

# American Cinematographer

International Journal of Motion Picture Photography and Production Techniques

MARCH 1975/ONE DOLLAR

ON LOCATION WITH  
"JAWS"



# F&B/Ceco says: “Don't buy a new camera now.”

## Here's how inflation has hit this market:

	1970	1972	1974	1970-1974
ARRIFLEX 35IIC	\$5908.	\$6370.	\$9386.	+ 59%
ARRIFLEX 16BL	8390.	9426.	13,888.	+ 65%
ARRIFLEX 16 'S'	5543.	5883.	8654.	+ 56%
ECLAIR 16NPR	7830.	10,524.	14,700.	+ 88%
ANGENIEUX 12-120 ZOOM	895.	1140.	1995.	+ 123%
ANGENIEUX 25-250 ZOOM	2645.	3410.	5775.	+ 118%

If you want to beat this ridiculous inflation, you'll keep your present camera running longer and avoid the high cost of a new purchase. F&B/Ceco wants to help you fight these high costs. That's why we're offering a complete repair and service program.

### Here's what we will do:

#### PREVENTIVE MAINTENANCE

- Check, clean and lubricate camera.
- Measure flange focal distance.
- Check ground glass depth.
- Check optical system.
- Inspect rollers.
- Clean film gate.
- Check lenses on collimator.
- Check motors for speed.
- Test batteries and cables.
- Test sync generator and cable.
- Clean and inspect magazine.
- Lubricate magazine rollers.
- Set clutches.
- Check footage counters.
- PLUS — our recommendations for necessary repairs, adjustments or replacement of parts.

#### COMPLETE OVERHAUL

- Completely disassemble camera and inspect each part for wear or defect.
- Replace worn parts.
- Clean and lubricate totally.

- Reassemble camera to factory specifications.
- Adjust flange focal distance.
- Adjust ground glass depth.
- Adjust film gate.
- Set pressure plate.
- Align optical system.
- Set motors for proper speed.
- Check sync generator.
- Guarantee: Same as Manufacturers new camera guarantee.



### Here's what it will cost:

	PREVENTIVE MAINTENANCE*	OVERHAUL**
16MM ARRI 'S'	\$45.00	\$210.00
16MM ECLAIR NPR	90.00	300.00
16MM SINGLE SYSTEM NEWS CAMERA	45.00	180.00
35MM ARRI	45.00	210.00
BNC REFLEX	120.00	750.00

\*Includes Camera Body, 1 Magazine and Lenses in Turret.

\*\*Includes Camera Body Only.

Contact us for repair and maintenance rates on other cameras or we will be happy to give you a repair estimate for a nominal charge of \$30.00 deductible from the cost of your repair.

### Here's the Clincher:

We'll also rent you the same equipment at a 50% discount off our regular rental rates while your gear is being repaired. We can do it because F&B/Ceco maintains a \$6,000,000 inventory of motion picture production equipment.

And we rent and repair everything. Cameras, lights, tripods, sound readers, editors, and all accessories.

So we can put the identical equipment in your hands during the repair — and save you half the rental cost.

Bring or ship your camera in today. You'll save money and help fight inflation at the same time.

For more anti-inflation information call or write:

### Repair and Maintenance Specialists



SALES - SOS DIVISION

315 West 43 St., New York, N.Y. 10036  
(212) 586-1420 • 7051 Santa Monica Blvd.,  
Hollywood, Calif. 90038 / (213) 466-9361  
Phone Toll Free (800) 223-5829. In New York State  
Phone Collect (212) 586-1420

# Will Rogers never met Sy Cane.

What's to like?

**Sy Cane is cheap.** In fact, his prices on every conceivable piece of motion picture equipment are as cheap as anybody's.

**Sy Cane is boring.** He knows more about cameras and equipment than Euell Gibbons knows about wild hickory nuts. And he's surrounded by a staff of camera fanatics with a single-minded expertise that borders on tedium. The only other thing Sy knows is the time of day. But he won't give it to anyone.

**Sy Cane is argumentative.** He won't sell you equipment just because you *think* you need it. He thinks it's wrong to sell someone more camera than

the job calls for (a character flaw, we suppose).

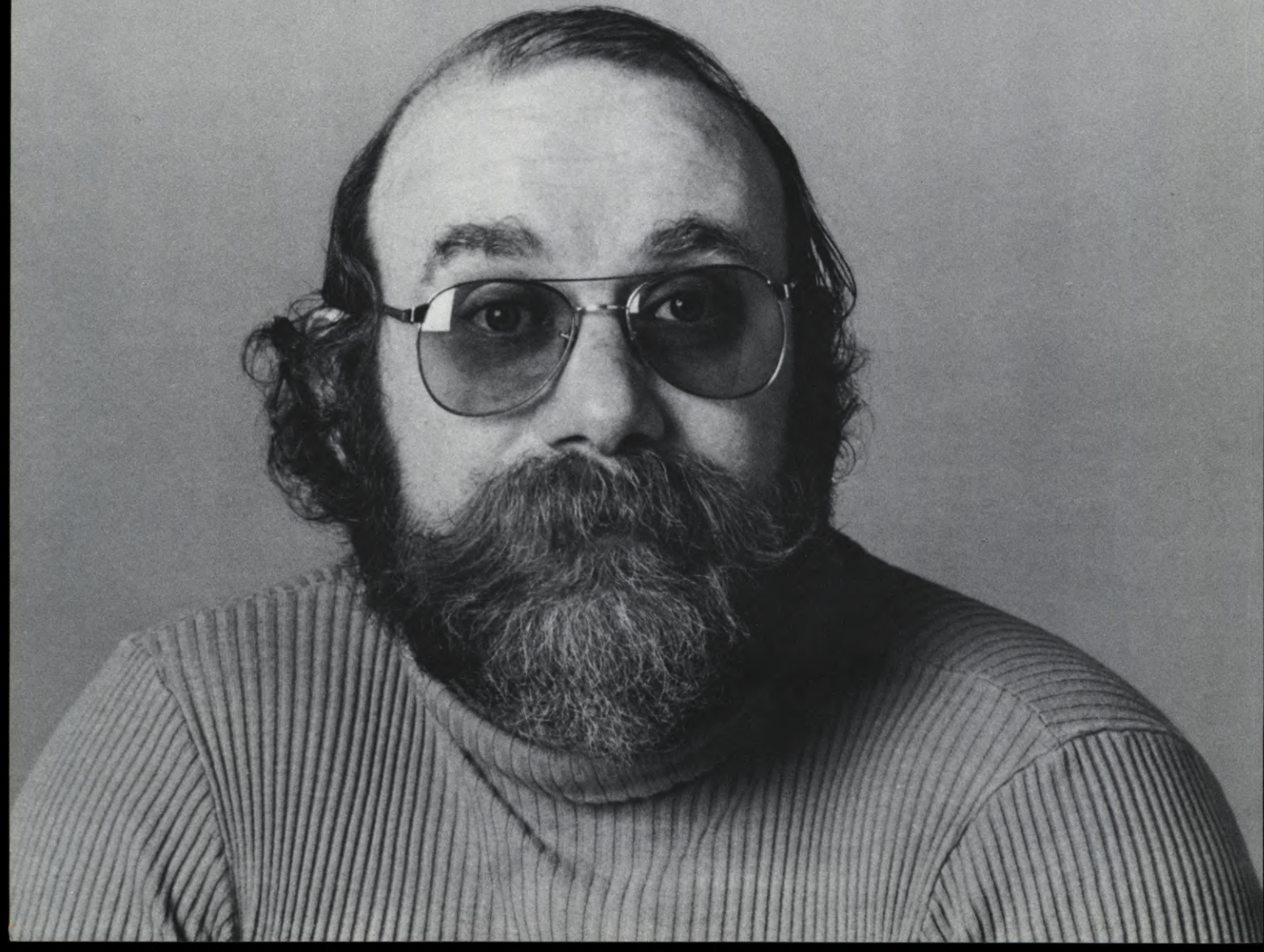
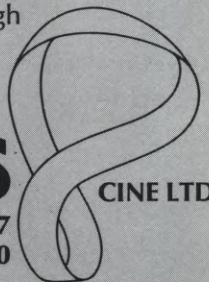
**Sy Cane is fussy.** Fussy enough to hire Eclair's Bernie O'Doherty to head up the Mobius service department. And heartless enough to guarantee 24 hour service in many cases, by threatening Bernie's life.

**Sy Cane is impossible.** Yet, through nobody's fault, a reality. He is, quite frankly, a man that only a customer could love.

**MOBIUS**

7 East 47th Street, New York, N.Y. 10017  
(212) 758-3770

CINE LTD.



# If you want a piece of the future, you'll have to get in line.

There is a certain responsibility that comes with creating a product that will change the course of filmmaking. Particularly when it is available in limited numbers to a vast market that will be stunned by the product's appearance and capabilities.

That product is the TGX-16, a 16mm single system/double system film camera that advances filmmaking into the 21st century.

**The Camera.** We could fill four pages of this magazine with the uniqueness of its features. But we'll let our free brochure, which you'll be sending for today, tell the whole story.

However, to whet your appetite, imagine a package of scarcely 8 lbs. on your shoulder (less than 15 lbs., loaded and lensed to the gills). A

Hi Rez body that ignores extremes in temperature. outside sound, scuffs, scrapes and scratches.

A body that's virtually indestructible. It has a half-heart cam movement for fast pulldown and high-speed capability. It offers quiet and efficient straight engagement. It forms loop automatically.

A 400' coaxial cassette mag is encased in the TGX-16 as part of the configuration of the camera. But you can top-load a 1200'

Mitchell mag. A heavy-duty flange mount accepts all 16mm format lenses. There's a constant and variable speed crystal motor. Positive locking of speed. And an illuminated frame line.

The TGX-16 has a multi-informational viewfinder with a VU meter for sound level, an out-of-sync warning light, digital footage counter (with a memory, no less) and low battery warning light. The battery is an integral part of the camera, runs a minimum of six cassettes and can be charged in as little as 15 minutes.

The self-contained detachable one-pound amplifier is a marvel in itself with enough incredible features to warrant a separate ad. The magnetic head, which features linear flow systems, eliminates film flectures and assures purity of sound.

The electronics of the TGX-16 are all on printed circuits, so 24-hour service becomes commonplace instead of wishful thinking.

**You must be on our Option List.** Now that we've whet your appetite, we would hate to see you disappointed. The TGX-16 is in full production by our manufacturing arm, Texas General Cine Corp. We expect orders over the next two years to be triple that of our production capability. By filling out the coupon at the bottom of this page, you will reserve an option for yourself and at the same time request a more comprehensive brochure. You will, in the near future, have the opportunity to exercise your option or be dropped from the list.

## TGX-16

The future is now.

**Gentlemen:** Please place me on your option list for the TGX-16 camera, and forward a brochure immediately. I understand that I am under no obligation to buy.

NAME \_\_\_\_\_

COMPANY \_\_\_\_\_ PHONE \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

**gc** general camera (212) 594-8700  
corporation 471 Eleventh Avenue, New York, N.Y. 10018



# American Cinematographer

International Journal of Motion Picture Photography and Production Techniques

The American Society of Cinematographers is not a labor union nor a guild, but is an educational, cultural and professional organization. Membership is by invitation to those who are actively engaged as Directors of Photography and have demonstrated outstanding ability. Not all cinematographers can place the initials A.S.C. after their names. A.S.C. membership has become one of the highest honors that can be bestowed upon a professional cinematographer, a mark of prestige and distinction.

**MARCH, 1975**

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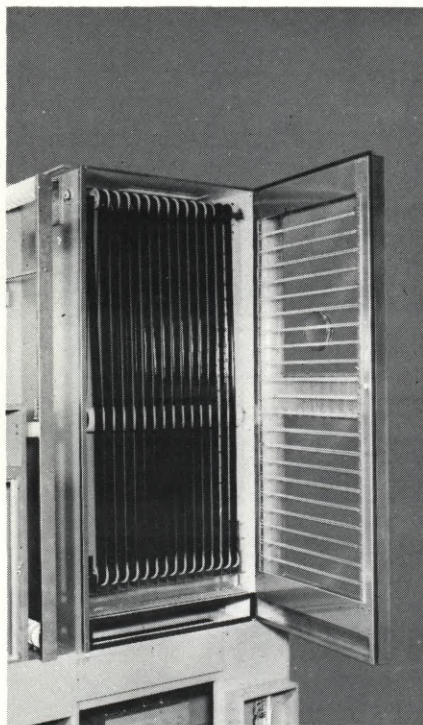
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ON THE COVER: The star of "JAWS", a Zanuck-Brown feature production for Universal, Bruce, the mechanical Great White Shark, rears his ugly head into the camera lens. The robot (there were actually three) cost \$250,000 to construct and twice that to operate during filming of the Bestselling novel by Peter Benchley.

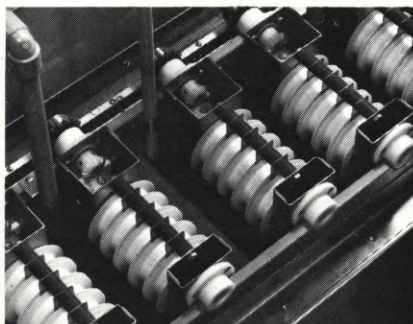
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# A few reasons why Houston processors are so much better.

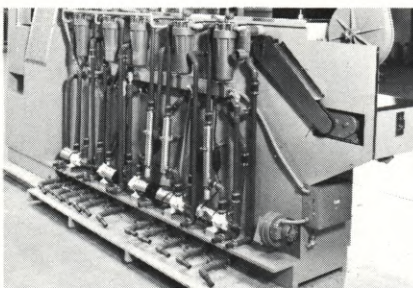
The fact that Houston film processors do their job so well is the result of 45 years experience in designing, building, operating, testing and improving every part, every material, every function.



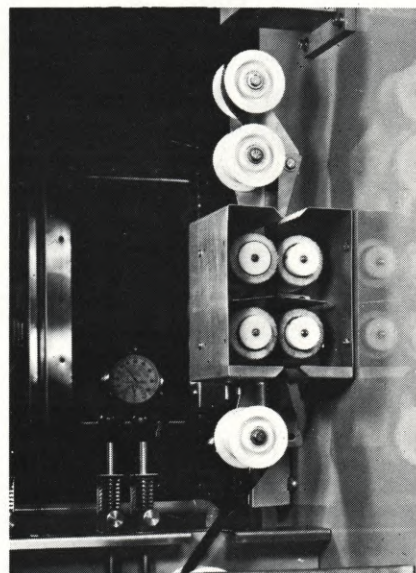
Houston's impingement film drying is the most efficient, positive system available. Allows complete circulation of warm air over and around film. Dries thoroughly without spotting.



Low, uniform film tension is maintained by Houston's demand type drive with all film spools completely submerged. No springs, less maintenance. Unlike many machines, film racks are quickly removable for periodic maintenance.



Thermostatically-controlled heat exchangers in the recirculation lines are extremely sensitive. Provide constant, accurate heat as required. Efficient chemical filters are easily accessible. Unscrew for fast servicing.

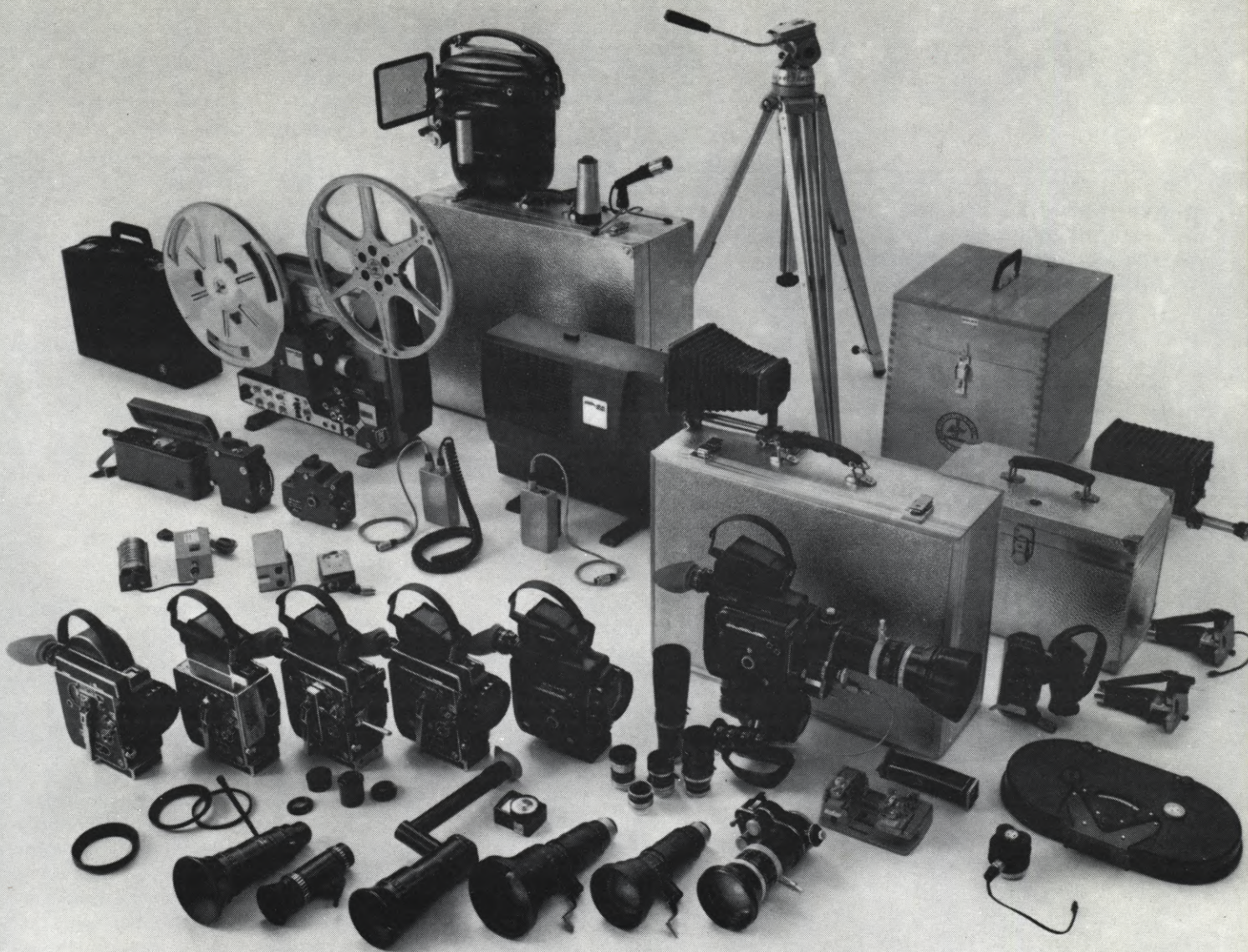


Houston buffer squeegees gently remove excess liquid before film enters dry box. Highly efficient. Extremely quiet. (Air squeegee is available if desired).

There are many other reasons why Houston processors are so much better. And there's a machine to process every type and size of color or b&w film.

Call or write: Houston Photo Products, Inc. 655 E. 20th St., Yuma, Ariz. 85364. (602) 782-3677. Telex: 669-450.

**HOUSTON**  
PHOTO PRODUCTS, INC.  
YUMA, ARIZONA



# THE WHOLE SHOOTING MATCH.

Maybe you're shooting documentaries. Or features. TV news. Or commercials (live or animated); travelogues; sports; wildlife; educational films; macrocinematography or cinephotomicrography, you name it. Bolex can provide you with exactly the right camera body, lenses and accessories to assure you'll have just what you need when you need it. (And at prices that may surprise you with their economy.)

**The cameras:** You get to choose from five rugged camera bodies designed for hand held or tripod use. With either three-lens turret or bayonet mount, with spring motor or electric drive, with 100' to 400' film capacity, for silent filming or sync sound with sync pulse generator or crystal. And that's just the beginning.

