, engineers, computer programmers, soldiers, executives or astronauts, trainees will learn more and learn it faster with EVR. The government will be able to teach the disadvantaged more efficiently and effectively. Hospitals will be able to exchange staff films on medical hygiene or new patient-care techniques; at his leisure, the busy surgeon can watch closeups of new operations in his field. Scientists and engineers will see and hear about the latest developments in their areas of specialization -- not just read about them.

And the future? Perhaps one day, there will be an entire encyclopedia in EVR cartridges, stored in a space no bigger than a single paperback book. There could be vivid motion pictures showing the circulation of the blood

or the way a nuclear reactor works. There could be animated geography lessons illustrating how volcanos erupt, chasms open or canyons split off. There might be an essay on political science with the President himself addressing the viewer. Or there might be an essay with Bertrand Russell observing that "the more purely intellectual aim of education should be the endeavor to make us see and imagine the world in an objective manner as far as possible as it really is...." As a major tool of education and enlightenment, EVR should help us see -- and experience -- the world in just that way.

# BUSINESS

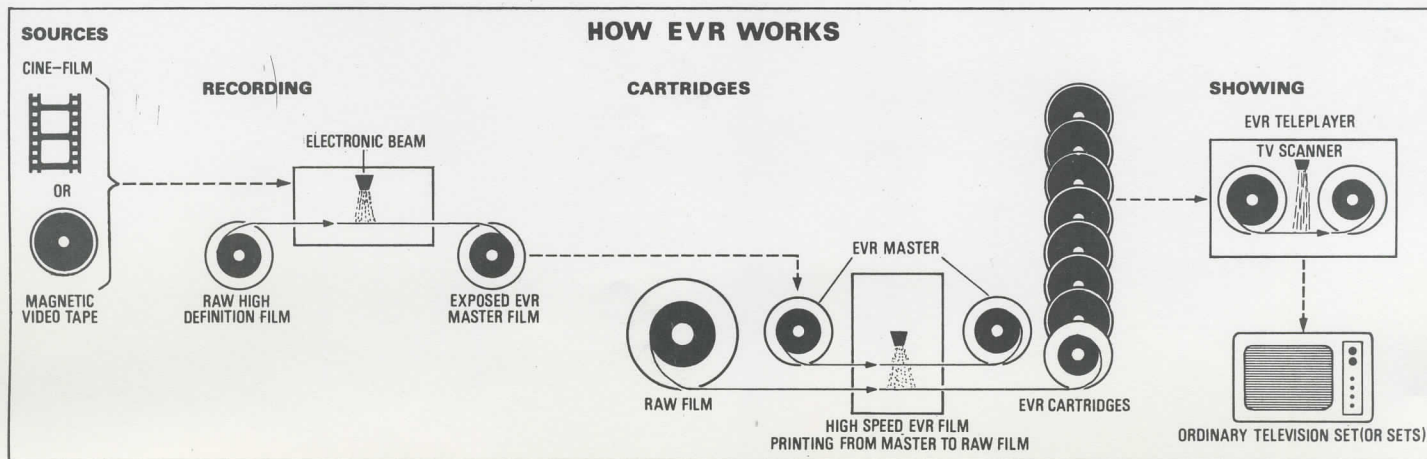
## EVRevolution

Britain is in on an exciting television development—film of plays, musicals, serials, orchestras and anything the customer likes that can be shown on his own television set whenever it's wanted. It could be the end of television as we know it today

Electronic Video Recording is to a television set what a gramophone is to a radio. If the transmitted programmes do not please, the viewer will be able to slot a cartridge into an EVR player and see the programme of his choice on his own telly set, just as the listener can put on a long-playing gramophone record instead of sticking willy-nilly to the Archers. EVR is not a machine which records direct from the television set itself. That is still very expensive and complicated. What EVR can do, and is likely to do in the next few years, is to take the place of the circulating library, the cinema and the long-playing record all together. Just that : it could be the most important thing in communications since the cathode ray tube.

The principle of EVR is to record the sound and picture electronically on to a master film, which can print limitless copies. The copies are put into cartridges which are loaded in a very simple way, so simple as to defeat the clumsiness of the ordinary idiot, into the player. The player is plugged into the television set's 625-line aerial socket (though players can be made for any number of lines), or into one of the free channels which most sets have. The picture and sound are of first-class quality and the set does not have to be converted in any way. The advantage of film as the recording medium is that copies can be mass-produced—unlike videotape copies which have to be reproduced at playing speed, and whose masterprints quickly lose clarity in the process. The protection of the cartridge, the minimal mechanical wear, and the automatic threading on to the player mean that the film can be shown without deterioration ten times more often than conventional 16mm sound film—that is, upwards of 500 plays. And the player is a neat box the size of a portable gramophone.