Consider features like: automatic threading, flickerless reflex viewing and focusing with complete depth of field control, a filter slot behind the lens, single-frame counter, unlimited film rewind, variable speeds for accelerated and slowmotion filming, single frame filming, variable shutter with automatic control possibility, registration claw for total accuracy in picture steadiness even when films are blown up to 35mm.

**The lenses:** With the Bolex system, you can choose from 7 fixed focal length lenses, ranging all the way from 10mm super wide angle to long 150mm telephoto. And they all have built in macro focusing, automatic depth of field scales and diaphragm presetting so you can step down the aperture without taking your eye off the reflex finder. You can choose a lens as fast as  $f/1.1$ , or one that can focus down to one inch without accessories.

The system offers you seven zoom lenses with zoom ranges from 5:1 to 10:1. One of those is the Vario Switar 100 POE-4 with built-in power zoom, automatic light measuring through the lens, focusing as close as four feet and picture sharpness equal to any good fixed focal length lens.

**The works:** You can extend your basic equipment almost indefinitely with a wide range of accessories.

For instance: if you choose a spring-wound camera, you can automate easily with any one of three auxiliary motor drives, for time-lapse or animation, for variable speed shooting or for filming with sync pulse generator or crystal. The system offers you tripod; monopod; camera grips; blimps; an automatic fading device; cable releases; matte boxes (complete with masks); an underwater housing; attachable exposure meter; 400' magazine; closeup lenses; extension tubes; optical magnetic sound projector.

It's quite a list. But that isn't all. The full story of Bolex's whole shooting match fills a 32 page book. Which we'll be happy to send you. Just write to Paillard Incorporated, 1900 Lower Road, Linden, N.J. 07036. You'll get a very professional response. Other products: Hasselblad cameras and accessories.

**BOLEX 16**  
PAILLARD

# WHAT'S NEW

IN PRODUCTS, SERVICES AND LITERATURE

## **CANON ANNOUNCES DISCOUNT RENTAL PROGRAM TO INTRODUCE NEW C10 x 12 12-120mm MACRO ZOOM LENS TO INDUSTRY**

Mr. Yasuji Asai, Manager of Canon Professional Motion Picture Products Division, recently announced a program designed to acquaint professional and student 16mm filmmakers with the firm's new 12-120mm Macro Zoom Lens. As an incentive, the program offers a \$10 discount to individuals renting the C10 x 12 Macro Zoom lens for the first time at participating dealers.

Said Mr. Asai, "Once people have the opportunity to try our new Macro Zoom, we feel there's a good chance they will want one for themselves. Because of the lens' superior optical performance in conventional applications . . . and because of the many creative possibilities opened by its macro potential."

Possibly the most unique feature of the new Canon Macro Zoom is the effects which can be achieved with the aid of the zoom ring. In the "normal" (locked) position, the lens operates as a conventional zoom. By using the macro ring in conjunction with the zoom control, it is possible to rack focus from an extremely near subject to distant ones . . . as for example, a businessman on the telephone just inches from the camera . . . to a person on the other side of his desk . . . to someone at the end of a long hallway. For the first time, it is also possible for a stationary 16mm filmmaker to "dolly" with a subject moving towards or away from the camera, *maintaining constant field size* and focus with a single control. For extra-closeup work, the Canon Macro Zoom focuses to within 1mm from the front element, with exceptional sharpness.

In conventional applications, the Canon 12-120mm Macro Zoom delivers results normally associated with prime lenses. An exclusive artificial fluorite element increases performance still further by diminishing chromatic aberration to near-theoretical limits.

Dealers participating in the program include: Adolph Gasser, Alan Gordon Enterprises, Camera Mart, Galaxy Film-Service, General Camera, Gordon Yoder, Helix, Mobius, Oscar H. Hirt, Photomart, Skinner Studios, Standard Theatre Supply, Victor Duncan.

## **THE FILMEX I-SHEET SHOW, AN INTERNATIONAL EXHIBIT OF OVER 400 MOVIE POSTERS**

An International Film Poster Art Exhibit, "The Filmex I-Sheet Show," will be one of the major highlights of the Los Angeles International Film Exposition (Filmex) at the ABC Entertainment Center in Century City. Gary Essert, Filmex Director, announced that the Exhibit will be comprised of more than 400 motion picture posters from over twenty countries.

The non-competitive Art Show, which will be free to the public, opens March 1, 1975, two weeks before the Exposition and runs concurrently with the Exposition through March 26, 1975.

The exhibit will be compiled from several collections including New York's Museum of Modern Art, the 1974 Cannes Film Festival poster competition, the Polish Film Museum, motion picture distributors in this country and abroad, private collections and from designers themselves.

The exhibit will be selected by a panel of the nation's most prominent graphic art authorities and will include international designers Saul Bass, Lou Danziger, Anthony Goldschmidt, Milton Glaser, Art Director of NEW YORK MAGAZINE, and Kenneth Donahue, Director of the Los Angeles County Museum of Art. The exhibit is being coordinated by Jivan Tabibian and Sally Shapiro.

Filmex opens with the US West Coast Premiere of FUNNY LADY, a Rastar Production from Columbia Pictures, on March 13 at Plitt's Century Plaza Theatre at the ABC Entertainment Center in Century City.

## **E-CAM COMPANY ANNOUNCES FULL SERVICE CAPABILITIES FOR ALL ECLAIR CAMERAS, INCLUDING THOSE MADE IN ENGLAND**

The E-Cam Company, exclusive U.S. importer and distributor for French-made Eclair cameras, has announced that it will service and repair all makes and models of Eclair cameras no matter where they were manufactured, according to Sam Getzoff, general manager.

"While we are the representatives of the original French manufacturer of Eclair cameras, we realize that there are English-made versions of the Eclair in use in this country," Getzoff said.

"Additionally, we know that because of certain recent developments, the repair and servicing of the English cameras may be difficult to obtain. Therefore, we are making available our complete factory-authorized Eclair service facilities to any Eclair owner, no matter where the camera was manufactured," Getzoff added.

Inquiries regarding Eclair service and repairs should be addressed to E-Cam Company, Attention: Service Department, P.O. Box 3955, North Hollywood, Calif. 91609. Telephone is (213) 466-3700.

## **NEW DIFFUSION MATERIAL FOR LIGHTING CONTROL**

VINYLITE, a new material developed to diffuse and soften light more efficiently, while transmitting more of the light, is now available. The material's unique characteristic is its surface texture pattern that acts like a sheet of tiny lenses to disperse the light. There are no pigments or frosts to cut light transmission. Because of this efficiency factor, there is a light loss of only one-half stop. The nature of VINY-LITE still allows some control of the light, as it is somewhat directional. It is especially valuable for shooting on locations where space, costs and power create limitations.

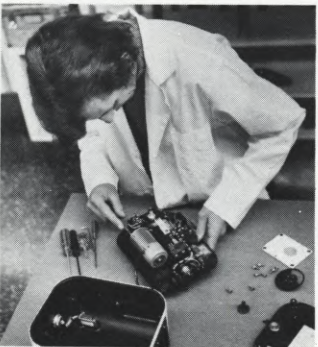
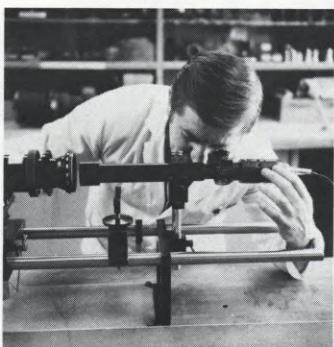
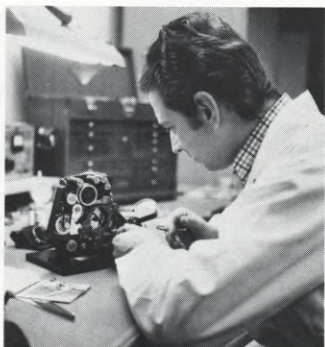
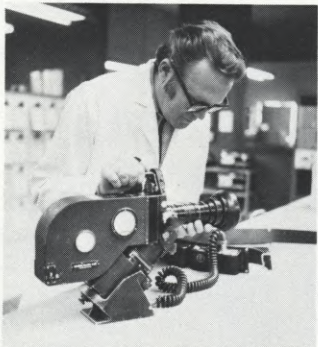
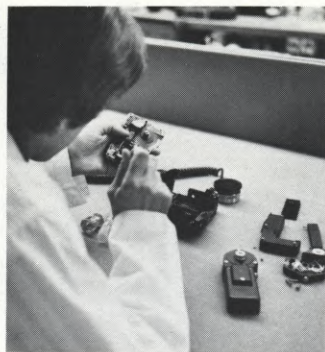
Best results are achieved when the VINY-LITE is placed in front of a light on the barndoors or, better yet, hung farther away from the light and closer to the subject. It requires no special lighting units, but can be used with any light source that is already available — quartz lights, photofloods or studio lamps. It can even be used in front of FAY lights for a softening effect with minimum light loss. Although it can simply be hung in front of a light, it can also be used in frames in most lights. It is especially effective on windows, or used outside to create a soft look in bright sunlight. It has a .0045 thickness, which allows for rough handling and makes it reusable.

VINY-LITE is being used in the major studios and was most recently employed to achieve a primary source of soft lighting for the 20th Century-Fox / Peter Bogdanovich musical, "AT LONG LAST LOVE", by draping entire sets overhead, while using hard light from standard studio lamps.

VINY-LITE is available in 54-inch 25, 50 and 100-foot rolls.

For free samples and application information sheets, contact: AGUILAR'S LIGHTING WORKS, 3230 Laurel Canyon Blvd., Studio City, Calif. 91604. (213) 766-6564. ■





# service is our specialty

We call our staff of camera technicians "The Service Team." Mainly because each one is a specialist whose knowledge of maintenance and repair goes beyond what you would normally expect. Our specialists, many of them factory-trained and whose expertise we rely on to keep our vast rental inventory in top working condition, believe, as we do, that expensive cameras deserve the best treatment available. That is why, when you bring in your professional equipment for servicing — whether it is an Arriflex, Eclair, CP-16, Mitchell, Milliken or any camera or accessory item from lenses to lights — you can be sure your AGE Inc. service technician is the most competent in the

business. Your equipment is repaired quickly but efficiently, thus assuring you of a minimum of down time. If your equipment is in need of a complete overhaul or just a minor adjustment, winterizing, modifying or a combination of these services, either mechanically, optically or electrically, check with our Service Team today. **Most pros do.**

Shipping equipment to AGE Inc. for service: Equipment must be sent freight pre-paid and fully insured. We recommend that a list of problems be included with equipment. Our technicians will analyze the problems and prepare a cost estimate. Those in a hurry can request repairs without estimate. For further information, call (213) 466-3561.

SERVING THE WORLD

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# SAC demands the best.

Above, the B-52 Stratofortress. Two hundred awesome tons of unquestionable capability.

It gives you some idea of the kind of equipment it takes to satisfy the Strategic Air Command.

Their standards for aerial recon film and film processors are pretty stiff, too.

In fact, the quality and quantity requirements for SAC's film processors are staggering.

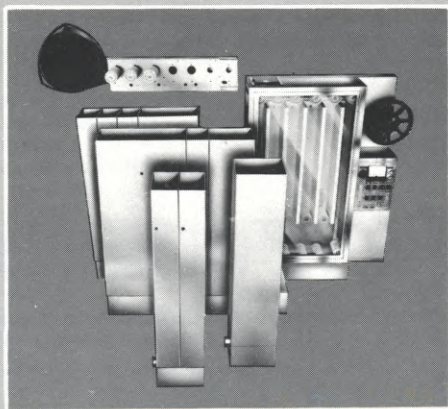
Tens of millions of feet of high altitude aerial roll film must be processed annually. And the definition of ground events on a single frame has to be nothing short of spectacular.

Houston Fearless processors measure up. The fact is, at least half of all processors on duty with SAC are ours.

We think our technological capability has a lot to do with it. And that same capability goes into every Houston Fearless processor made, including our new

Advanced Colormaster processors for Color Negative II motion picture film.

They might just be the only processors you can buy for ECN II with a *proven track record*.



This is possible because of our unique modular construction concept. We use the same tried and true components in our Advanced Colormaster processors for ECN II as we do in our Advanced Colormaster processors for color positive, reversal, and intermediate films, and our Advanced Labmaster processors for black and white motion picture film and microfilm. Only the *arrangement* of components is different.

For all the facts on our off-the-shelf custom designs, stainless steel construction, Central Diagnostic Service Center and nationwide sales and service organization, contact the Marketing Department of Technology Incorporated at (213) 479-3941...or write to the address below.

## Advanced Colormaster™

**Houston Fearless®**  
PROCESSORS



**Technology Incorporated**

11801 West Olympic Blvd., Los Angeles, California 90064  
Cable Address: TECHINCLA • TWX: 910-342-6899  
In Canada: Braun Electric Canada Ltd., Ontario

# INTRODUCING THE NEW CP-16R INFORMATION DISPLAY

Our *information display* system for CP-16R reflex cameras keeps you posted at all times about critical camera operating conditions. It is logically organized, easy to interpret, reliable and dependable in performance.

This is how it works.

Advanced solid state circuitry permits the use of dependable light emitting diodes (LEDs) as monitoring devices, rather than the usual delicate metering needles which are so susceptible to damage.

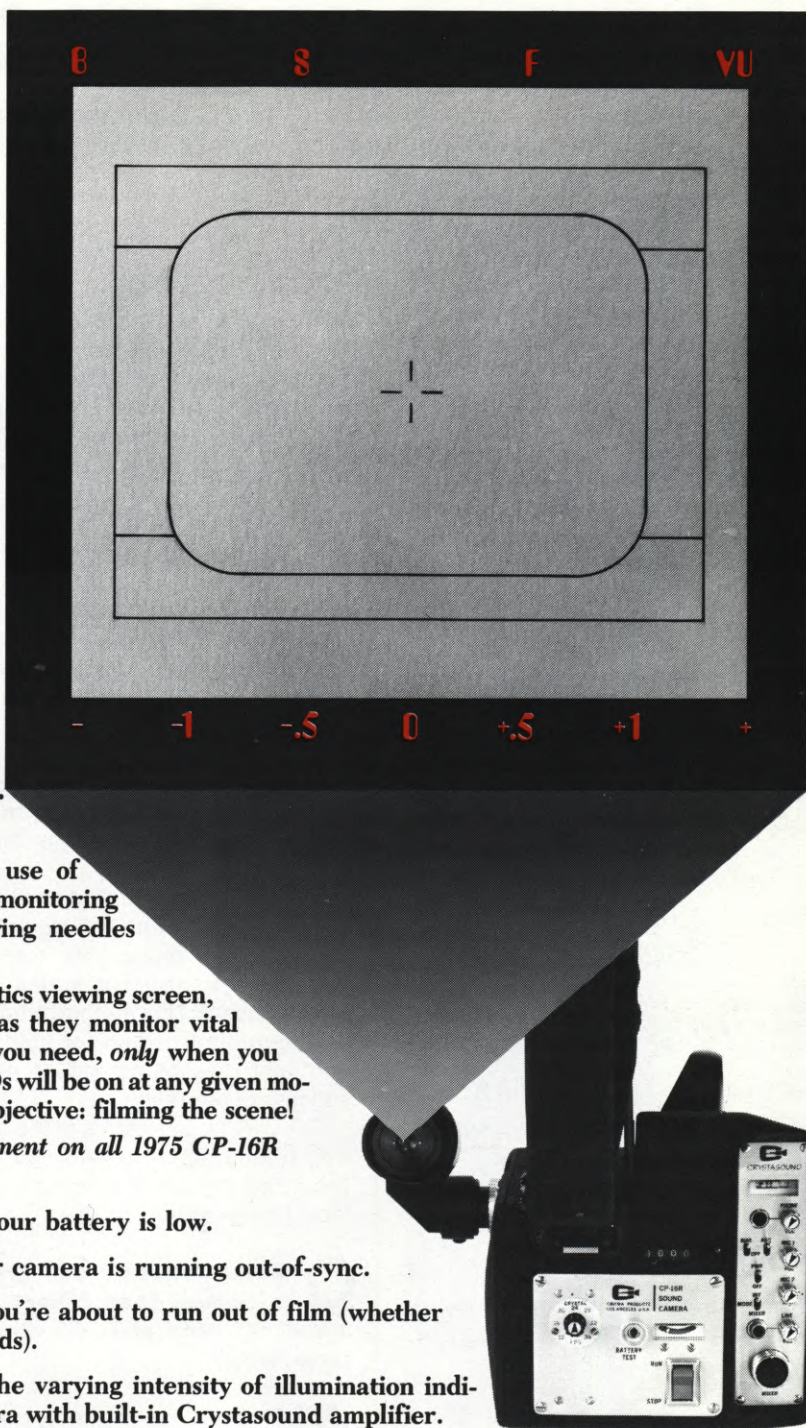
Above and below our unique CP-16R fiber optics viewing screen, various LEDs light up or change in intensity as they monitor vital camera functions. You get all the information you need, *only* when you need it. Most of the time, no more than two LEDs will be on at any given moment. So you can concentrate on your prime objective: filming the scene!

The following indicators are standard equipment on all 1975 CP-16R reflex camera models:

- B** — for "Battery." It lights up *only* when your battery is low.
- S** — for "Sync." It lights up *only* when your camera is running out-of-sync.
- F** — for "Footage." It lights up *only* when you're about to run out of film (whether you're shooting with 200 ft. or 400 ft. film loads).
- VU** — for "VU Meter," of course. Here, the varying intensity of illumination indicates modulation levels in the CP-16R/A camera with built-in Crystasound amplifier.



CP-16R/A reflex camera shown with optional fully automatic exposure control system.



The exposure information (at the bottom of the display) is featured only in CP-16R reflex cameras equipped with our *optional* semi-automatic or fully automatic exposure control system. In which case, the illuminated **0** represents "Correct Exposure." And the symbols to the right and to the left, progressing in ASA half-stop increments, light up to indicate over- or underexposure.

Our CP-16R *information display* truly informs, without distracting. Without cluttering up the viewfinder. Sure, 1975 CP-16R camera models cost more. But the *information display* alone is well worth the increase. And it is but one of the many new innovative design features that make the CP-16R reflex the most outstanding 16mm camera system ever!

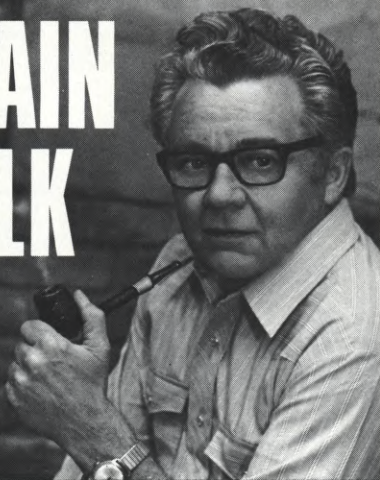
For further information, please write to:

**cinema E products**  
CORPORATION

*Technology in the Service of Creativity*

2037 Granville Avenue, Los Angeles, California 90025  
Telephone: (213) 478-0711 ■ Telex: 69-1339 ■ Cable: Cinedevco

# PLAIN TALK



by *J. Carl Treise*

## "The one thing no processor manufacturer talks about"

I've read a lot of film processor ads and haven't found any manufacturer who's willing to say how long it takes to install his unit and get it working.

It's not hard to guess why.

The usual installation often takes up to 3 or 4 weeks and can cost a bundle.

So a man would have to be a fool to bring the subject up, right? — Wrong.

I'm more than happy to talk about it.

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# QUESTIONS & ANSWERS

Conducted by CHARLES G. CLARKE, ASC.  
and WINTON HOCH, ASC.



(Inquiries are invited relating to cinematographic problems. Address: Q. & A., AMERICAN CINEMATOGRAPHER, P.O. Box 2230, Hollywood, Calif. 90028.)

**Q** How can I make good images of the sun? On my next job I will need to make shots of the hot, summer sun over Tokyo. Also other portraits pointing the camera directly at the sun. I film documentaries on 16mm Eastman film.