The technical breakthrough has been getting the source material, whether black and white or colour, on to high definition, low cost film. Although the film can record direct from the television camera, the high-speed process requires that the material be pre-edited, and this is done on 35mm film or videotape. Again the analogy is with long-playing records, where all the ironing out is done before the high-quality discs are churned out from the master. The electronic process was in fact invented by Dr Peter Goldmark, of the Columbia Broadcasting System, who was mainly responsible for developing the first long-playing records. CBS has the rights in the United States, but for the rest of the world has formed a partnership more or less equally with Imperial Chemical Industries and the Swiss company CIBA, who jointly own the English photographic company Ilford. Ilford makes the specialised film needed, and a printing and processing plant, costing £2 million-£3 million, is being built at its Basildon factory and will be ready at the end of the year. The EVR partnership will be using it for the printing service which it will offer to anyone who wants to put material into cartridges. The cost will be between £6 and £10 a cartridge, each one of which will have an hour's playing time for black and white and half an hour for colour. With colour half the film will carry the image and the other half a signal code telling the colour television receiver how to process it. The players are being made under licence by Rank, Bush, Murphy and, although this licence is not exclusive, they have thought it worthwhile to invest several hundred thousand pounds in tooling up to cope with a production of 1,000 per week. How soon it gets up to that figure from the time production starts in July, 1970, depends on how the market itself grows. It ought to expand pretty fast.



Although some parts of the player, such as the scanner and high-tension power supply, are common to the player and the television receiver, the existence of a vast stock of black and white sets means that a player built into the set, on the lines of a radiogram, is still some little way off. Since it is believed that the big domestic demand for EVR will be for colour entertainment packages, the system will be built into colour sets; this should not, however, bump the price of colour receivers too much above the present high range. Although the EVR recording and printing process is as happy with colour as without, the players have to be different. So the pattern is likely to be black and white sets with a separate player, or a colour set with a player built in.

The obvious starting point for EVR is in education and industrial training, where colour is not really vital anyway. An Open University student will be able to hire a player and programme, put it on when he likes, stop the film at any frame, and even make it go backwards. This particular capability will be especially useful in scientific studies. Certainly the ability to learn whenever a student finds it most convenient is entirely superior to the current idea that he must study whenever BBC-2 finds it has spare time on its hands; what is remarkable is that no one, not even Miss Jennie Lee, seems to have realised the full potentiality of this process. It is now very important that educational broadcasting ideas should be rapidly revised. In industrial publicity, motor car manufacturers will send a cartridge round to all their

dealers showing them how to promote or service a new model. The possibilities are endless: the device can be used to record microfilm, and will be much more useful than most microfilm readers. With such a low cost per showing, reference and entertainment libraries could eventually hire out an hour's fact or fiction for a shilling or two. No wonder Pay-TV surrendered.

The biggest commercial question of all is what the mass audience will do. The popular development of EVR is likely to be slow, perhaps very slow in its early stages. The television networks still believe that much of the audience will always prefer to have its viewing pattern provided for it; that it will not build up its own evening's viewing for itself. But this could be wrong, especially in a generation which will increasingly be accustomed to running its own, extended leisure time. Gradually, EVR may edge itself into the ratings, one way or another, and if that happens what will the television advertisers do then? The possibilities are enormous, and not just for highbrows. No longer will maiden aunts complain at experimental plays: they can have Deanna Durbin and Annie S. Swan on demand. Eventually television and film companies may have to think of producing for the new medium. The television that the ordinary viewer could want to see pretty much as he does now will chiefly be live television of actual events. This is much more than sheer fancy. We are getting one stage nearer McLuhanism.

THE

# NEXT

MEDIUM by ROBERT RUSSEL

5. EVR

Since the announcement about the Electronic Video Recording cartridges first appeared in London and New York, I've been watching the newspapers and journals for some informed speculation or comment. With the exception of Jack Gould of the New York Times, the science and communications writers have let the story pass. Since the EVR system promises to reduce the cost of Videotape by a factor of fifty, and the cost of film by one of approximately fifteen, as well as seriously undercutting the cost of print on paper, bringing the next medium dramatically closer, the silence implies fear or blindness or both. Let's look.

There are three elements to the EVR cartridge system: the cartridge itself, the printing system, and the player. Briefly, the CBS system records a quality image onto a special film in a plant designed for mass-production, the first of which is already abuilding outside London. The film is stored in 1500-foot rolls inside 7"-diameter cartridges, a half-inch thick, which will play an hour's program (black and white) on a home television set through a small player which sits on top of the set and plugs onto the antenna terminals. The image may be a film, a television program, a series of instructional sequences, or (presumably) around 100,000 discreet images of text or illustration, any one of which may be selected for study. The cartridges will be marketed for \$7.50 to \$15 each, the players for \$300.

The truly devastating aspect of the system, it seems to me, is not the remarkable mechanical technology for handling the film, but the film recording process itself: The drastic reduction in costs implied will revolutionize the economics of information transfer, television and film, to the point where the individual can have, at hand and at home and easily playable, almost anything he wants on film or in print. In effect, this begins to take the control of film and television and educational programs out of the hands of the distributor,

broadcaster, exhibitor or educator, and puts it where it belongs: under the control of the individual. At last he can do what he wants at his own convenience: teach himself, inform himself, entertain himself (and perhaps even degrade himself, as the system would lend itself admirably to the dissemination of pornography).

Ordinary film techniques don't lend themselves to reduction. If you projected an 8mm film alongside a 35 or 70mm film in the same theatre, you'd see the differences immediately. The definition is delicious in the big format; in the 8mm film you'd be immediately conscious of the grain, as though the image were made of black and white mice scurrying across the screen. In recent years, the computer people have been working on other types of optical storage, with considerable success. The most impressive of these developments comes from National Cash Register, who use a helium-neon laser beam to record an image on the evaporated metal coating on a thin film. The film is grain-free, and the reductions are of the order of 250 to one: that is, a standard typewritten page of text can be reduced to a dot about a thirty-second of an inch wide. This process, which NCR is now marketing commercially, can record 2000 pages of text on a single card four-by-six inches. The size of enlargements from these microdots are limited only by the optical system of the reproducer. Since this heat-mode printing is instantaneous, requiring no processing or developing, processing times and costs are dramatically reduced. (See SCIENCE, 23 Dec. 66, 1550ff.)

Jack Gould has been speculating on the entertainment implications of the EVR system. He feels that the TV viewer will be pleased to buy old films and TV programs for something around the price of an LP record or two, which he will presumably play over and over again. As an executive of the Cinémathèque Canadienne, where old films are offered to what appears to be a severely limited audience, I am not yet convinced that the general public will want to see old favourites that many times at home. It may prove more interesting to offer special events on EVR, such as Opera or Theatre performances, or Music Hall recordings or Night Club shows, than old movies which are otherwise available on the Late Show. But I can certainly imagine forking out ten dollars for The Best of Ed Sullivan, and perhaps even The Best of Seven Days. And certainly, The Best of Lenny Bruce.

The most promising use of the system, it seems to me, is in the field of education—in school and in the home. At the moment, there is a large and growing market for 8mm film-loops. These are four to seven-minute films in cartridges, which plug into small viewers about the size of a TV screen. The film usually illustrates a single concept, and is designed to be played over and over until the concept is clear. A cartridge costs about \$15 to \$25, depending on the company which puts them

out. Assuming the EVR cartridge holds fifteen times as much film, and costs about half the price, the price advantage is from fifteen to thirty times that of the film-loop cartridge now being successfully marketed. Teachers and pupils should find the greatly extended length a real convenience, and the greatly reduced cost a real inducement toward building an extensive collection.

Since the system plays through a TV set, any classroom with a \$300 investment in a set would be induced to invest a further \$300 in the player. In addition to receiving ETV programs from the air, they will be able to tap the school's library of EVR cartridges for programs and single-concept material at their convenience. Teachers who don't like the idea of adjusting their teaching schedules to that of the central ETV schedule, will be able to make up their own schedules to suit their class and their own style. In addition, they'll be able to stop the program at any moment to bring out a point, ask questions, or even replay a complex sequence. They'll be able to review the lesson on film before class, and thus won't have the fear that they'll be surprised or contradicted by a program they haven't seen in advance over the air. Thus they'll be able to build the program into their lesson in their most effective manner. Students who have been absent from class can catch up easily; and the program is there (perhaps in the library, where students can consult it on their own time) for review as exams approach. Bright students can broaden their studies with EVR, while the rest of the class catches up. The economics are such that, while ETV stations in large centres can distribute programs cheaper than EVR cartridges, in the hinterlands, where schools are spread far apart, EVR may prove a considerably more economical system than building microwaves and transmitters. This is an important factor at a time when the Provinces and the Federal Government are actively considering the establishment of ETV networks.

But the most portentous advantage of the EVR system lies in the area of what the French call Permanent Education. Here we can see groups of professionals, such as doctors, nurses, teachers, lawyers already anxious to keep up with sweeping developments in their fields. An EVR system would permit a doctor, for instance, to keep up with the latest techniques, and to consult his cartridge library when a particular treatment was to be undertaken. A teacher could explore new curricula developments at her leisure, or study new teaching techniques, perhaps for academic credit. Once installed and paid for, the \$300 players can be used for continuing the life-long process of education on both a formal and informal basis. Despite the silence in the press on EVR, many educators are already knocking on the doors of the CBS Laboratories for more precise information about the true costs and modalities of the process.