**A** Photographing the mid-day sun has always posed problems due to lens flares. Because of the extra glass elements in a zoom lens, it probably is better to use regular telephoto and normal angle lenses. Heavy absorption Neutral Density filters will help the exposure problem. Read your exposure meter through the Neutral Density filter you select that permits a reasonable f. stop. Even so, to reduce lens flares you should center the sun in your composition.

For those "portraits" against the sun, you may photograph *still* pictures of the sun and rear-project the transparencies on a translucent screen behind your subjects. This method would allow considerable freedom for composition and light-balance as well as ease and success of operation.

For very large images of the sun, you may photograph the telescope images projected at your Planetarium or some local Observatory.

**Q** Some lenses I use give less exposure than others on the same "T" stop and "f." stops settings; why?

**A** There are two factors involved here. First, the exposure of a long shot of a scene can be different from the exposure of selected areas as you change the lens focal length and photograph that area. This stop setting is dependent upon your evaluation as a cinematographer of the artistic presentation of the scene. If you ignore the highlights and reach for the shadows or vice versa, that is your election and responsibility. This change in stop could give the impression that the lens stops were not consistent. Second, some lenses are not consistent regarding "T" stops or "f." stops. Have your lens or lenses checked at your local camera repair facility or check your lenses yourself by photometric techniques. This can be accomplished if you

have an electronic or radio shop available, i.e., Radio Shack. Obtain a CdS photo cell, some resistors and a very sensitive current detector. Connect them in the customary manner, place the photo cell in the film plane. Shield this pick-up from outside light and then put up a white surface in front of the lens and illuminate it with light (by about 1000 footcandles). Determine the reading of the lens wide open, then check each stop. Do this with all your lenses making sure the white surface in front of the lens is uniformly illuminated. You can now compare your lens stops. Several should agree closely. Select the average value of the most consistent as your "standard", then re-evaluate the stop marks on all your other lenses, you should now be on safe ground with respect to constant exposure. Don't forget that depth of focus and depth of field is still a function of "f." stops, i.e., the physical size of the aperture.

**Q** Color saturation is a term that is often used in current articles regarding color film; what is its meaning?

**A** That ever -handy dictionary gives a pretty good answer. However, Munsell has presented an excellent and complete description of color. He defines color as having three attributes; hue, value and chroma. Hue he defines as the actual color, i.e., red, green, blue, purple, etc. Value is the brightness; a red card in the shadow has a low value, in the bright light it has a high value. Chroma is his term for "color saturation". The purest and most saturated colors are spectrum colors created by a spectrophotometer or equivalent using a narrow light entrance slit. These are essentially monochromatic colors.

Additionally there are available many brilliant dyes and paints that transmit or reflect colors with high chroma values (or highly saturated colors). Saturated colors can be desaturated by thinning, if a dye; adding white pigment, if a pigment; or adding white light, if they are projected or monochromatic colors. Your local library may have a Munsell Color Book.

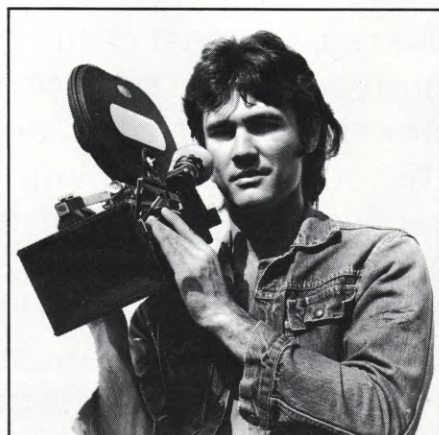
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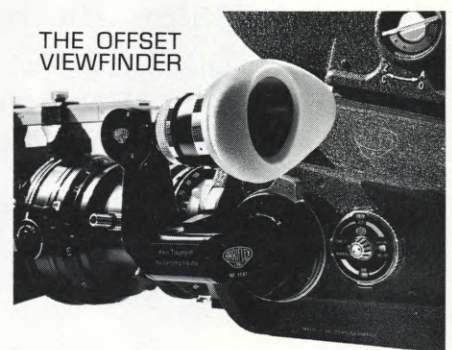
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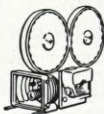
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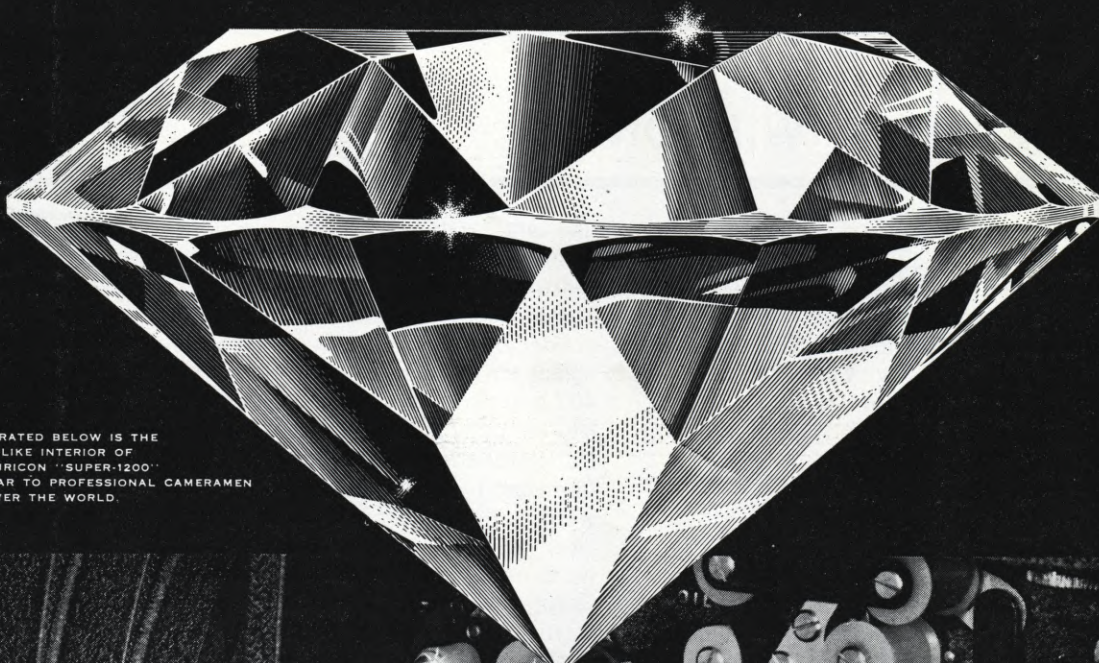
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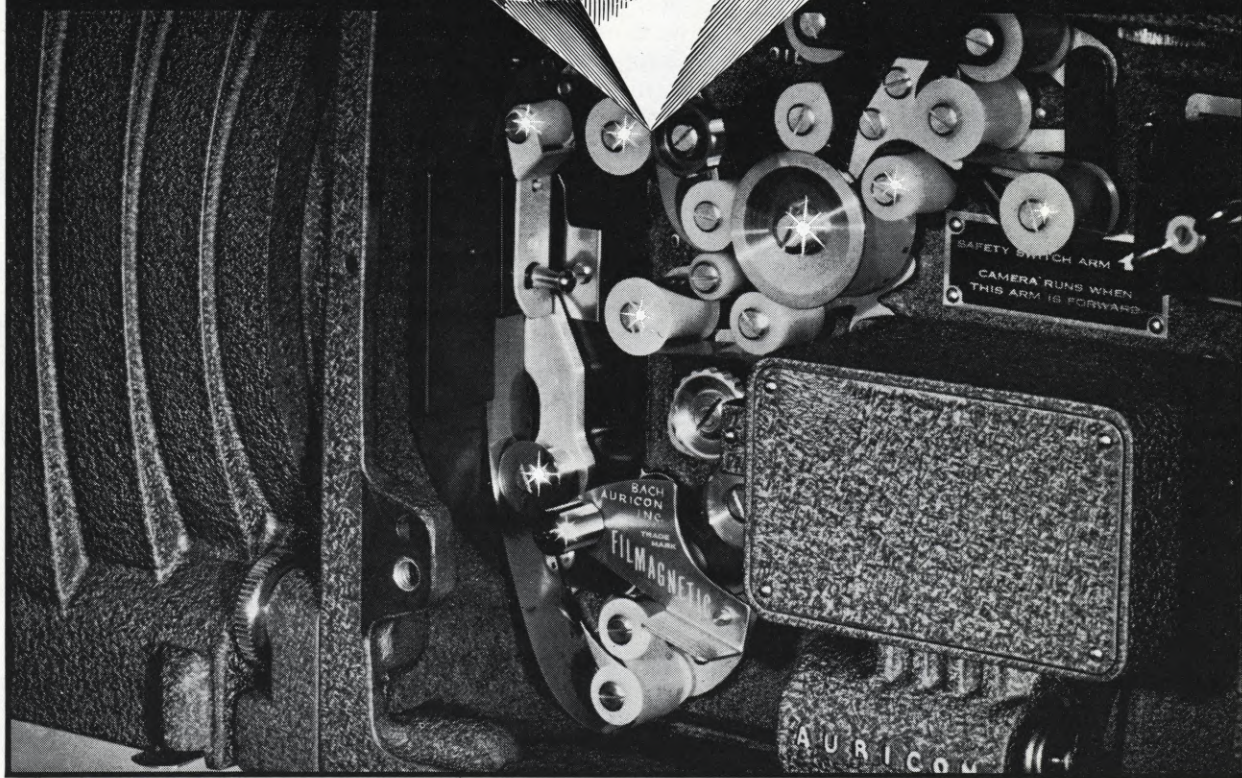
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# CINEMA WORKSHOP



By ANTON WILSON

## Battery Connectors

There are three types of power cable connectors in common use on most professional motion picture batteries. These are the 5-pin Cannon XLR, the 4-pin Cannon XLR, and the 2-pin banana. The 2-pin banana was very popular for

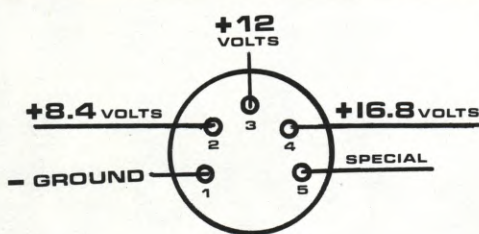


FIGURE 1—5-pin XLR Battery Connector

use with Arriflex cameras since the 1940's. At the time it was introduced there was not the present variety of commercially available multi-pinned connectors and the banana was sufficient for the early needs. Back in the 40's and early 50's there was no necessity for polarization, as there were no transistorized motors that could be damaged by inverted polarity. Two pins were sufficient, because there was no need for multiple voltages or connections for pilotone and bloop.

Times have changed, and the 2-pin banana is essentially obsolete, although there are still many in use. Almost all new battery systems have standardized on the 5-pin Canon XLR connector. Arriflex themselves have made the transition to the 5-pin XLR and most independent battery manufacturers (ANTON/BAUER, CINE 60,

FIGURE 2 — Battery connector for 4-pin XLR

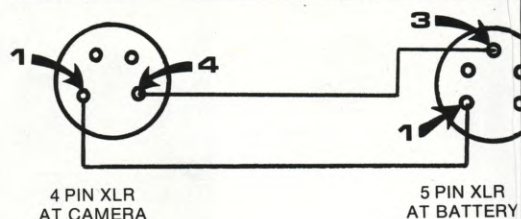
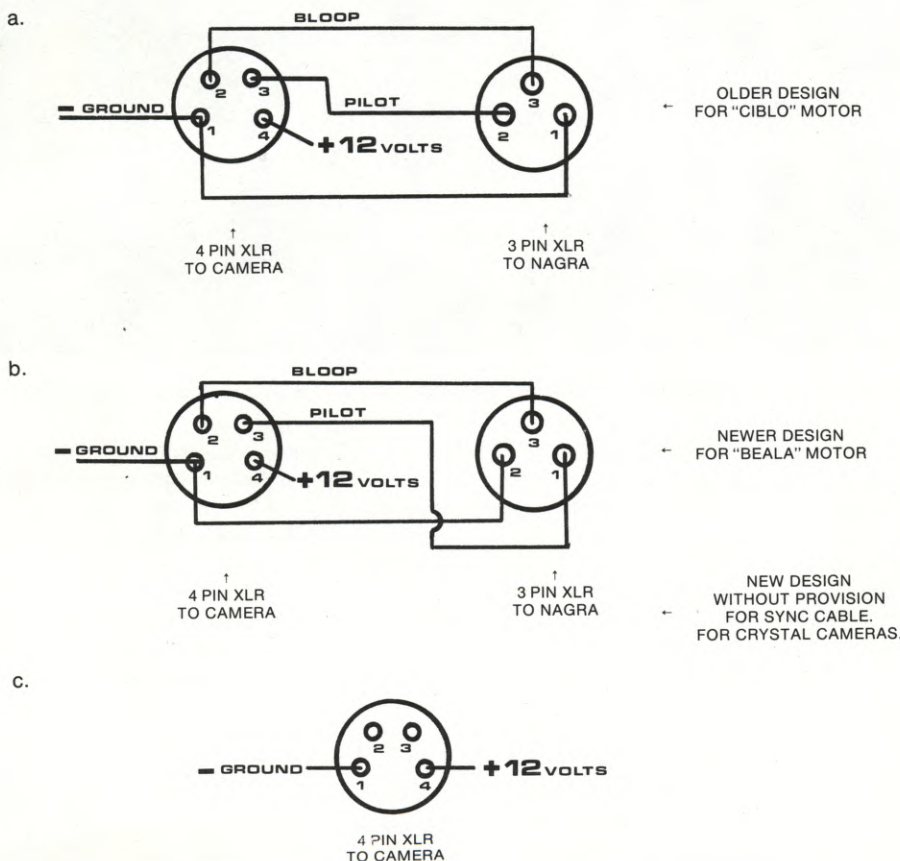


FIGURE 3 — Power cable connection from Eclair NPR or ACL camera to 5-pin XLR at Battery

etc.) have also adopted this convention. The main reason for the popularity of the 5-pin XLR is its universal applicability. The five pins provide a multitude of voltages to run almost any professional motion picture camera. The Arri 16S & 16M run on 8.4 volts; the Arri 35IIC needs 16.8 volts; and most modern cameras (Bolex, Arri 16BL, 16SR, 35BL, and Eclair NPR, ACL) run on 12 volts. The 5-pin Canon XLR provides all these voltages automatically. Referring to FIGURE 1, PIN 1 is ground; PIN 2 is +8.4 volts; PIN 3 is +12 volts; PIN 4 is +16.8 volts; and PIN 5 is reserved for special application.

Power cables are simply wired to the 5-pin connector according to the camera being used. Arri 16S & 16M: ground to PIN 1 and positive to PIN 2. Arri 35IIC: ground to PIN 1 and positive to PIN 4. All 12-volt cameras: ground to PIN 1 and positive to PIN 3. Thus, no voltage switch is necessary, as the properly wired cable automatically taps the correct voltage for the application.

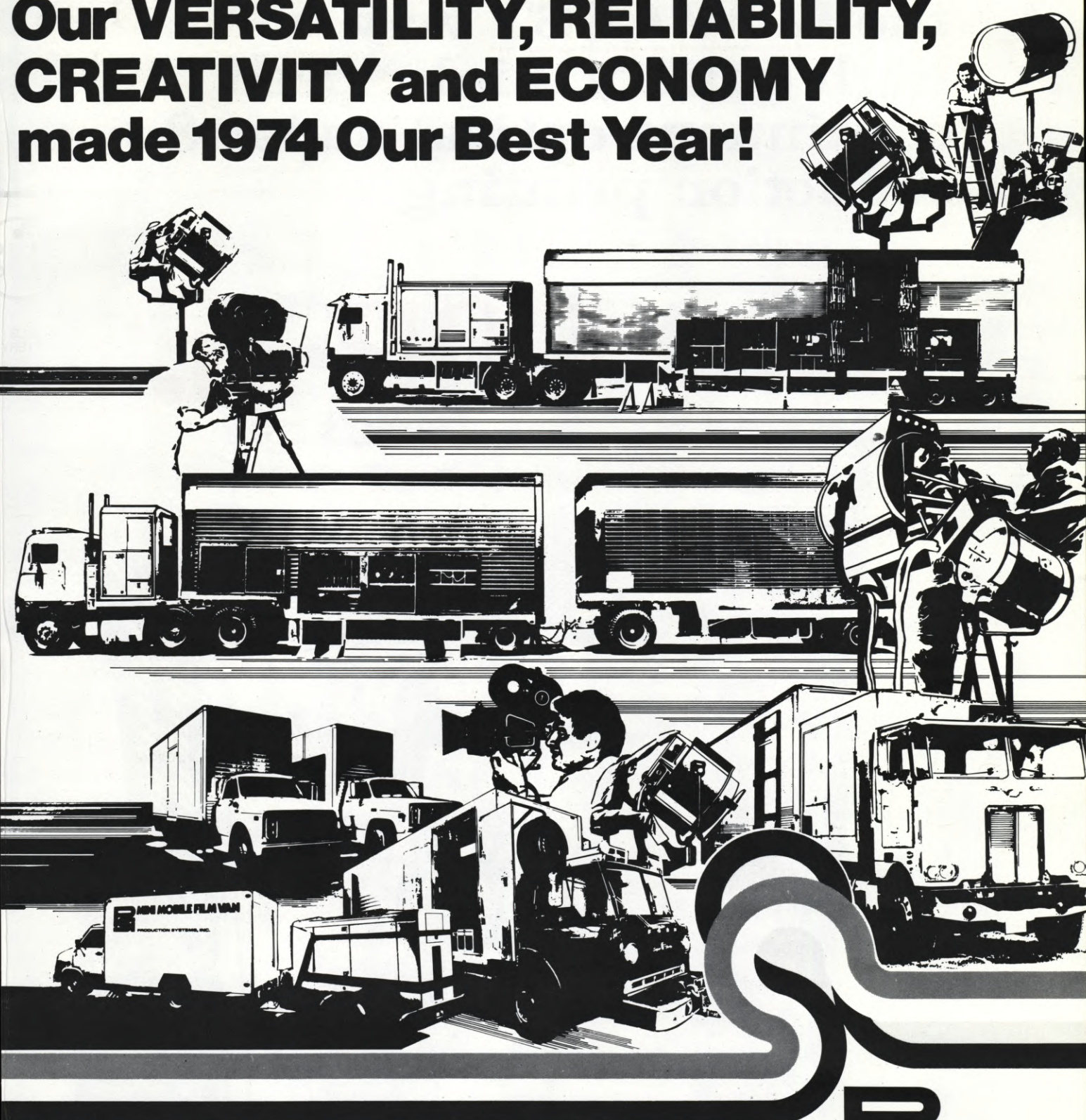
One world of caution: Be very careful when soldering these XLR connectors. Even the smallest drop of solder between *any* of the five pins will cause a dead short across the battery.

What about the 4-pin Canon XLR? Why not standardize on the 4-pin XLR which has been around for years? The 4-pin connector gained popularity with the Eclair NPR which used a 4-conductor power cable; two wires for power and an additional two wires for pilotone and bloop. The pilotone and bloop cable to the Nagra came from the battery instead of directly from the camera, as is the Arriflex convention. Thus, the necessity for the 4-pin connector. FIGURE 2 explains the 4-pin

Continued on Page 341



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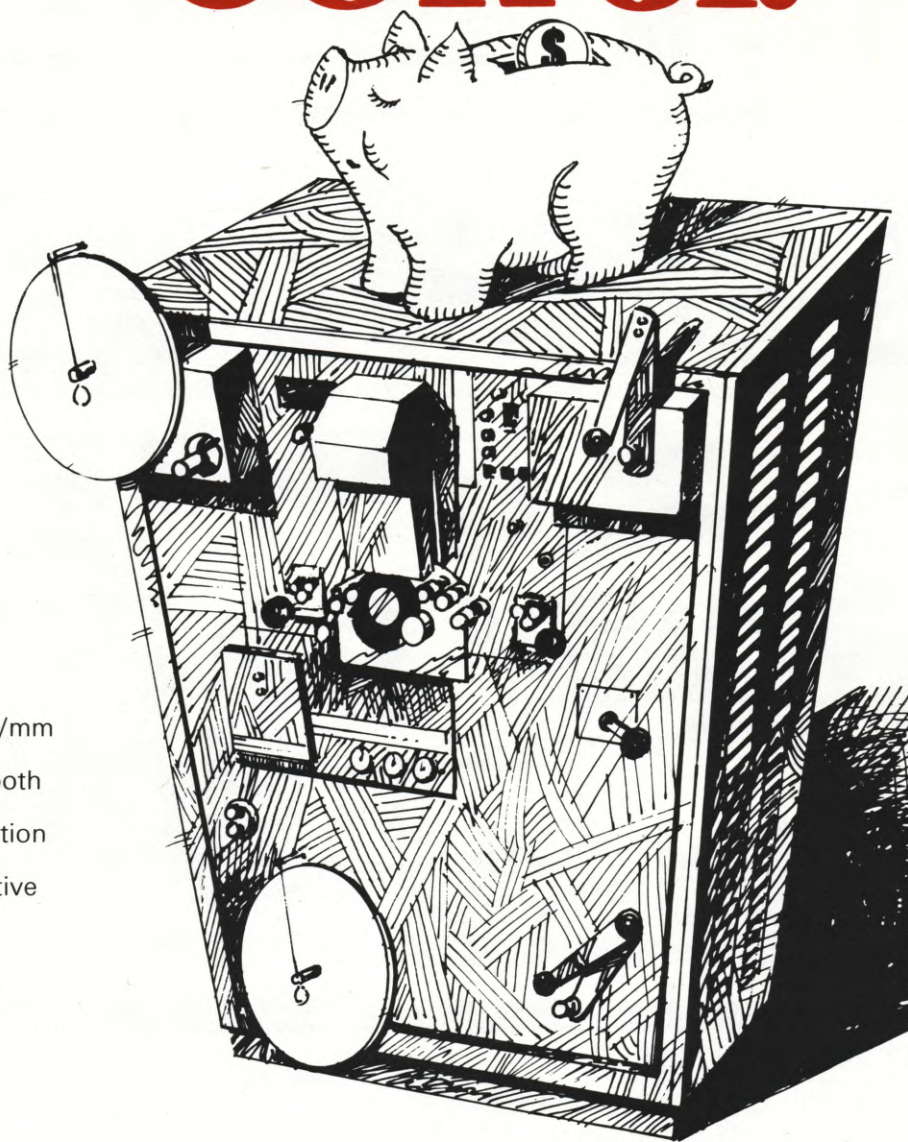
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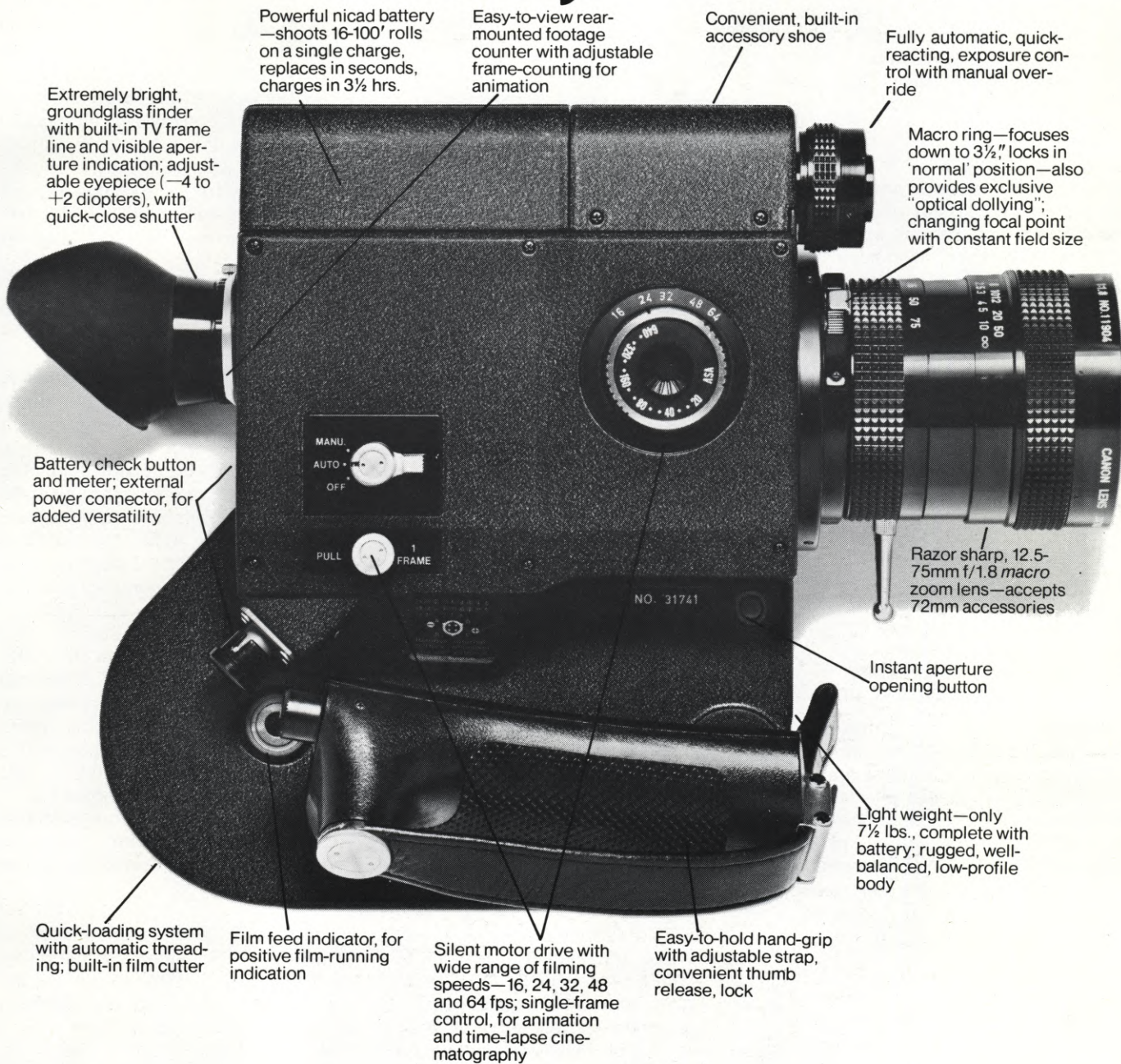
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A wide-ranging collection of articles, FRANK CAPRA: THE MAN AND HIS FILMS provides a comprehensive view of the director as seen by Capra himself, Graham Greene, James Agee, Lewis Jacobs and others, plus an original interview by Richard Glatzer, the book's co-editor with John Raeburn. (U. of Michigan Press \$3.95)

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### DATA FOR SCHOLARS & BUFFS

Aptly compiled by James Robert Parish and Michael R. Pitts, FILM DIRECTORS: A GUIDE TO THEIR AMERICAN FILMS lists the credits of 520 top directors, including all their feature films of 4 reels or longer and other relevant information. (Scarecrow Press \$15.)

An exhaustive 2-vol. reference source, INDEX TO CRITICAL FILM REVIEWS catalogs over 20,000 critiques of 6,000 movies, and over 3,000 reviews of 1,200 books about film. Editor Stephen E. Bowles has scanned 29 major U.S. and British cinema periodicals from 1930 to 1972, including *American Cinematographer*, and adding such useful data as a cross-index of directors and critics. (Burt Franklin Publ. 235 E. 44 St., NYC 10017, \$26. per set)

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Sponsored by the International Federation of Film Archives, INTERNATIONAL INDEX OF FILM PERIODICALS 1973 records and summarizes over 8,000 reviews, essays and articles appearing in 63 movie journals during 1973. Thoroughly cross-indexed, the 2nd issue of this impressive annual is edited by Canadian film archivist Michael Mould. (Bowker \$28.50)

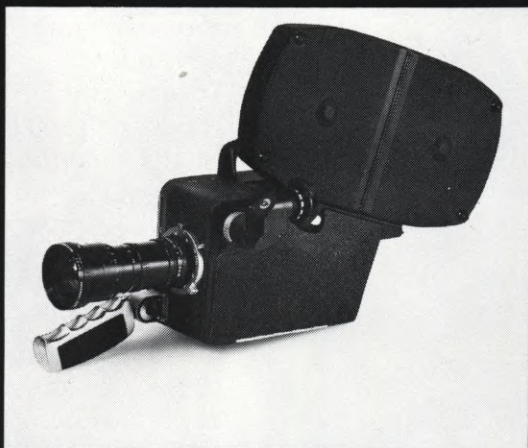
A bibliography of articles about film published in English language periodicals between 1946 and 1973, THE CRITICAL INDEX provides a guide to writings about directors, cameramen, producers, actors, scriptwriters and others, together with topics on various aspects of film. Compilers John and Lana Gerlach have examined 60 general periodicals and 22 film journals, from which *Action*, the authoritative magazine of the Directors Guild of America, is unaccountably missing. (Teachers College Press \$15./6.50)

In CINEMA BEYOND THE DANUBE: THE CAMERA AND POLITICS, Michael Jon Stoil surveys film production in the USSR and neighboring Popular Democracies combining film criticism with a socio-political approach, the book's view of propaganda may appear a bit naive, even in retrospect, but its factual information (films, directors, writers) is extremely useful. (Scarecrow Press \$6.)

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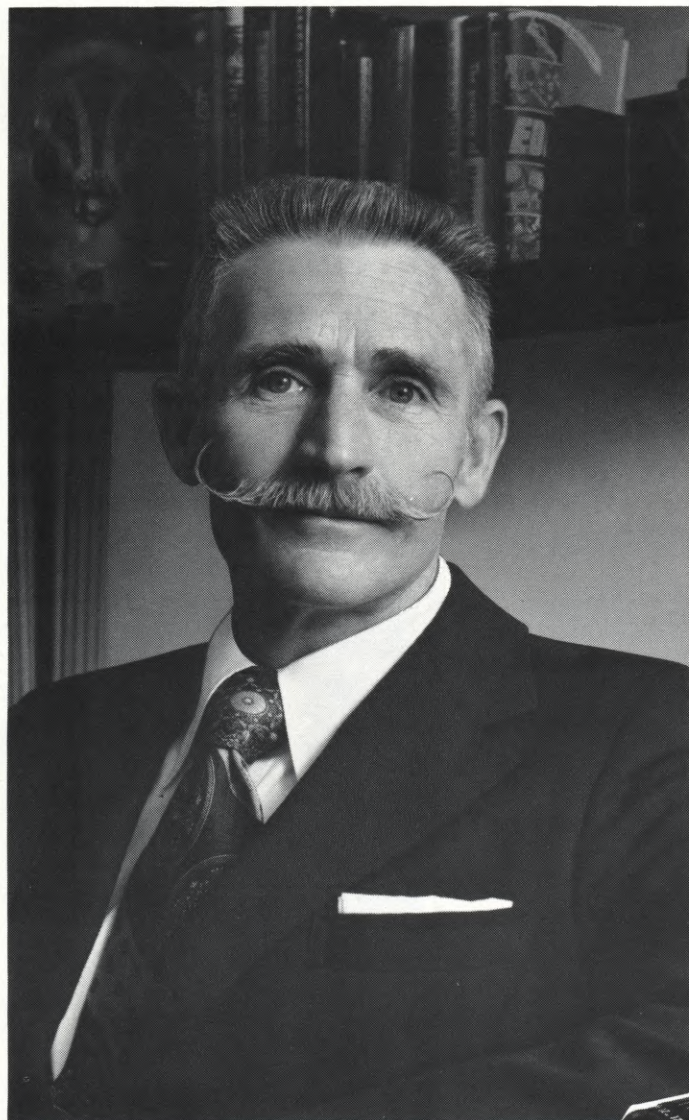
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# PROFILE: A.S.C.

By JOHN ORMOND

## CARL "BRICK" MARQUARD, A.S.C.

On September 6, 1974, his first working day for the Walt Disney company shooting the film, "Ragwing," cinematographer Brick Marquard almost lost his life in a helicopter crash near Camarillo, Calif.

The helicopter plunged into a hill at 40 knots, and Marquard subsequently was taken to an Oxnard hospital, suffering a cracked pelvis and crushed arteries in both legs.

During a four-week hospital stay, Marquard received scores of telegrams, letters and phone calls from well-wishers. Elizabeth Taylor and Richard Burton sent a "room-full" of flowers.

Brick (a childhood nickname because of flaming red hair) discovered he had far more friends in the movie business than he had ever realized, during that period in hospital. And while he was flat on his back, he had plenty of time to reflect on a memorable career.

"I've always been an adventurer," he told me. "I never wanted to stay with any one company too long, and I always wanted to travel to exotic places and do unusual things."

Few people have bettered Marquard in either objective. He was a veteran of the OSS during World War Two, filming documentaries in the front lines (and behind the enemy lines) over a three-year span. He won the Silver Star for his work on Omaha Beach during the Normandy landings. He piloted a twin-engine bomber on a "special mission" for the U.S. government during a revolution in Guatemala. He filmed documentaries and second-unit productions in most parts of Central and South America. He traveled with John Ford, making pictures in several countries.

Among many achievements, he won an Emmy for his camera work in 1968 on the Peggy Fleming TV Special.

Marquard started out in Hollywood in the mid-1930s. His first camera assignment, as an assistant, was at the now-defunct Mascot Pictures. Mascot's Nat Levine, who hired him, told him: "Keep your eyes open, and your mouth shut. Remember, the office boy you insult today, could be your boss tomorrow. In this business, you never know!"

Marquard chuckled when he recalled those words. "That was pretty good advice," he grinned.

In 1937, Mascot was merged into Republic Pictures, and Marquard was then out of a job. "So I went sailing," he reminisced. "Seemed like the thing to do."

He was later called in by Faxon Dean, a camera rentals company, and worked there on various projects until late 1939. "Everything then was improvisation," he noted. "But it was at Faxon Dean that I learned the mechanics of my business."

Following a two-year job in Technicolor's camera department, Marquard enlisted after Pearl Harbor, and soon was assigned to John Ford's OSS filmmaking unit. He went to London in 1943 and filmed documentaries on Coastal Command (RAF) and the U.S. 9th Air Force. He also completed a hazardous behind-the-lines film on the French Maquis resistance movement.

Brick was assigned to accompany the U.S. 2d Rangers in the Omaha Beach landing, ahead of the main invasion force. It was this stint that won him the Silver Star. He also filmed a documentary on the man-made Mulberry Harbor.

Marquard has worked for the CIA as well as the OSS. After the war — still feeling restless — he bought a twin-engine medium bomber from the Howard Hughes company, and used it for his special Guatemala mission.

During the 1950s, he worked again for Ford on several film projects. One of the Ford films was "The Searcher," starring John Wayne, in 1954. Marquard supervised the second unit cameras.

He moved into television during the late 1950s, working on such series as "Sea Hunt," "Bat Masterson," "Tombstone Territory," and "Aquanaut." Then in 1960, he won his initial job as first cameraman. That was at Ziv studios, on "Man and the Challenge."

The Ziv studio didn't survive too long, though, and soon Brick was working on the Lee Marvin series, "Law Breaker." This developed into an 18-month assignment.

He worked then for "a whole bunch" of different companies. At Universal, he was director of photography on "Adam 12" for a year. At Columbia, he photographed "Mister Deeds Goes to Town". Not long after that, he did the Peggy Fleming Special, which won him the Emmy. And he photographed "Rat

Patrol", the series on World War Two battles in the Libyan and Egyptian deserts.

Recently, he has been working closely with producer James Ellsworth, an associate of the late John Ford.

"Ellsworth and I have some very exciting projects coming up. Our first one will be called 'Marine,' and it'll be the life story of Lt. Gen. Lewis Puller, the most decorated general of the Marine Corps.

"It'll either be photographed in Brazil or the Philippines," he elaborated. "And I'm really going to enjoy doing this one!"

Following his serious injury in the helicopter crash, Brick is still convalescing after more than four months at home. His wife of six years, actress Yvonne Peattie, had plenty of trouble keeping him resting, though, at their two-bedroom apartment in West Hollywood. He has been yearning to get going again on the new assignments with producer Ellsworth.

"Course, I read a lot of books, and that helps," he conceded. "I love biographies. I rarely read novels. I especially like Civil War stories. And I'm blessed with good retention."

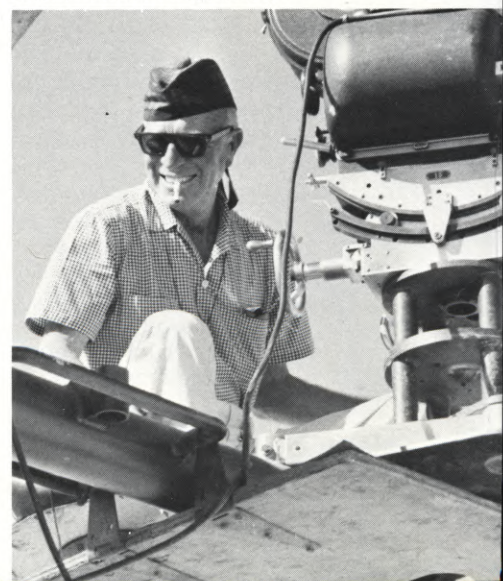
His main joy in life, however, is sailing. At every opportunity, Marquard can be found down at the California Yacht Anchorage in San Pedro, where he keeps his 34-foot cutter.

"I feel like a different person when I'm on the boat," he said. "It's a whole new world, and I love it."

Certainly it's not likely that the helicopter crash injury will keep Brick Marquard grounded for too long. Already, he was moving around fairly actively by late January, and said he "hoped he could convince" the doctors that he was faring as well as he said he was.

"You see, I'm one of these guys that just has to be working. Some people like to take long vacations, and that's fine for them. And the boat helps me relax when I have to.