Even less information is available from CBS about the "information retrieval" aspects of the system. Peter Goldmark, in announcing the system at the end of August, stated that one cartridge would hold all of the pages of a complete set of the Encyclopedia Britannica, each of which may be selected and consulted separately. Here it is difficult to understand the meaning of the claim. My television set won't resolve more than 8 or 10 short lines of large type. A page from an encyclopedia would appear as a blur of grey. If the system is to be used for the storage of print as well as image, the text will have to be specially designed for TV, or we will have to own special high-definition television sets (1000 lines or more) to be able to read what the film is obviously capable of recording. But even with these limitations, the ability to store around a hundred thousand pages in an inexpensive film cartridge could be enormously useful. If a small computer system could permit us to select pre-coded pages at random from the cartridge, then each of us could have our own living encyclopedia in our own home, for much less than the cost of a good printed set, and have it updated each month as new information develops.

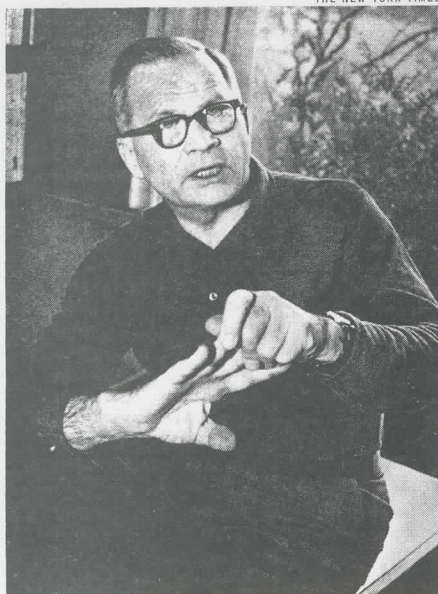
The same logic which would allow us to select at random any item from our EVR encyclopedia, would also permit the preparation of sophisticated program-learning systems. Several dozen learning sequences could be recorded on a single cartridge. At the end of each, the viewer is asked to reply to a question. His answer, right or wrong, sends the film through the cartridge to an appropriate sequence. Such a system, once the logic and mechanics were perfected, would turn the home or school TV set into a relatively inexpensive teaching machine comparable to the extremely high cost Computer Assisted Instruction systems now being introduced into American schools. Thus the addition of logic and mechanics to the system as announced seems to me to be a sensible and economic next step. There has been a good deal of talk among computer thinkers about the advantages of microfilm over magnetic tape for computer memories: this dramatic breakthrough in film costs may weigh heavily in the debate.

With this logical extension of EVR, we are back concretely in the domain of the next medium. For it seems to me that the next medium implies two things: the information must be available to the individual and under his control, and (further) the system should be responsive to him, interact with him, modify its program in line with his individual responses, personality and understanding. In this way, we see Technology serving the individual, rather than dehumanizing him. And the "commie", the home communicator, becomes as much a part and extension of his life as the four-speed gear box and the telephone.

## TECHNOLOGY

## The Genius at CBS

By one definition, an inventor is someone who converts fancies into facts. A man who turns fancies into facts and then facts into entire industries is much more. He may even be deserving of that overworked word: genius. The description seems to fit Peter Goldmark, 62, president and head of research for CBS Labs. Goldmark built the world's first practical color TV system in 1940 and invented the long-playing record in 1948. His latest discovery may well touch off an even greater electronic convulsion. In Manhattan last week, he dis-



GOLDMARK AT HOME

torola will turn out EVR for institutions in less than two years and for the public market by late 1971.

**Freezing Frames.** The effect of Goldmark's system is to free individual TV receivers from the confinement of commercial broadcasting. Under its agreement with CBS, Motorola will produce briefcase-sized player units with wires that clamp onto the antenna terminals of existing TV sets. The viewer can then choose a film cartridge, drop it into the player, and dial an unused channel. The film, which automatically threads and rewinds itself, can carry nearly an hour of black-and-white viewing and can be stopped at any time for ei-



TEACHER WITH EVR

*Enough to keep the boss on edge.*

played the first operating model of Electronic Video Recording (EVR), a new system that transforms an ordinary TV set into a movie screen on which a viewer can play a series of films at any time he wishes as easily as he could play a phonograph record.

The EVR prototype comes 15 months after CBS announced Goldmark's plans for a revolutionary "educational art form" that could turn every TV set into a teaching machine. Though an EVR owner will not be able to record his own programs, he will be able to order pre-made films on almost any topic. In theory, a family equipped with EVR will become a self-contained educational center: Junior will study the sex life of grasshoppers (the subject Goldmark drolly demonstrated last week), Father will settle back for an evening of golf lessons or an audio-visual version of *LIFE* and Mother will sharpen her French through an EVR correspondence course. CBS has already drawn up a manufacturing agreement with Motorola, Inc., under which Mo-

ther individual "freezes" or to flip the frames through one by one as in a slide projector.