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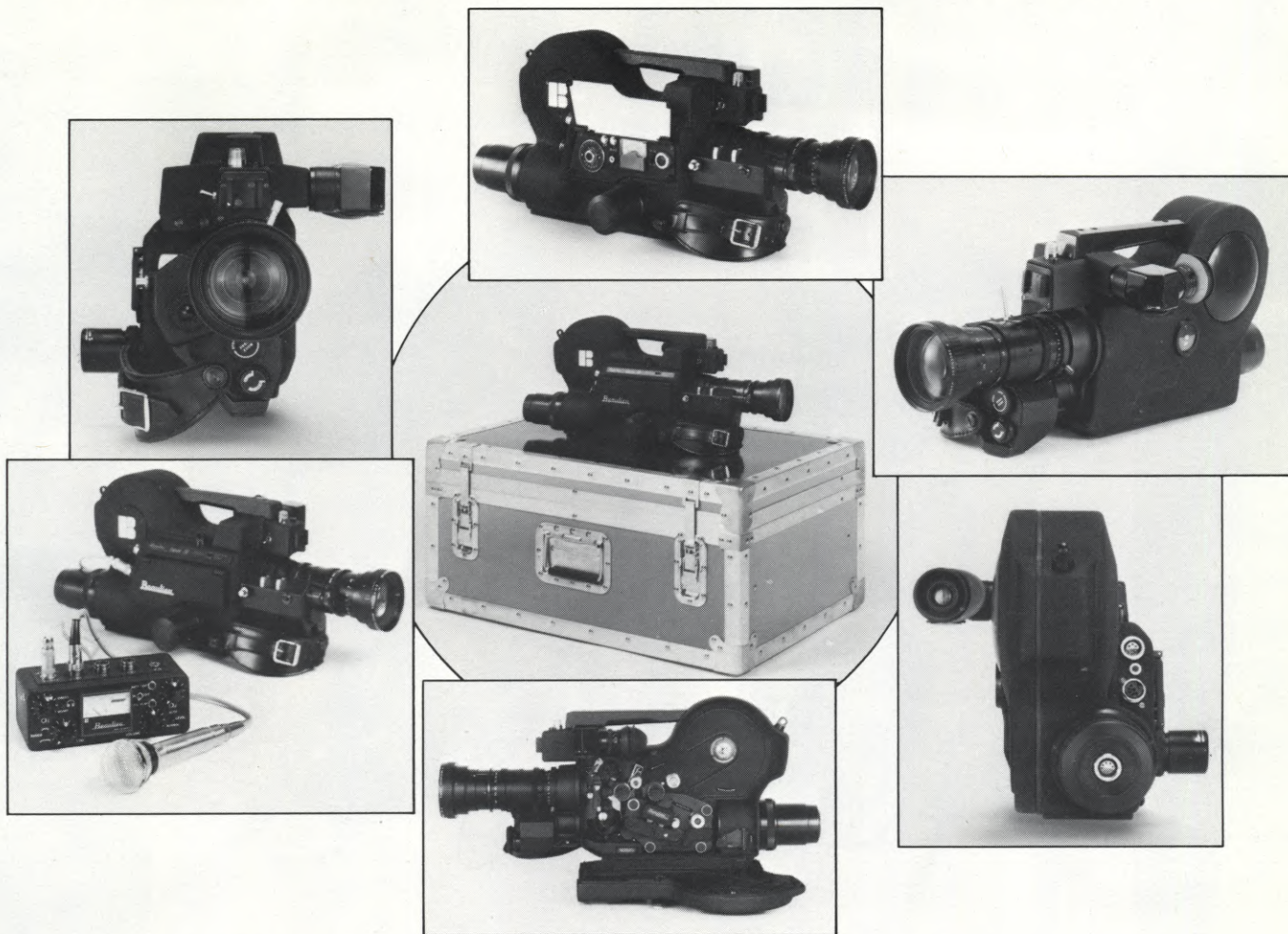
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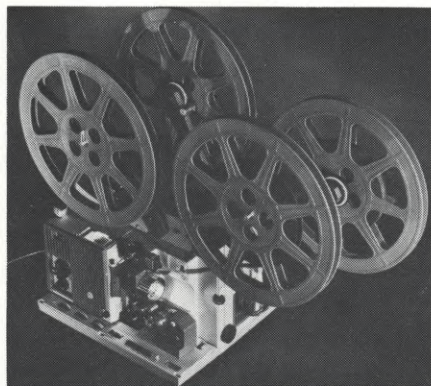
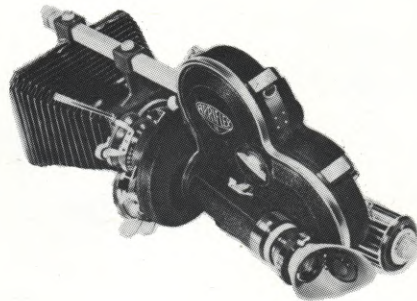
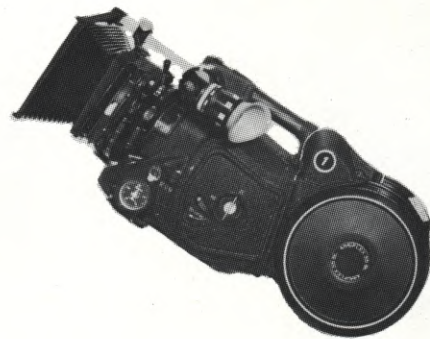
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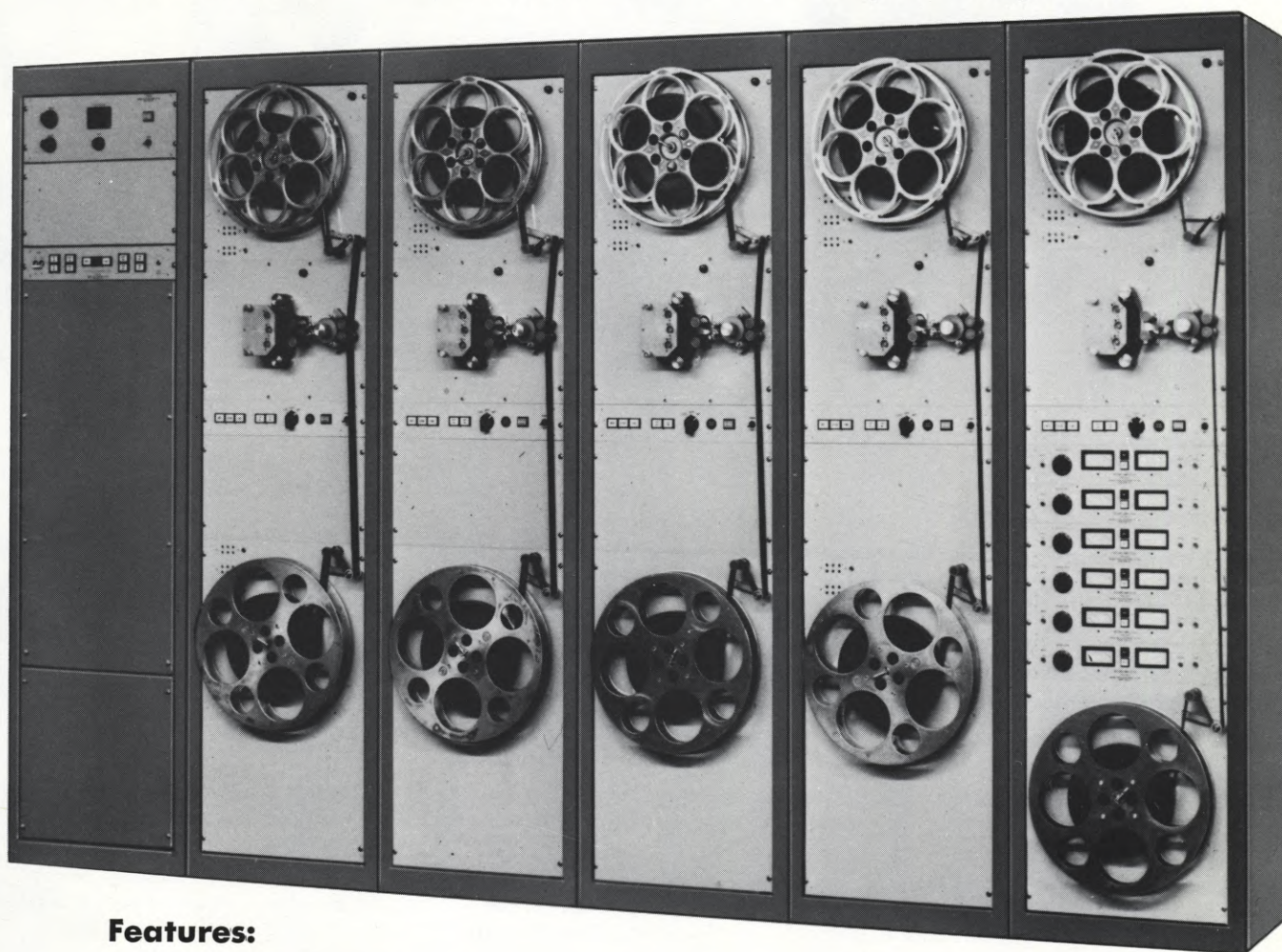
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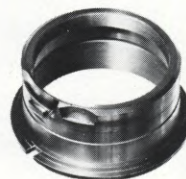
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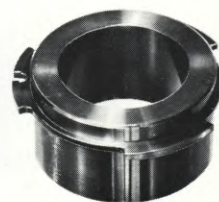
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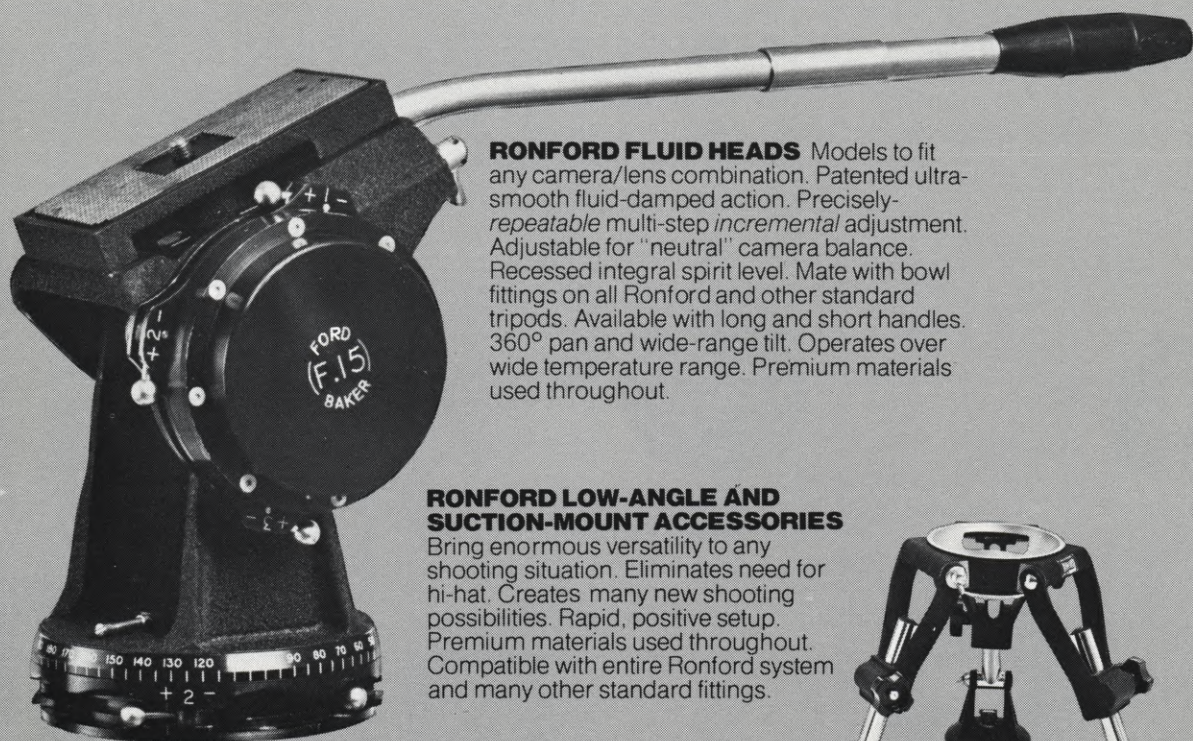
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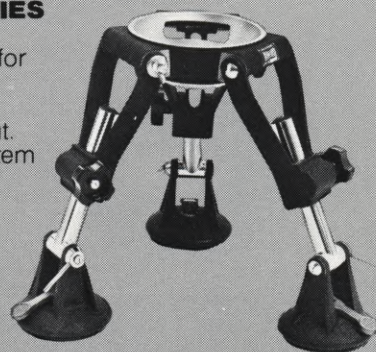
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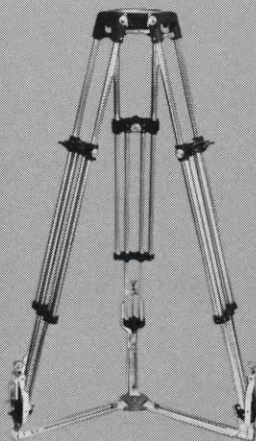
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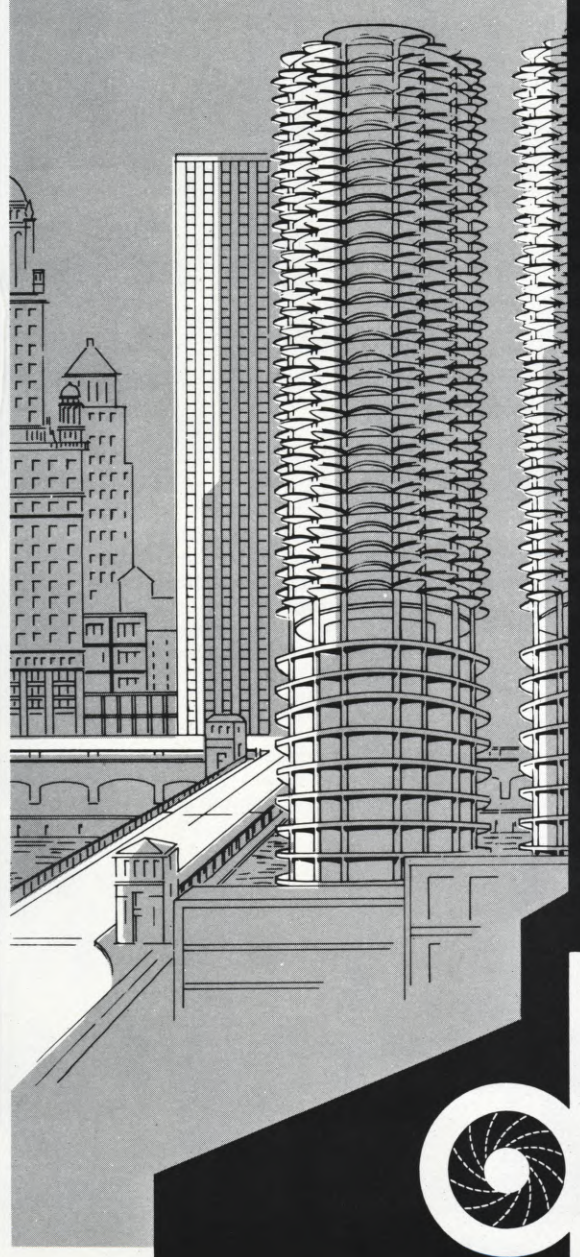
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# ON LOCATION WITH "JAWS"

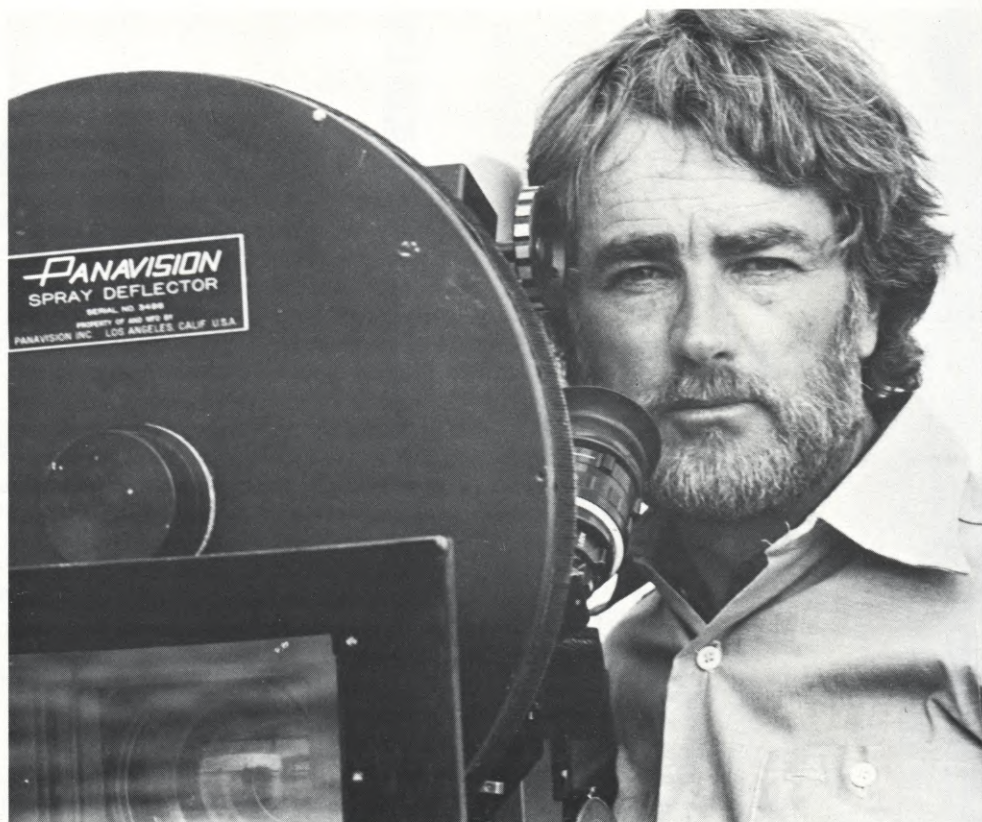
Seeking realism for the filming of a bestseller about a killer Great White Shark, film crew works under enormous difficulties at sea off Martha's Vineyard

By MIK CRIBBEN

I had gone out to Martha's Vineyard for a short vacation but when I heard that a feature film called "JAWS" was being shot I ended up spending most of my time watching the filming.

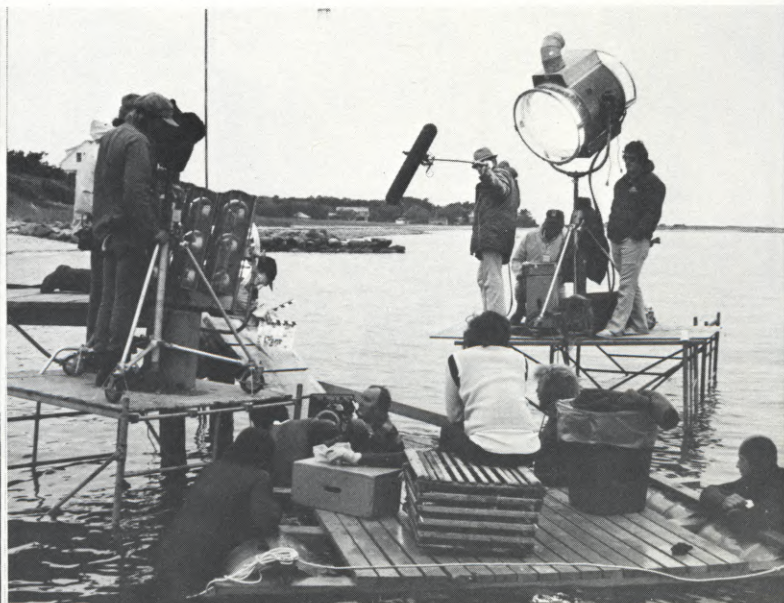
"JAWS" is an adaptation from the Peter Benchley bestseller which was sold to the producers Richard Zanuck and David Brown, who are making the picture for Universal, while it was still in galley form. Peter Benchley is the son of the famous writer, Robert Benchley. Benchley got the idea for the story from a real incident that happened off of Montauk, Long Island, in 1964, when a 17-foot, 4,500-pound shark was caught by a fisherman named Frank Mondras. During the shooting a story bearing the caption "Shark Scores KO" appeared in a Boston paper. A 1,500-to-2,000-pound shark grabbed an aluminum boat out on the swordfish grounds, 60 miles off Nantucket and violently shook it and the people in it.

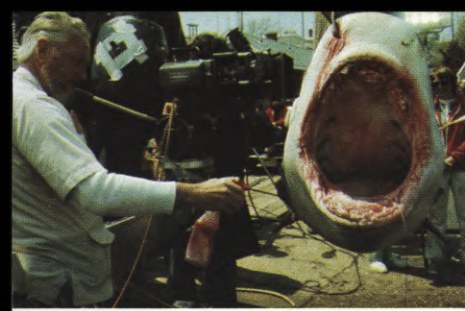
Simply sketched, the story is about a giant white shark that terrorizes the resort community called Amity, Long Island. Some people are killed by the shark and the town is dying because the shark is scaring away all the tourist business. Three men become involved in destroying the shark: Brody, Amity's Chief of Police, who wears glasses and feels inadequate to deal with the shark; Hooper, a young shark expert from the



Bill Butler, Director of Photography on "JAWS", produced by Zanuck-Brown for Universal, sought to photograph the film in a visual style similar to that of painter Andrew Wyeth, a far cry from his work on Francis Ford Coppola's "THE CONVERSATION". The Panavision Spray Deflector shown in this photograph is a special piece of equipment originally devised to help Freddie Young, BSC, in his filming of storm scenes for "RYAN'S DAUGHTER". It incorporates an optical glass disc that whirls at a very high rate of speed, deflecting water drops as they hit.

(LEFT) On the beach at Martha's Vineyard, an island off the coast of Cape Cod, the crew rehearses a trucking shot. (RIGHT) All of the filming equipment had to be supported on parallels set up in the water, as well as on rafts. According to the director, "JAWS" is the first feature to do more than half of its shooting on location at sea, with no scenes filmed in a studio tank. Problems of water and weather stretched the schedule far beyond its original estimate.



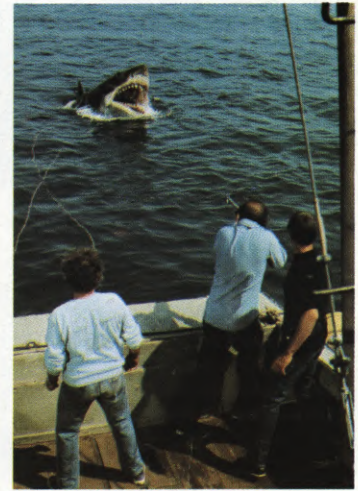


**(LEFT)** Setting up to shoot a closeup of a 13-foot Tiger Shark, which was flown in from Florida. In the film it is captured by the townspeople, who mistake it for the killer shark. **(CENTER)** "Bruce" the mechanical robot shark leaps toward the boat carrying the two protagonists. This elaborate toy (actually, there were three of them) cost a quarter of a million dollars and twice that to operate. It was required to be 25 feet long and able to jump out of the water and smash a boat, and eat people. "Bruce" filled the bill. **(RIGHT)** Tracks set for a long dolly shot on the beach.



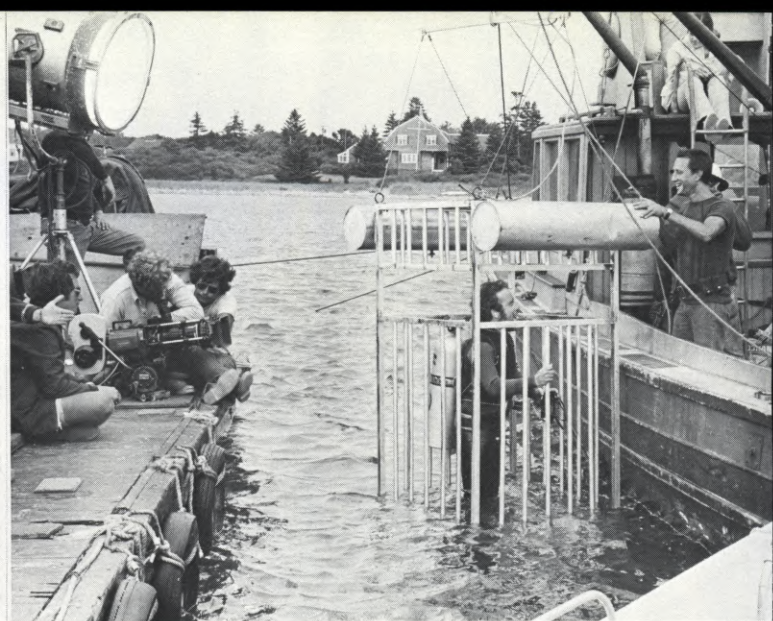
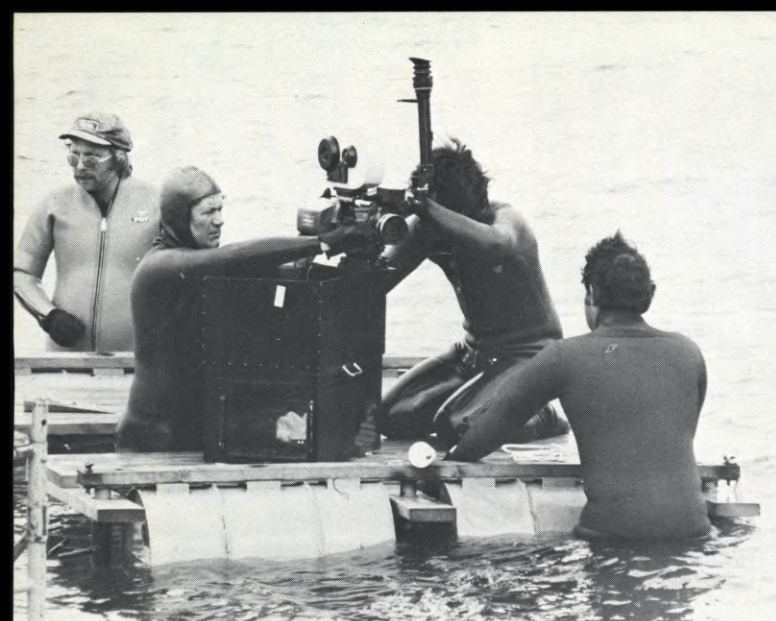
**(LEFT)** "JAWS" was filmed by a mixed crew of technicians — some from Hollywood, others from New York, but it was a strenuous workout for all involved. **(CENTER)** At sunset, the "Orcha I", principal boat appearing in the film, floats idly on a ruddy sea. **(RIGHT)** Director Steven Spielberg, something of a "ham", demonstrates action for an amused Roy Scheider.

**(LEFT)** Crewman basks on forward camera platform of boat, while other crew members, crowded onto the turret with lights and camera, shoot a scene. **(CENTER)** Australian shark expert Ron Taylor, who, with his wife Valerie, shot the exciting underwater scenes of real sharks for "JAWS". **(RIGHT)** Man on board shoots, as the shark checks out the boat he will eventually destroy.



**(LEFT)** Shooting at one of the resort beaches on Martha's Vineyard. Brute arcs were used to fill the bright sunlight. **(CENTER)** Say "aaahh". Bruce obligingly rears up and smiles for the lens, with his multiple rows of teeth seemingly inches from the Panaflex camera. **(RIGHT)** The Great White Shark crashes onto the deck of the boat and gobbles up Robert Shaw, who looks understandably dismayed. The film, with all of its intricate illusions, employed a small army of special effects experts.





**(LEFT)** The Panaflex is lowered into the water box, used to contain it when shooting just under the surface of the water. The raft shown here was developed by cinematographer Bill Butler specially for this film. It could be raised or lowered (on its pontoons) out of the water to different levels. **(RIGHT)** Richard Dreyfuss, playing the role of a young shark expert in "JAWS", is lowered into the water protected by a shark cage. A genuine young shark expert, Leonard Campango, was very very helpful to Production Designer Joe Alves in designing the robot shark.



Institute at Woodshole; and Quint, the shark-boat Captain who is hired by Brody to kill the shark. It's kind of a modern day "Moby Dick". Although the basic idea is intact, there have been several major changes from book to screenplay. For example, in the book there is an affair between Hooper and Brody's wife which does not appear in the screenplay.

Edgartown on Martha's Vineyard, the island off the coast of Cape Cod, was chosen as Amityville by the film's designer, Joe Aves, after he visited scores of towns up and down the Eastern Seaboard. The town had to have an old quiet resort town flavor and because Edgartown is on an island, accessible only by ferry or plane, he has managed to maintain a style that is rapidly being lost to Cape Cod and Long Island. But the most important consideration was the suitability of the

**(ABOVE LEFT)** Bill Butler sets up a phalanx of cameras, including the Panaflex and several Panavision-adapted Arriflexes. Multiple cameras were used often to shoot action that could not easily be repeated. **(RIGHT)** The director looks through the orientable eyepiece of the Panaflex in the water box. **(BELOW LEFT)** The camera, mounted on the boom end of a crane, hangs in space above the deck of the boat during night shooting. **(RIGHT)** The Panavision underwater camera is brought into play.





**(LEFT)** The camera is set up on a tripod anchored in the water, while chilly crew members watch the action. Shooting was originally set to be completed before June, when Martha's Vineyard's population swells from 6,000 to its summer population of 40,000, but the camera crew remained long after the tourists had left. **(RIGHT)** The Panaflex, a very well balanced camera, fits comfortably on the skull — a good place to put it for a walking dolly shot, perhaps. Morale of the crew remained high, even though shooting took much longer than expected.

water locations, since more than half of the picture takes place on the water. The platform which operates the mechanical shark had to be placed in no less than 20, and no more than 30, feet of water. Also a place with a small tide was needed because a large tide would swamp the shark and cause matching problems. Edgartown's harbor had only a three-foot tide.

The cast for the movie consists of Richard Dreyfuss, star of "THE APPRENTICESHIP OF DUDDY KRAVITZ" and "AMERICAN GRAFFITI", as Hooper; Roy Scheider, who co-starred with Gene Hackman in the "FRENCH CONNECTION", as Brody; and Robert Shaw of "THE STING", as Quint. Three very different and very exciting actors.

The film is being directed by Steve Spielberg who directed Goldie Hawn in "SUGARLAND EXPRESS". When I first

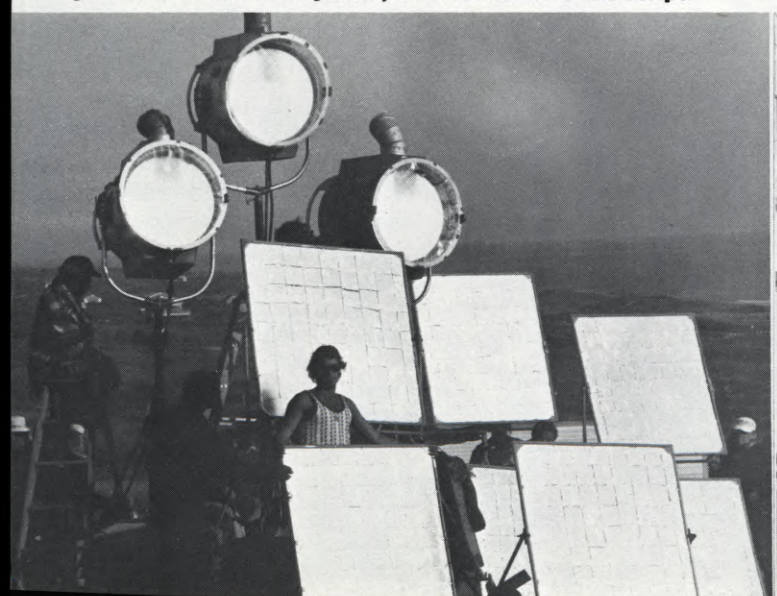
interviewed Steve, who is 26, I had a list of questions to ask him. My first question was, what was the most boring question an interviewer had ever asked him. He said that people always asked how he made it big in the film business so young. I decided to skip my second, but from many other interviews I know that Steve made a short called "AMBLIN" for \$15,000 while still in school. The film was twenty minutes long. When it was completed he showed it to a producer who liked it and he got his start directing television. "SUGARLAND EXPRESS" was his first feature. When I asked Steve why he wanted to direct "JAWS" he responded, "I knew my mechanical mind would be good with the mechanical shark."

The director of photography on the film is William Butler. His operator is Michael Chapman, who photographed

"THE WHITE DAWN", and his assistant is Jim Continer.

Bill Butler started out in the business making documentaries with William Friedkin. He worked in television for many years in Chicago before switching to film and moving to Los Angeles. The rest of the camera crew, which at times had three cameras running at once, was from New York. Butler's last picture was "THE CONVERSATION" for Francis Ford Coppola. I asked Bill how he thought the picture should look. "My philosophy for this film was that it should have an Andrew Wyeth look in the beginning, and as the story takes place around the Fourth of July I wanted it to look sunshiny. For the third act at sea, when they go for the shark, my feeling was that it should be dreary. It should look ominous, and foreboding." **Continued on Page 320**

**(LEFT)** A bevy of reflectors, augmented by three Brute arc lights, is set up to fill the intensely strong sunlight. Bill Butler explains: "The story takes place around the Fourth of July and I wanted it to look sunshiny. For the third act at sea, when they go for the shark, my feeling was that it should look dreary. It should look ominous and foreboding." **(RIGHT)** The town of Edgartown on Martha's Vineyard doubled for "Amityville", as it was called in the script.



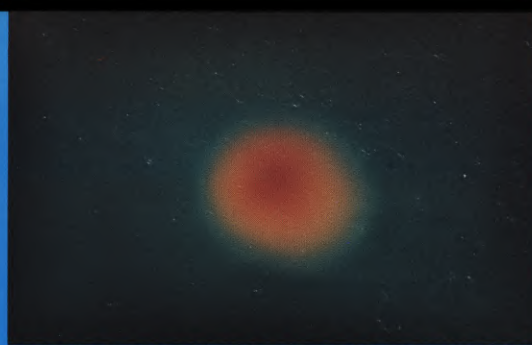
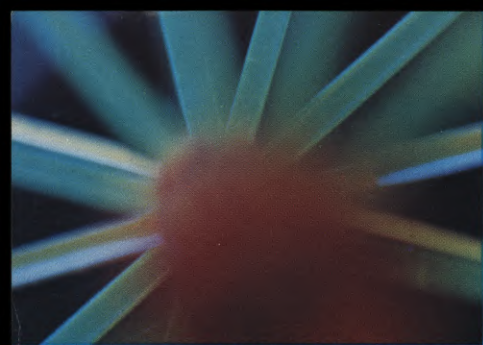
# "EXPLORATORIUM"



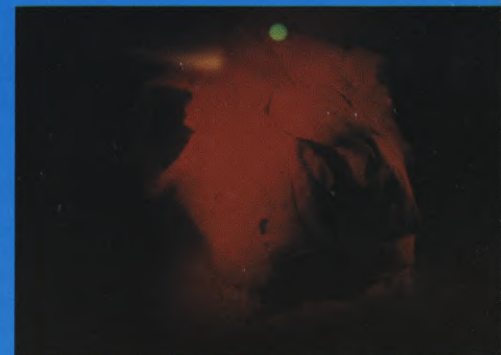
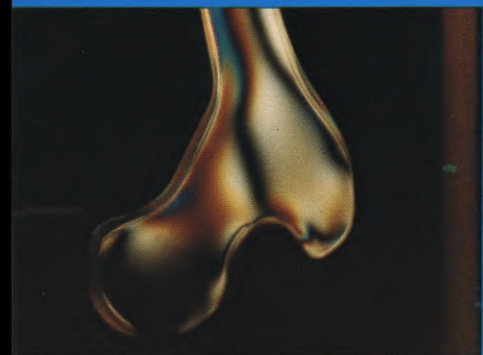
The fascinating challenge of  
filming an obstacle course  
of strange phenomena and  
bizarre light sources  
sparks ingenuity

By **ERIC SAARINEN**  
*Director of Photography*

The Exploratorium in San Francisco, founded and directed by Dr. Frank Oppenheimer, is a museum designed to teach about human sensory perception. Part science exposition, part art gallery, part county fair, the place has hundreds of exhibits to play with which use illusions and quirks of the human eye and ear to show the limits of the way we see and hear. We discovered that the experience for the spectator was so strong that one hour spent



(ABOVE LEFT) Ultraviolet light is made visible when conducted into a system of lucite rods. (CENTER) Fading dot. When stared at for about thirty seconds the red dot will disappear. (RIGHT) Sun. A place to play with pure color. (BELOW LEFT) A plastic bone seen through a polarizer. This exhibit demonstrates graphically the tension and torsion of a human under stress. (CENTER) The limbic system. A geodesic dome acting as a total environment. A system of mirrors and lights disappearing into the infinite. (RIGHT) Hologram. A three-dimensional photograph of a cow's skull projected with laser light.

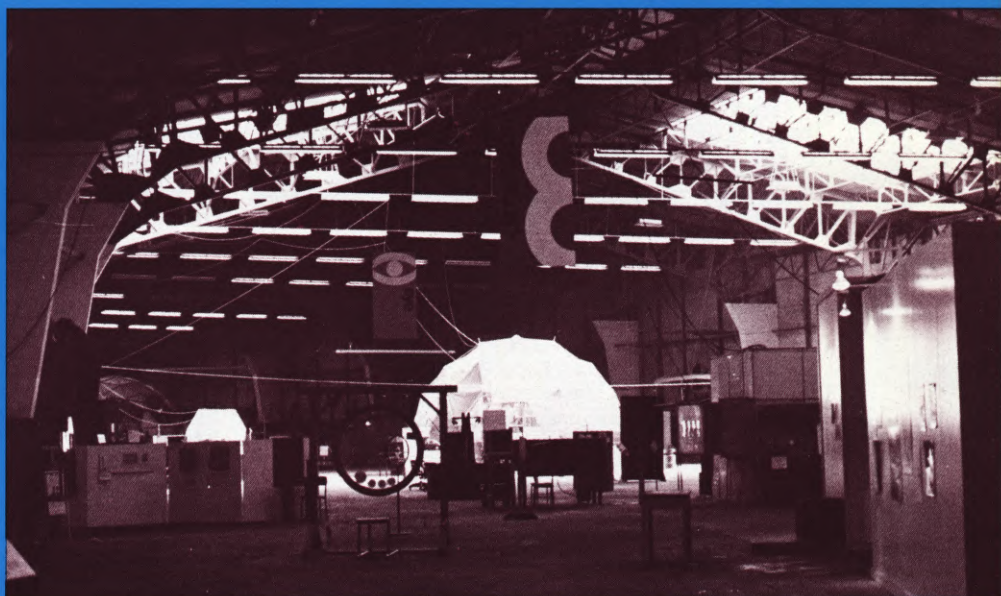


exploring left one emotionally and psychologically exhausted.

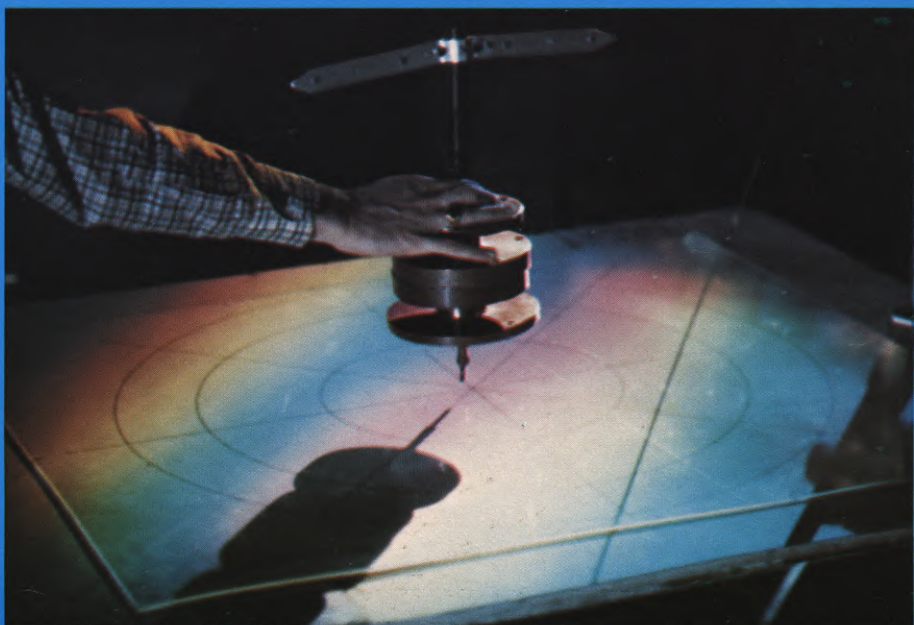
We were about to shoot a twenty-minute, 35mm short on the Exploratorium. Jon Boorstin, the director, chose eighty exhibits to film and began organizing the film's structure. With the aid of a production board he came up with a shooting schedule of eighteen twelve-hour days. I flew up from Los Angeles to help sort out problems and shoot some tests. There were so many exposure tests to shoot it would have been a waste of film to do it with a movie camera. I used my still camera and bracketed everything. For spinning and moving exhibits, strobing and "wagon wheel" effects, I used my Arri 2C. Since we were going to use 5247 for the film, I used it in both cameras. Testing and pre-production took two weeks.