The heart of EVR is a tightly wound film, 8.75 mm. wide, that can store an astounding 180,000 separate frames on one seven-inch roll. Previously, no one had been able to compress so much film and still preserve its ability to produce clear playbacks. While working on a CBS lunar-photography project for the National Aeronautics and Space Administration, Goldmark devised a high-resolution film that can carry millions of bits of electronic information. That film has led to an even more startling breakthrough. Goldmark and his colleagues have managed to treat black-and-white film with electronic color codes so that it will reproduce full-color images. When the coded film passes through a special scanner, the colors are electronically retrieved for viewing on the TV screen. The discovery of this cheap color film is likely to stir a revolution in the motion-picture industry and may someday give every amateur

the resources of color-movie photography at drugstore prices.

**Captivating Experiences.** Goldmark believes that initially EVR will be purely instructional—used in schools, hospitals and industries—if only for reasons of cost. Motorola will price the first EVR player units at nearly \$800 apiece. Yet mass production could conceivably push the price down to a fraction of that and eventually lead to TV sets with built-in EVR units. "EVR will make education as compelling as TV entertainment," Goldmark insists. He points out that with EVR, a backwoods teacher could become an educational paragon, ordering lectures by Robert Lowell on poetry, by Zino Francescatti on the violin, by the President of the U.S. on politics.

Born in Hungary, and possessed of a rich musical heritage (he enjoys playing his cello to his mother's violin accompaniment), the grey-haired Goldmark hardly seems the Edison-style scientific adventurer. But after studying physics at the University of Vienna, he became so captivated by television that he turned to electronics and moved to the U.S. in 1933 to apply for a job with RCA. He was blithely unaware of the Depression—until he was abruptly turned down. He finally joined CBS in the early days of broadcast TV. "We did everything—put on the show, ran transmitters, jumped in front of the cameras," he says. "We had no audience—there were only a handful of TV sets in the country—but we had to keep on the air to hold our license." Goldmark still maintains a workshop in his Stamford, Conn., home, in which he repairs his own TV sets and tinkers with his latest experiments.

**Most Horrible Sound.** At CBS, Goldmark's bursts of innovation keep management watchful. His first color-TV system, far simpler than today's color models, was rejected because it would have required the junking of all black-and-white broadcasting equipment then in existence. Though engineers had been working on long-playing records for years, Goldmark did not try his hand at it until he listened to a recorded Vladimir Horowitz concert and despaired at the periodic clunks of rejecting 78-r.p.m. records—"the most horrible sound man ever made." In 2½ years, he had compressed the playing time for six 78-r.p.m. records into the first 33½ microgroove disk and started a multimillion-dollar industry.

Goldmark's EVR may send similar shock waves through CBS. EVR families could, presumably, not bother to tune in the network at all and instead rely on their own library of TV tapes. CBS President Frank Stanton answers that EVR is an "additive" that will complement TV, just as record players complemented radio. Still, CBS has protected its profits with an intricate tangle of patents. An agreement made with the New York Times for creation of the first EVR educational films, for example, provides that CBS will share with the Times in both production and profits. Eventually, as one industry cynic observed last week, the mediocrity of network TV may prove to be a virtue by stimulating the sales of EVR.

## A REVOLUTION IN TV

*TOM HOPKINSON, former editor of Picture Post, examines an invention that could revolutionise home entertainment and the knowledge industry.*

RESEARCH and design for a proposed "Experimental City" is now well under way in the United States. The city, for perhaps a quarter of a million people, will be 50 to 100 miles from any large metropolitan area.

This means that planners can apply knowledge obtained over the past ten years in social sciences, without having fresh ideas strangled by the debris of problems from the past.

In the home of the future an "information room" will be as essential as a bathroom. An underground pneumatic system will provide far speedier delivery of newspapers and letters. Besides all the improvements in colour television and radio already envisaged, there will be some

form of printing device recording news, weather and other essential information as it is transmitted.

On Wednesday, with the first public announcement of EVR (Electronic Video Recording), one piece of this city of the future was brought into today.

EVR is the invention of Dr Peter Goldmark, president of the CBS laboratories, and the man who invented long-playing records. He was also a pioneer of colour television. Goldmark says of his new invention: "For the first time it frees the set owner from complete dependence on the programmer and broadcaster. I always thought it was possible to do this, but it took six years to develop the right combination of machine and materials. Now we're ready to go."

Some experts say that EVR means to broadcasting something like what the motor car has meant in transport: it gives the individual power to go where he wants, when he wants, instead of being tied to a public service governed by timetables.

The device consists of a low, square box, looking like a pleasantly-designed table-top tape recorder, which can be plugged in to a TV aerial socket. From this box cassettes, or cartridges, of film are transmitted through the set, enabling the viewer to broadcast any prepacked programmes he pleases. And by using dial or push-button control, it will be possible to stop the programme at any point, to hold a single frame, or—in the case of reference or study programmes—to locate any image or sequence required. In short, this is a viewer's dream come true. You can switch off "Z-Cars" and put on "Swan Lake." Or you can switch off "Swan Lake" and put

on "Z-Cars." Or Malcolm Muggeridge. Or the Encyclopedia Britannica. Or anything at all that is capable of being put on film.

Besides what it means to entertainment, EVR has enormous possibilities for education—formal education in schools and universities, and perhaps even more startling possibilities for home study.

Initially, programmes are likely to consist of material which does not require too much rethinking and remaking—the filming of

plays; the packaging of existing films; visual lectures and demonstrations of all kinds. But in the long run, the opportunities EVR offers are so far-reaching that a great deal of educational material is likely to be entirely recast in visual form.

Consider the possibilities. A single cassette, seven inches across and about half an inch thick, holds 780 feet of specially-made film, giving up to 52 minutes of programme material. The dual-track film carries its own soundtrack in two ribbons of magnetic tape built into the edges. One film can hold over 187,000 frames of black and white, or half that number of colour.

These can be divided between stills and moving film in any combination, with accompanying sound. So at one extreme it will be possible to run almost a one-hour programme of film. At the other, by using no moving film and treating every one of the frames as a still picture, it would be possible to reproduce all 24 volumes of the Encyclopedia Britannica on a mere 1½ cassettes seven inches wide.

A much more practical arrangement, of course, will be to organise a careful balance of film with stills and text. A single colour cassette on the work of a particular artist might contain over 20 minutes of motion film with accompanying lecture, followed by something like 1,500 different single colour pictures or text pages. Alternatively, there might be four short film lectures, each followed by 375 frames for individual study.

For the teacher EVR is a mighty liberator. It frees him from the need to organise class-work to fit in with broadcasting schedules. In the words of a Carnegie Committee report: "The teacher can select his programme, play it at the moment of his own choosing, replay it at will in whole or in part, interrupt it for his own comments—in sum, fit the programme to the needs of his own classroom."

EVR is not only very much cheaper than film projection (the estimated cost for an hour's programme of EVR is between one-tenth and one-twentieth that of an hour's programme on 16mm film), it is also far more convenient. There is no need to darken the room. The device is easier to operate than a record player. It can be attached to a TV set in seconds.

Storage is easy—a cassette is similar in size and weight to a seven-inch reel of audio tape. It is also sealed against dust, so that there is almost no wear and tear. The player unit simply receives the cartridge, feeds it through the mechanism, and automatically rewinds ready for re-use.

Though the aim is to give educational material priority, EVR has immense potential in other fields. Sport is an obvious one. Coaching becomes far easier if the coach can control the medium—showing a film, and then stopping at any point for discussion.

Every home with TV could also have a complete reference library covering, say, cookery, gardening, home medicine, a general encyclopedia and a reference atlas.

In the professions, a new cassette mailed fortnightly to doctors, say, or engineers, could keep them abreast of new developments. Specialised journals and magazines may one day be put out in cassette form.

A more immediate development concerns information storage. Central audio-visual storage units linked to computers will make

information rapidly available to libraries, professional or governmental bodies, or for the armed forces.

These will all be comparatively short-term developments. In the long-run the possible effects of EVR may involve nothing less than the rethinking of educational methods, and the re-working (not rewriting) of a great mass of textbooks and study material into picture or film form.

A measure of the importance attached to EVR is the scale of the organisation formed to handle it throughout Europe. An "EVR Partnership," has been set up by Columbia Broadcasting Inc. of America, Imperial Chemical Industries of this country, and CIBA of Basle, Switzerland. Ilford Ltd., a jointly-owned subsidiary of ICI and CIBA, is building a plant in Essex to produce the cassettes. Prototypes of the playing device are being made by Thorn Electrical Industries.

(continued)

The system will first be demonstrated through educational applications in British classrooms. Regular production of both cassettes and players will begin early next year, and both will be available in significant quantities by mid-1969.

The fact that Britain is to play so important a part in EVR's development owes much to Wolfgang Foges, a 58-year-old naturalised Briton who is managing director of Aldus Books. Foges has been appointed executive director of task forces by both organisations involved—CBS for the USA and Canada, and the EVR Partnership for Europe. He is so far the only man employed by both.

Why a book publisher in this position? The recent dramatic series of link-ups between the great electronic firms and book publishers, often in a far more modest way of business, is based on the tremendous demand these firms anticipate for "software"

—material for transmission—and the belief that book publishers have both the know-how and the contacts to meet this need.

Foges, born in Vienna in 1910, is one of a small group of central Europeans who have made a powerful impact on British ideas and techniques in communication. For Foges this is the culmination of a life spent trying to develop the visual element in communication.

He has been spending the last month in New York, working with CBS to organise the necessary flow of "software" and establish priorities for production

between different types of material.

He says: "I'm an International Man. My task has always been to co-ordinate new methods of production, new means of distribution, using several languages and operating in many countries.

"I have also always been fascinated by visualisation. If we are to have anything like a common civilisation, then we must employ means of communication which transcend the language barrier.

"EVR is a most powerful weapon in the hands of those who want to build One World."