The filming was divided into three parts: 1) STAGED EXHIBITS. We would very carefully stage scenes of actors playing and interacting with specific exhibits. Most of these were musical exhibits, to be shot while the museum was closed. 2) EXHIBIT MONTAGE . . . a fast paced barrage of about seventy

**Continued on Page 312**



(OPPOSITE PAGE) Figure is silhouetted against reflections of pure light broken up by prisms and rear-projected onto a screen. (RIGHT) This pendulum seems to be moving in circles, but is actually moving in a straight line. (CENTER ABOVE) The Exploratorium is 50 feet high, 150 feet wide and 1,000 feet long.



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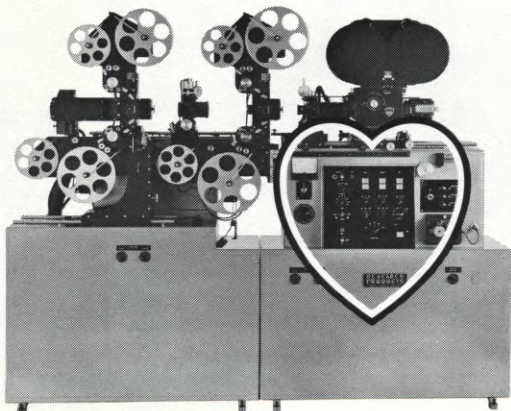
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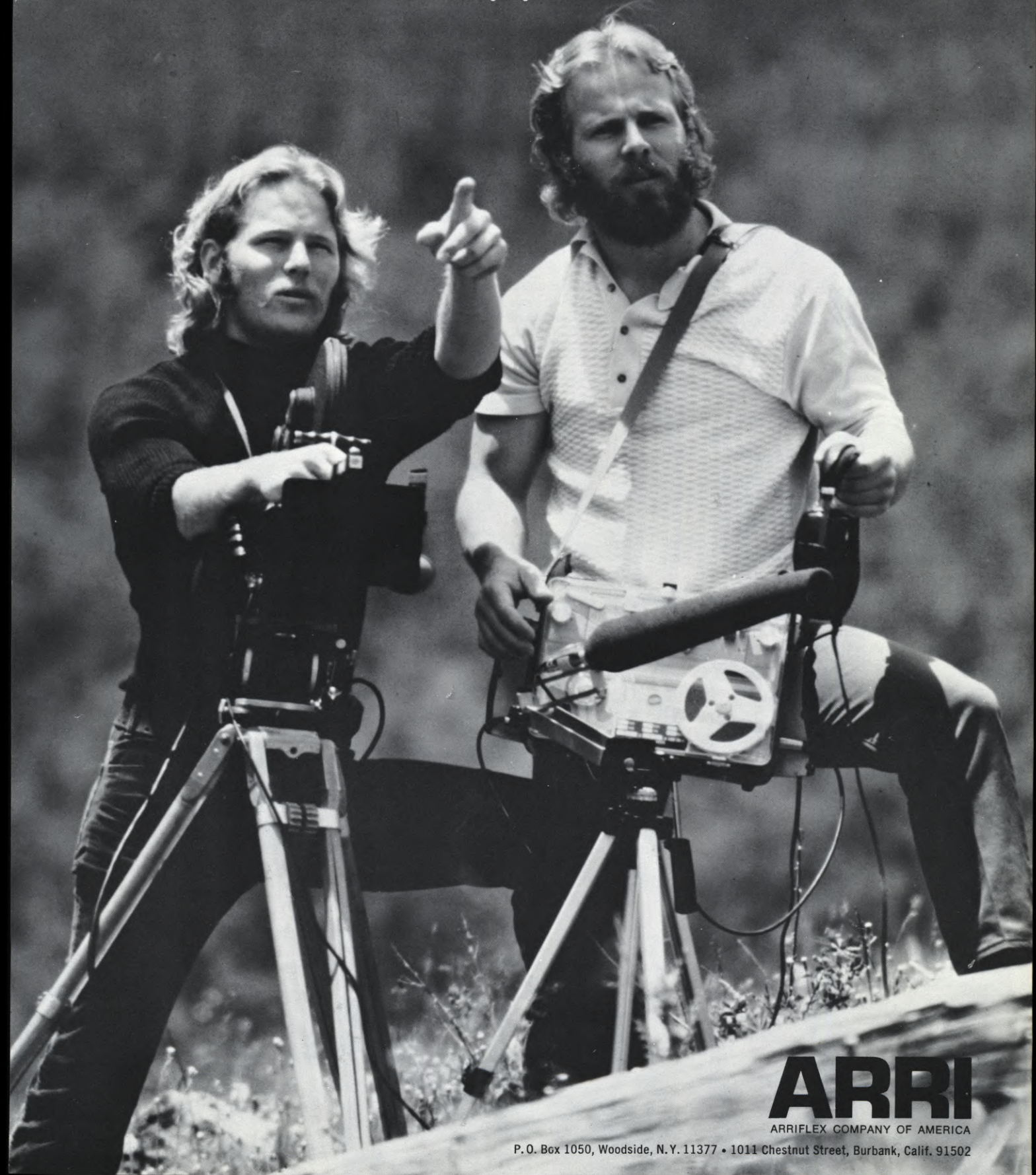
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# THE LIGHTING AND FILMING OF PAINTINGS

Though it would seem simple, the filming of paintings in color is a definite specialty, with several important tricks of the trade

By **CAL LANGENBERG**  
Cinematographer — *WTTW, Chicago*

Within the past year, the film unit at Channel 11 in Chicago has been producing some programs dealing with the visual fine arts. This has been in large measure due to the resources and co-operation of the Art Institute of Chicago and the energy and interest of one of our executive producers.

As of now, we have completed two programs, and more are being planned. One program is on a special Renoir exhibition, the likes of which may never be seen again. Each year, the difficulty of collecting a life's work of an artist increases and, of course, expenses are always going up. The

second program encompasses almost the entire history of Art through the Art Institute's permanent collection.

The half-hour Renoir special has just won an Emmy, and we think the hour-long film of the permanent collection is even better.

These films are the pet projects of executive producer Donald Knox, who among other high qualifications, spent time at the American Film Institute researching his book on the making of "AN AMERICAN IN PARIS" (*"The Magic Factory"*).

For a cinematographer, the filming of works of Art offers certain problems.

Paintings are usually mistakenly thought of as being two-dimensional. The heavy impasto and high reflectivity of the surfaces make for interesting lighting problems. They are absolutely static, so all camera moves must be flawless. The camera itself must be totally stable.

Curators and Conservators of paintings are notoriously picky about color reproduction. As various galleries are either totally sunlit, totally incandescent, or some mixture of the two, color shifts are imminent and must be carefully considered and corrected.

We filmed in 16mm using an Arri BL

**(LEFT)** Cinematographer Cal Langenberg, Assistant Cameraman John Latushko and Executive Producer/Director Don Knox outside the Art Institute of Chicago. **(CENTER)** A graceful spiral staircase inside the Institute. **(RIGHT)** The crew at work. The Arriflex was mounted on an O'Connor 100 fluid head on Mitchell legs, with a ball leveller for ease of set-up.



**(LEFT)** A basher light used to illuminate Japanese screens. The basher mounts a 10K lamp inside a five-foot circular lamphouse, the inside of which has been painted a reflecting white. There is a plate in front of the bulb to prevent any direct light from reaching the subject. **(CENTER)** In order to minimize distortion, almost all photography was done at long focal lengths. **(RIGHT)** Quick semi-tent lighting, which works for a large painting.



**(LEFT)** Filming in the Oriental collection. Every possible precaution was taken to avoid any damage to the paintings. **(CENTER)** Key Grip Maurice Smith moves a 4K Colortran softlite into position to achieve a quick tent set-up, which consists of two such units pointed directly at each other and 90 degrees to the subject. **(RIGHT)** Filming a shot of patrons passing an announcement for the Winslow Homer show.





**(LEFT)** Filming details of the painting, "Sunday Afternoon on the Grand Jatte". Paintings are usually (mistakenly) thought of as being two-dimensional. On some paintings the heavy impasto adds a third dimension. That and the high reflectivity of the surfaces makes for special lighting problems. **(RIGHT)** Set-up for shooting a small painting. The challenge of lighting was to prevent color shifts caused by ambient light of a different color temperature.

with our sharp 12-120 Angenieux zoom lens. When we had to zoom, we used a motor. Not having the Cinema Research feedback loop joystick, we had to use the rheostat for smooth starts and stops. Contrary to popular belief, it really is possible to pan, tilt, and turn a knob simultaneously — and if at first you don't succeed, try and try again.

In order to minimize distortion, almost all photography was done at long focal-lengths. This, of course, exaggerates any instability or lack of precision. The solution to good camera moves is in large measure a matter of being gentle.

The Arri was mounted on an O'Connor 100 fluid head on Mitchell legs with a ball-leveler for ease of setup. My personal solution to the problem of stability is to increase mass. Things which are heavy don't move as easily. Parenthetically, this could be the reason why hand-held photography with the Eclair NPR is generally better than with the smaller Beaulieu, Bolexes, and Bell and Howells. Greater inertia means fewer unwanted small vibrations. For the films being discussed, we always used the heavy tripod. On "PAINTINGS", our record number of setups in a normal day exceeded sixty individual paintings.

The lighting was challenging. To prevent color shifts, we over-rode all existing light with our own tried and proven 3200-degree Kelvin lighting. The impasto and associated differential specular reflections presented more than just a simple copy problem. In addition, the frames themselves were subject to hot spots, as their surfaces were shiny and rounded. An analogous problem would be the photography of a silver column. It was sometimes necessary to show frames and sometimes not. Our solution to the lighting problem worked either way.

I like to think of light as a spray, com-

**Continued on Page 352**



**(ABOVE)** Renoir's "twin" paintings, "City Dance" and "Country Dance". **(BELOW)** The set-up for shooting a large painting. The 4K Colortran softlites are placed facing each other, 90 degrees to the subject. When used from maximum height, these lights simulate nicely the prevailing softness of the ambient illumination.



# DIRECTOR JOHN BOORMAN TALKS ABOUT HIS WORK

One of the cinema's most creative craftsmen delves into several off-beat techniques that he employs relating to post-synchronization and uses of color

British director John Boorman (who now lives and prefers to work in Ireland) is something of a walking-around paradox. A very genial, good-natured man with an air of the innocent about him, his breezy personality seems strangely at odds with the hard-hitting, sometimes violently brutal material that he so expertly flings onto the silver screen — including such gut-twisting items as "POINT BLANK", "HELL IN THE PACIFIC" and "DELIVERANCE".

An honored guest at the recent Third Tehran International Film Festival (where his latest film, "ZARDOZ", was being screened in competition), Boorman missed his scheduled press conference when a Jeep in which he was scouting locations broke down in the middle of nowhere. Thus, the assembled press corps was denied the benefit of his very quotable wit and wisdom.

However, in a private conversation with the Editor of *American Cinematographer*, Boorman discussed various aspects of his work which, we feel, will be of interest to readers of this journal. What follows are statements by Boorman excerpted from that conversation.

## **On the subject of creating a "nightmare" mood in beautiful surroundings for "DELIVERANCE":**

*In preparing to film "DELIVERANCE", I felt it was important to capture the quality of a nightmare, which the telling of the story seemed to require. But, in that respect, I was up against a problem which many directors face (and solve in various ways) — namely, that color photography tends to beautify everything. I mean, even slums look picturesque when they are filmed in color.*

*I took a long time in looking for a river that would have the requisite nightmare quality and finally found one in northern Georgia that seemed appropriate, but I still felt that the color needed some sort of desaturation in order to make it more somber and more threatening. So I had long talks with the cameraman, Vilmos Zsigmond, about how we could achieve such an effect. Vilmos favored flashing — he was very keen on it at the time — but when we shot some tests actually on the river, we found that the flashing really wasn't appropriate, because it*

*seemed to take the hard edge off of the photography.*

*It may seem like a paradox, but in addition to the desaturated nightmare quality, I wanted to retain a very sharp quality, too. For example, the flashing not only took out the color, it also took the sparkle out of the water. It did away with that hard edge that I wanted to preserve.*

*Vilmos and I then talked to the people at the Technicolor lab in Hollywood and I asked them about the type of saturation John Huston had used on "MOBY DICK" and "REFLECTIONS IN A GOLDEN EYE". They told me that, yes, such an effect could be achieved rather more easily now because of the CRI process. It was merely a matter of printing in a black and white negative of a certain density, along with the color negatives.*

*Well, we made some tests of that method and they were quite successful, except that in looking at Huston's films again and other attempts at desaturation, I discovered that the primary colors tended to desaturate at a lesser rate than the mid-tones. In effect, the primary colors remained as they were, while the mid-tones went almost black and white, so that you had the illusion of little blobs of red and blue floating about on the screen with everything else black and white.*

*That discovery persuaded me to try to make the whole film in mid-tones, eliminating all primary colors. This took a great deal of effort, but we got rid of all primary colors in props and clothes and so forth. On the river we were able easily to avoid sky. When we shot some more tests without the primary colors involved, it worked very well.*

*The film was shot without fog filters or anything else to soften it down, because I knew that inevitably there would be a certain deterioration in the desaturation process and I wanted to retain a clean hard negative that would stand up to such treatment. By the time we got to the end of shooting on the picture and I was ready to work with the lab people on the desaturation effect, there had been a tremendous upheaval and change of regimes at Technicolor. A lot of staff was fired and many of the people I had been speaking with there earlier seemed not to be there anymore.*

*Nevertheless, we set to work on it. I*

*had imagined that, after making some further tests, it would be possible to set a pattern of desaturation at 10% or 20% or 30% or whatever seemed appropriate, and then just use that percentage of desaturation uniformly throughout the picture. Well, that soon proved to be a hopeless dream, because every sequence — indeed, every shot — when desaturated, produced a different effect. For example, a 20% degree of desaturation on a scene that had quite a bit of rich color in it seemed to make little or no change in the scene. On the other hand, a 20% desaturation on a scene which was already low in color saturation made everything go completely black and white. It quickly became evident that we would have to pretty well time every shot individually for desaturation and, indeed, that's what we did on the entire film.*

*By this time Vilmos was busy working on another picture, but I kept in constant touch with him and, from time to time, he would come in to help us and advise us. But in the main, I was sitting over there at Technicolor week after week for nearly three months to get this effect. We ran into another serious unforeseen problem in that, having first timed a scene for the color, we would then time it for desaturation, only to find that the desaturation changed the color balance. So, having already timed all the color and then timed all the desaturation, we had to go back and re-time all the color. It became a tremendous labor, but, at this stage, there was no turning back for me. The film looked very raw as it stood, and we would never have shot it that way if we had not intended to desaturate it, so I was absolutely committed to the desaturation and we were forced to continue.*

*Whether the end results justified that amount of labor I don't know — but we certainly achieved the effect we set out to get. It gave the film a kind of monochromatic nightmare quality, without it being self-consciously so. It was still a color film. It didn't look sort of hard black and white, but the blacks were a little blacker and everything was a bit more somber and strange.*

## **On the subject of applying an entirely different visual style to the filming of "ZARDOZ":**

For me there are certain decisions in preparing to make a film that are very important. The first thing I have to do, in a sense, is find a "landscape" for the film. I don't mean necessarily an outdoors landscape, but a kind of visualized "world". Once I find it, that becomes the beginning of how the film should look. It's a strange thing, but for each film that one makes one must find a photographic style in which to shoot it. I mean, I don't think that any filmmaker today just goes in and shoots a film. There is no longer a "classic" way of photographing a picture. You choose an approach to it.

I have been fortunate in having worked with a number of marvelous

cameramen and I was especially fortunate on "ZARDOZ" to get Geoffrey Unsworth, whose work I have admired for years and who has a tremendous depth of knowledge and experience.

We talked about a photographic style for "ZARDOZ" and I said that I wanted a very diffused effect in this film — pastel colors and a soft feeling. If, in "DELIVERANCE", I was looking for a nightmare, here I was looking for a dream. I was hoping to get a kind of floating quality. This would result partially from the movement of the camera and how I moved the people, but soft pastel color would also be important.

Obviously, the type of diffused effect I had in mind would suggest flashing —

but I have a certain reservation about flashing. It's like a fog filter in that it's one-dimensional. Everything looks the same. It's recognizable for what it is, and it's not subtle enough.

I talked a lot about this with Geoffrey and we finally came up with a solution — which was to use a light fog filter and then to use smoke in every scene. The smoke would not be visible as such, but would lightly fill the set. Geoffrey lit the smoke indirectly. He didn't light the people at all, but the smoke itself diffused the light and, as it fell on objects and people, it was very soft and very nice and very even. The smoke combined with the fog filter gave us a very interesting effect. Everything was shot wide open, at around F/2.4, and this added to the effect of diffusion.

That's the solution to the problem of photographic style that we went for in the case of "ZARDOZ" and it seemed to work quite well. Of course, on that picture there were many special effects and tricks which were done in the camera and which were the result of Geoffrey's experience, and quite fun to do.

**On the subject of photographic experimentation during the filming of "HELL IN THE PACIFIC":**

"HELL IN THE PACIFIC" was photographed by Conrad Hall, a brilliant cameraman and he was "cast" exactly right for the film. Obviously, I think that no matter how versatile a cameraman might be, you have to cast him for a particular picture. Geoffrey Unsworth, for instance, brilliant though he is, would not have had the kind of skill that Vilmos Zsigmond brought to "DELIVERANCE", because Vilmos has incredible physical prowess. The kind of corners he was able to get into on that film added up to a tremendous contribution.

By the same token, Conrad Hall was born and brought up in Tahiti. His father was the co-author of "Mutiny on the Bounty", so Conrad was a tremendous source of strength when we were out on that remote island in the South Pacific making "HELL IN THE PACIFIC". He knew the terrain and how the sea behaved. He understood the ways the light came and went. He was a tower of strength in that sense.

Again, in the very beginning, we had long conversations about the photographic approach to the story. The subject of flashing came up. It was relatively new at the time, but Freddie Young had used it on a picture with good results. Ultimately, we decided against flashing because of the nature of the script. There were only two characters in this film. There was

**Continued on Page 334**

**British director John Boorman (now a resident of Ireland), shown while on a sight-seeing trip to the Persepolis archeological site in Iran, while he was in that country to attend the recent Third Tehran International Film Festival. His constant good nature and merry mein seems at odds with the kind of talent it takes to put on the screen such hard-hitting, gut-twisting dramas as "POINT BLANK", "HELL IN THE PACIFIC" and "DELIVERANCE".**



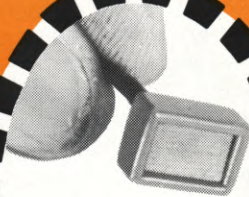
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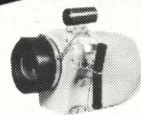
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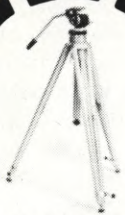
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# A brief encounter on the set at Pinewood Studios — between Arthur Ibbetson and David Holmes

World famous lighting cameraman Arthur Ibbetson found a few minutes between filming to chat to David Holmes, Managing Director of Lee Filters.

DH "It's looking as hectic as ever Arthur. Reminds me of my many years as a lighting cameraman."

AI "Yes, with such high production costs these days we're always trying to keep up to the shooting schedule."

DH "I'm delighted to see that you're using Lee filters — I hope we're contributing to an efficient production."

AI "Well, we've gone for Lee filters because they've such a long life. How do you do it?"

DH "The answer lies in the base. It's Melinex — a polyester film from I.C.I., that's really tough. And heat-resistant, too!"

AI "That certainly stops us having so many disrupting burn-outs. But the colour consistency is so good. It solves lots of problems for us, you know."

DH "Through my experience as a lighting cameraman I've always felt that colour consistency was vital. That's why we've installed a special Bone Craven coating machine at our Andover plant — and we back it with vigorous colour control checks using I.C.I. digital colorimeters and Beckman spectrophotometers."

AI "It really does make sense, David. Long-life filters with near-perfect colour control. That's what I need!"

DH "Well, there's just one thing, Arthur. That's service. You know, I'm proud that we're able to deliver every colour in the filter range off-the-shelf for you. So that there's absolutely no loss of continuity at any time."