## Television

# Renting a Movie Or a Professor To Take Home

By JACK GOULD

INSTRUCTIONAL television, potentially the most constructive use of the electronic medium, has been a distinct disappointment — although not an outright failure — for rather simple and obvious reasons: Its use has not been under the control of the teacher; a battery of transmitters, either over the air or on closed circuit, is needed to cover a fraction of a school's curriculum; it is practically impossible to devise a schedule suiting the convenience of many schools simultaneously, and a taped or filmed program may move too fast for maximum absorption of content.

Fortunately, a way is now open to eliminate all these obstacles and achieve a reduction in cost far beyond anything previously conceived. The solution lies in the Electronic Video Recording device developed by CBS Laboratories under Dr. Peter C. Goldmark. An important feature of EVR is that the device can be stopped at any point in a program — or a given segment instantly repeated — so that the teacher is the master and not the slave of his electronic aide. And the hour at which a program is shown lies solely within the discretion of the teacher or the school, not some distant broadcaster.

Even at the introductory price of \$900 for the EVR unit (certain to fall with eventual mass production by Motorola, Inc.) and the cost of any color or black and white receiver, the expense to a school would be a pittance compared with the outlay of several hundred thousand dollars periodically contemplated by major school systems. The notion that instructional TV necessarily must be an inconvenient luxury of dubious value has been abruptly made obsolete.

After tinkering around with an EVR unit at home, this writer concluded that its implications and possible applications border on the staggering. For fun, a segment from the film "The Prime of Miss Jean Brodie" was stopped and made into a still picture. In leisurely fashion, one could examine the exquisite pastel color shadings, discuss the director's intent and appreciation of composition, and then run the whole scene a second time. The same could be done with instructional material ranging from medicine to mathematics. In a recorded lecture, for example, explanatory material could be repeated as often as necessary.

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It is scant wonder that British and Swedish school officials are eager to obtain EVR units as soon as possible. If a motion picture scene can be "frozen" and studied at leisure, so can a complex mathematical equation, the diagnosis of a brain injury, or an artistic masterpiece. Such a procedure cannot be followed with tape, and to do so with a conventional motion picture film projector would be merely to burn a hole in the film.

Eventually, EVR could be the means of introducing the

element of rental into show business and education. In the EVR unit, the film, in its self-threaded cartridge, is scanned electronically and the picture fed into an unused channel on any TV set. The day may not be too far off when one will be able to rent a movie at less cost than taking the family or one's date to a theater. CBS already has run one EVR film over 1,000 times with no picture deterioration; ask any librarian about the condition of a book after it has been thumbed by 1,000 readers.

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The advent of EVR — and, presumably, assorted variations thereof in the years ahead — in itself is an interesting commentary on the ill-informed pundits who sneer at electronics and the mass media. Giving the viewer a large measure of control over what and when he wants to see something on TV is the first step toward getting away from the hokum about the medium being the message. It is scientifically possible here and now for the individual to exercise the right of choice in TV; it is merely a matter of time and imagination before such a system reaches the public and the accompanying programming is prepared.

On this count one has to say a word apropos the world of electronic technology and its scientists, most of whom prefer to make lasting contributions to the cultural, informational and educational enrichment of the world rather than invent destructive military devices; many, if not most, have been denied that option by divisive pressures exerted by political leaders and aggressors of one sort or another.

Dr. Goldmark has suggested that there might even be a temporary moratorium on electronic invention, to give society a chance to digest and make intelligent use of a technology that keeps racing ahead before the world has a chance to comprehend what has been accomplished.

The degree of understanding between academicians and scientists already is exceedingly frail and part of the problem is that the former lag behind the times and the latter may be too far ahead. Many forms of TV — whether for the mass audience or the individual — do not have to be as bad as intellectuals so often, and quite legitimately, believe to be the case. But progress hardly is to be expected if the best brains elect to cop out and then whine over the results. There are many exciting new developments on the horizon, of which EVR is only one; to make them serve mankind will require the help of all.

For 20-odd years, there seemed no alternative in electronics to the mass medium concept, with all its built-in limitations. For this writer, one night with an EVR unit demonstrated that such a concept is no longer valid. If society can divest itself of its worn and pompous hang-ups of yesteryear, there's much to look forward to. Some revolutionists wear white laboratory coats.

## Books Reproduced on TV Cartridges

By JACK GOULD

A system of reproducing the printed word by electronic means is being advanced by C.B.S. Laboratories in conjunction with major European electronic and publishing concerns.

Dr. Peter C. Goldmark, president of the Columbia Broadcasting Company division, said yesterday that tests of reading from the television set already had been made and had been extremely promising, some participants preferring the screen to a book.

Instead of the conventional turning of a page, Dr. Goldmark said, a TV reader would have a remote control switch next to his favorite chair and flip the pages at his own convenience electronically. Illustrations could be included whenever or wherever the author or publisher decides.

A total of 500 novels of an average length of 50,000 words could be included in a black and white cartridge, which would be inserted in the C.B.S. electronic video recording device and connected to a TV receiver. The cartridge is tentatively priced at \$50.

If large type is used—to help

the five million Americans who require this service — 200 volumes could be included in one cartridge, Dr. Goldmark said. The cost would be around 25 cents a volume.

All the collected plays and sonnets of Shakespeare, for instance, could be included in one cartridge in the design intended for the hard of seeing. Similarly, the complete history of all religious works—the Bible, the Torah and the Credo of the Mohammedans—could be placed in one cartridge of film.

As for a modern best-seller, Dr. Goldmark said that on the average it would require only about 18 inches of film for TV reproduction. He did not entirely rule out the possibility of a cartridge containing all the best-sellers in fiction and non-fiction, which might augur a huge reduction in the retail cost of purchasing the printed word.

Dr. Goldmark noted that the proposed system need not be tied to a large set in the living room. It could just as easily be attached to a small bedside receiver for late-evening reading.

He doubted if the electronic video recording method would

have immediate application to newspapers. The immediacy of news, he observed, calls for a different approach from the filming of books. "I think in time journalism will have to develop its own electronic art form," he said.

Affiliated with the C.B.S. research endeavors overseas are the Imperial Chemical Institute, a large industrial organization, and Ciba, Ltd., in Britain; Librairie Hachette, the large French publishing house, and Thompson CSF, electronics manufacturer in Paris; the Robert Bosch Company and Videothek of West Germany; two concerns, Geigy and Additions Recontre, in Switzerland; Mondadori, Italy's largest book publisher; and Zanussi, electronic equipment manufacturer.

Alex Springer, the West German publisher, also is reported interested in becoming involved.

Independently active in exploring possible uses of TV playback facilities—or direct recording of TV off the air—are N. V. Phillips Telecommunications Industrie, of Hilversum, the Netherlands; Matsushita, owner of Panasonic, and Sony, which have made major inroads on the American set market.

## Goldmark's Variations on a Video Theme

The visual equivalent of the long-playing record has been so long predicted and expected that it has begun to assume fantasy proportions, like pocket computers and household robots. But there is nothing fantastic about the machine developed and demonstrated by C.B.S. and scheduled for production by Motorola. The Electronic Video Recorder, or E.V.R., is a briefcase-size machine that hooks up simply and quickly to any TV set. It plays pre-recorded films, fifty minutes in black-and-white or twenty-five in color; the viewer can run through all or a portion of a film, freeze single frames, or browse through a series of frames at his leisure. The film comes with a stereo sound track and can carry movies, still pictures, charts, diagrams—and will, when it is fully developed, carry books at the rate of a page per frame. Deliveries are to begin in September, and the price is set at \$795.

E.V.R. is not the first relatively compact video-playback device to be offered for sale. Ampex, Sony, Matsushita, and others have been marketing recorder/playback videotape units. Would-be competitors are also hard at work. Sony expects to market an updated version of its machine in the U.S. next year at something more than half the price of the E.V.R. And RCA is working on a system that uses holographic images—created by lasers—on low-cost plastic tape; RCA expects it will be cheaper than E.V.R. in every way.

But the C.B.S. machine is more than a promise (the RCA device is at least two years from production). It also shines with the exclusive technical wizardry of **Dr. Peter Carl Goldmark**, sixty-three, head of C.B.S. Laboratories and—tidily enough—the inventor of the long-playing record itself. Goldmark and his associates invented a revolutionary high-resolution film, used in E.V.R., which carries, says C.B.S., 25 percent more visual information than conventional videotape, at approximately one-sixth the cost. Even more technically arresting is the technique, also devised by Goldmark and his laboratory, for carrying color information on black-and-white film. Color values are electronically coded into the film when it is recorded; the player, following the code signals, adds color in the appropriate values when the film is played.

The E.V.R. machine was designed especially for pre-recorded programs, which C.B.S., with a huge program library and a new production plant, is in perhaps the best position in the industry to supply. And Darryl F. Zanuck of Twentieth



Goldmark of C.B.S. Laboratories

Leo Choplin • Black Star

Century-Fox has committed 1,500 films from the Fox library for E.V.R. reproduction.

E.V.R.-like devices have generally been touted as home-entertainment instruments. While these devices are still too expensive for that market, powerful demand is sure to pull the price down before too long. As a simple fact, E.V.R. is, as Goldmark puts it, "not just another tool in an audio-visual kit; it's a new medium, a new dimension." E.V.R. and its kindred ma-

chines fuse the dramatic potential of the audio-visual medium with the individual choice and convenience implicit in a book. A user, whether he be a classroom teacher or a man in his home, is freed from the fixed program material and time schedule inherent in broadcasting of closed-circuit educational TV; he has absolute choice over material, and over when, how, and at what length he can use it. "I think it's going to be the greatest revolution in communications since the book," says Goldmark.