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# IMAX AND MULTI-MEDIA PRESENTATIONS TO BE FEATURED IN PHILADELPHIA'S ELABORATE BICENTENNIAL EXHIBIT

Unusual motion picture and audio-visual formats will play a prominent role in exhibit center being built to celebrate America's 200th Anniversary

The City of Philadelphia has unveiled plans for the country's major Bicentennial exhibit — an \$11.6 million Living History Center that will mirror 200 years of American life.

Centerpiece of the innovative brick and glass structure at 6th and Race Streets will be a 45-minute film by a major motion picture producer using the dramatic new 70-millimeter cinematographic technique known as IMAX.

Also featured will be a series of exhibits that will use the latest in multi-media techniques to:

- Glide visitors on a moving sidewalk past jolting Conestoga wagons going West for gold, offer the sensation of a paddle-wheel steamer pumping through a canal and the whooshing into space aboard a nuclear-age rocket.
- Recreate the building of cities on the prairies, the fires that leveled them, the panorama of skyscrapers spring-

ing up across the hills and plains of America.

- Offer the accents of a dozen American regions and allow visitors to create their own visions of dream houses and lifestyles.

Richard C. Bond, chairman of Philadelphia '76, Inc., the city's Bicentennial planning agency charged with overseeing the building from concept to completion by April 1976, explained the center's concept during a recent news conference at the PSFS building, 12 S. 12th St.

"People know the Liberty Bell is here and they will come to see it as they always have," Mr. Bond said. "Now they will have the opportunity to see something — a living history of what happened after the original roots went down."

Mr. Bond added that the exhibits will be grouped around themes celebrating changes in American life, including immigration, cities, transportation, lan-

guage and American dreams.

"We want people to see and feel American life throughout its history in unforgettable ways," Mr. Bond said. "We want to give them the sensation of what it meant to be an American at the time of the Revolution during the opening of the West, the Civil War and right up to the present day."

Above all, he said, the impact of the exhibits would be to present America as a vast melting pot, telling the story of peoples from diverse cultural, religious, and ethnic backgrounds.

The exhibits, like the rest of the center, are being created and executed by the New York design and research firm of Raymond Loewy/William Snaith, Inc.

Architect for the 85,000-square-foot structure with its 875-seat theater and 65-foot-high screen is Mitchell/Giurgola Associates of Philadelphia.

Initial ground preparation and leveling began on Nov. 6. General contractor is Irwin & Leighton, Inc., King of Prussia, Pa.

Six motion picture producers were initially considered for the \$2 million film that will tell the American story in a seven-story-high projection process known as IMAX. Final choice will be announced shortly.

IMAX has been used only at theaters in Toronto and San Diego, at Circusworld near Orlando, Fla., at Japan's EXPO '70, and the Spokane (Wash.) World's Fair.

The history center will occupy a 2.5-acre site within a stone's throw of Independence Hall, the country's birthplace. The exhibits include an open mall and waterfall, a children's historical playground, two restaurants and a merchandising area.

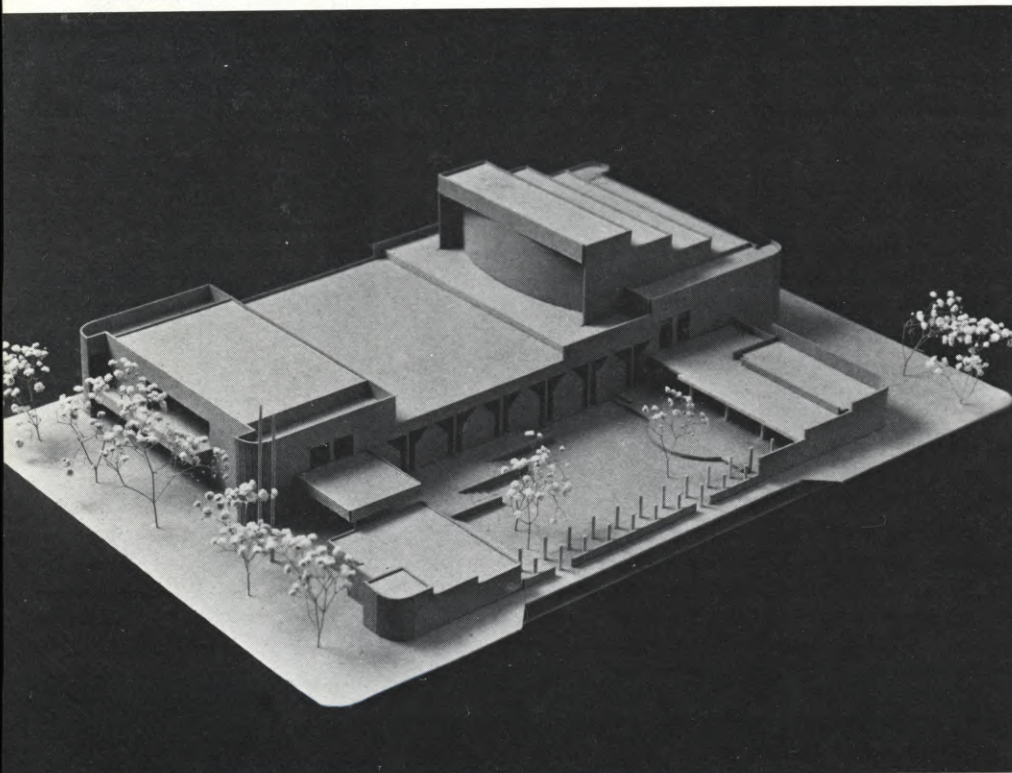
An \$8.5 million City Council loan will finance most of the costs. The balance will be secured in bank loans, Mr. Bond said.

During the Bicentennial year, 1.5 million visitors are expected to go through the center spending two to three hours inside. Daily peak is estimated at 10,000 in the summer months.

Adult admission will be about \$3.00; \$1.75 for ages 10 to 12, and \$1, ages 6 to 11. Admission is free for children under six.

The center, along with many of the

**A model of Philadelphia's Living History Center at Sixth and Race Sts., which will house the city's major Bicentennial exhibit. The building of stone, concrete and glass is built around a landscaped court and includes an 875-seat theater, 18,000-square-foot of interior exhibition space, a children's playground, a restaurant and shopping area. Raymond Loewy/William Snaith, Inc., designers; Mitchell/Giurgola Associates, architects.**



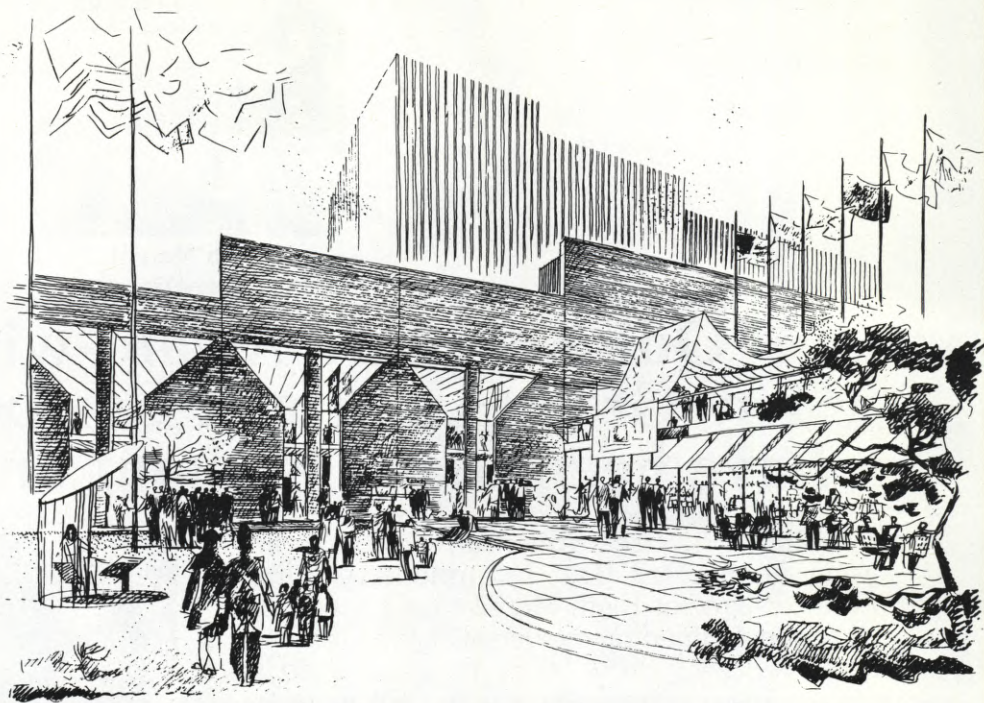


exhibits and the film, will remain open to the public beyond 1976.

Twenty-one exhibits will be grouped around themes mirroring the changing pattern of American life. Major themes are immigration, cities, transportation, language, American dreams. There will be heavy emphasis on the newest developments in multi-media techniques encouraging audience participation.

Here is a listing:

1. Walk Through American History  
*A chronological history of the United States from 1776 to the present, based on the major social, political, economic and cultural changes which have occurred.*
2. American Jubilee  
*A dazzling showcase of Americana.*
3. Craft Board  
*A presentation of craftsmen at work — movable cutouts, not real people — and their creations: For example, cabinetry, quilts, scrimshaw, pottery, silver objects from the 18th Century to the present.*
4. Music  
*An audio exhibit where the sounds of American music will be heard: Indian drums, Negro spirituals, talk songs, jazz, rock.*
5. What Do You Say?  
*An audio-visual presentation of regional accents and expressions and information on the development of an American language quite different from English English.*
6. Changing Face of America  
*The story of immigration to America, how it affected the immigrants and how the immigrants affected American culture.*
7. Day-In and Day-Out  
*About changes in daily life: school, eating, housekeeping, leisure-time activity.*
8. Made in USA  
*About inventions large and small that have changed life in America.*
9. The Market Place  
*About the changes in how and where Americans buy the goods they need and want, from the early town market to marketing by mail to the vast super-market created by the mass media.*
10. Views of America  
*Maps of the U.S. from Amerigo Vespucci to a view from the moon.*
11. On The Line  
*The assembly line and the changes it has brought in how Americans work.*
12. From Farm to Factory  
*About the industrial revolution by tracing changes in one industry.*
13. Men At Work  
*About jobs which no longer exist and*



**Architect's sketch of the open mall and patio area of the new Living History Center, the thrust of which will be to mirror 200 years of American life. The impact of the exhibits will be the presentation of America as the vast melting pot that it is, telling the story of peoples from diverse cultural, religious and ethnic backgrounds.**

*jobs created in the 20th Century.*

- 14a. American Dreamers  
*How ideas of people like Jacob Riis, Thomas Jefferson, Martin Luther King, Horace Greeley, Jane Addams, Margaret Sanger and John Brown created reforms in America.*
- b. American Goals  
*How the national ideals of different periods in American history have changed.*
- c. The American Quest  
*Personal goals of Americans in different periods of history.*
- d. What Am I Going To Be?  
*An exhibit for children only, showing occupations in different eras.*
15. Turning Points  
*From catalysts to change in American history: American revolution, depression, civil war.*
16. This Land Is Your Land  
*About the vast size, beauty and diversity of landscapes and cityscapes.*
17. Rise of Cities  
*About the growth and proliferation of American cities.*
18. On the Go  
*The development of transportation.*
19. Moving On  
*About changing patterns of migration: East to West, black movement south to north, old people's move north to south, from farm to city.*

20. The Medium Is . . . . .

*About changes in communication in America: telephone, telegraph, penny press, advertising, satellites.*

21. To Secure These Rights

*The development of rights and liberties in American history; the inclusion of increasing numbers of people — black, women, minorities — in political and racial rights.*

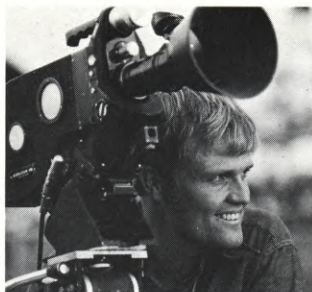
Here is a closeup of some of the exhibits:

#### **Exhibit #2 — AMERICAN JUBILEE**

This exhibit serves as a preview to the 18,000-square-foot exhibition hall. It invites people to "come see what's here." It will consist of oversized pop images of Americana objects: an oversized baseball, a ten-foot telephone, a skyscraper with an elevator moving up and down, a revolving cowboy and horse. TV monitors will hang from the ceiling to show what is going on around the country: history in the making. Banners will drop at intervals with such things as old broadsides on them: "Wanted" posters, believe-it-or-not-style facts about America. There will be a birth clock clicking off the new American arrivals as they're born. The whole exhibit will be illuminated with on-and-off lights chasing around the images. "Flying Fact Banners" will appear and disappear. Information

**Continued on Page 300**

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**Kieth Merrill,  
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take your assignment with complete confidence in the reliability of your equipment. Why not join Kieth Merrill and all the other satisfied Eclair NPR users and start filming with an award-winning camera now? After all, there could just possibly be an Oscar in it for you, too.

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# FILMING "MOONRUNNERS"

By **BRIAN W. ROY**  
*Director of Photography*

"MOONRUNNERS" is a contemporary comedy based on the exploits of one-time moonshiner, Jerry Rushing, who also acted as advisor on the film. Written and directed by Gy Waldron and produced by Bob Clark, "MOONRUNNERS" was photographed entirely on location about 40 miles southwest of Atlanta, in and around a small town called Haralson. The entire cast and crew stayed in nearby Griffin for six weeks.

When Gy first called me, he suggested that he would like to shoot in black and white, because as he explained, although "MOONRUNNERS" is a comedy, he did not want it to have a "high-key", super-slick look, which he felt would be the effect of shooting in colour. He was concerned that it would only detract from the feeling of reality necessary to the story.

He had already chosen many of his locations, both interior and exterior, after making many trips to the Haralson area. I went with him later and we drove many miles over narrow country roads that would be used in some of the high-speed car chases. We also looked at some old houses, including the one that would be the home of Jesse, played by Arthur Hunnicutt, one of the main characters in the story. Built in 1868, this house was occupied by Mr. and Mrs. Quick, both in their 70's, and just as charming and hospitable as they could be.

This, together with the other locations we looked at, were so rustic

and full of character, I didn't feel that black and white would do them justice. I assured Gy that I would try to light in such a manner as to retain as closely as possible the quality and character for which he chose the locations. I also discussed with Movielab in New York, the fact that I wanted to underexpose some of my interiors by two stops and force-develop one stop, my reasons being that I felt I could achieve the look I wanted from a thin negative rather than depending on the lab to give me what I wanted from a normal negative. Surprisingly, they did not scream at the suggestion. In fact, they were extremely cooperative. Our work print was excellent and Gy was very pleased with how the interiors looked.

We hear a great deal about achieving an authentic or natural look on film, I believe that, like beauty, it is in the eye of the beholder. I think we achieved our goal in this respect and hope that the audience will think so, too. We spent about six days shooting in and around the Quick house, and the first members of the crew to arrive early each morning were welcomed by the Quicks with hot coffee and biscuits. The house was supported by large boulders all around which appeared to have been placed strategically wherever the house looked as though it was about to collapse. Inside, the floors undulated throughout. You could even see all the way through to the ground between some of the boards. My first concern was whether the floors would support

the weight of our dolly with the BNCR and the crew. The house is still standing and probably will for another one hundred years.

We shot both in the kitchen and in the living room. In the kitchen, we shot several "day scenes" and several "night scenes". Our blocking for the day



The next best thing to a crane is a tall tree. This was the best vantage point for filming a collision between a moonshiner's car and a police road block.

(LEFT) Making movies is very serious business, but not as serious as the expressions of Director of Photography Brian Roy and Director Gy Waldron would indicate. (RIGHT) "MOONRUNNERS" was shot entirely on location. One of the interior locations was the Fayetteville jail. Being filmed here is a scene in which Willie Woods and Keel Martin become acquainted.





**When shooting the auto chases, it was necessary to mount cameras on various parts of the cars. Jim Latham and Bert Bertolami did wonders with Super-grips and Century arms, plus, of course, a bit of gaffers tape. As the cars gradually got wiped out, it became necessary to use a car for several different purposes. One day a car might belong to a moonshiner and the next day it would be a police car. A quick repainting job did the trick.**

scenes was such that at some point, we would be seeing the windows. I decided to use 85ND3 so they would not burn out. This left the outside hotter but you could still see detail. Inside I used two 1K soft lights, one above each window. This gave me a working aperture of T/4 at ASA 200. In approaching the lighting from this standpoint, we were trying to retain the appearance of the kitchen as it originally looked. I believe we achieved this.

As for the night scenes, our apparent source was from a bare bulb hanging in the middle of the kitchen, which never actually appeared in the shot. I don't like to show a bare bulb, unless it is absolutely necessary. Sometimes it is, but in this case I felt that the apparent source was believable without showing it. It is important to the realism of the scene, that the key light be determined by the position of the apparent source, a table lamp, candle, or whatever, whether it is in front, behind, or to the side of the subject. As an example, we have a scene which takes place at night in Jesse's living room. Keel Martin, who plays Lee, and Chris Forbes, who plays Beth, are seated on the couch, their backs to the camera. Jesse paces back and forth as he talks to them, thus facing the camera. The practical, a table lamp, is in the corner of the room facing the camera as well. The key light is hung directly above the table lamp so that when Jesse is pacing, he is side-lit at one point; then, as he moves between the table lamp and the camera, he is completely back-lit, except for a minimal amount of fill light.

I used the same lighting setup for the reverse shots, except for a set light on the wall facing the camera.

One of the biggest and most challenging lighting setups was in an aban-

doned tavern, renamed the "Boar's Nest". It was decorated inside and out by art director Pat Mann and his crew, so realistically that many passing motorists stopped in for a cold beer. In other sections of this same building, Mann built a barroom and brothel, which again were fantastic and real-looking. At least, I was told the brothel looked real. The major problem in lighting the tavern was that it was necessary to see the whole room at some point, and the ceiling, would be in the shot, eliminating the possibility of stringing lights. The room was also

going to be filled with people, sitting at tables and in booths, and some walking around. It was not practical to hide lights behind anyone, since they would be constantly moving. I decided to put small practical lamps on all the tables with No. 1 Photofloods inside and cut red gel to fit inside the shades. Those sides of each lamp that faced the camera were scrimmed down so as not to appear too hot. Other areas in this same room such as the bar area and the bandstand, I was able to light from the ceiling by placing units behind

**Continued on Page 304**

**The crew and actors wait — not for the sun, but hopefully for the departure of a small airplane doing stunts directly above the location. The local airport did not have a radio, so it was impossible to contact the pilot and ask him when he would be through fouling up the sound track.**



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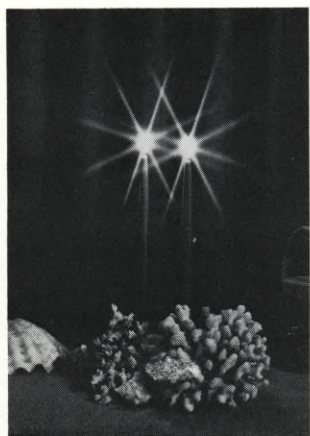


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# HOW A MEMPHIS TV STATION PRODUCES IN-HOUSE COMMERCIALS

**Know-how and the right equipment combine to create low-budget local commercials to compete for viewer attention with expensive regional and national spots**

**By JAMES HOLDEN**

To whom can a potential advertiser turn when he wants to promote his business on television and has no commercial to run? That's not only a dilemma for the advertiser, it's also a frustration for the station's time salesman. Regional producers often are too costly; in many cases the production budget can be higher than the time cost.

In Memphis, Tennessee, a number of advertisers turn to Jay Perkins, production manager of WMC-TV, who is busy refining a complete in-house, high-quality production service.

"For a low budget, we can offer slides," Perkins says, "but if the client needs it, we can turn out a production equal to or better than most commercials on the air today."

Perkins, who had been WMC-TV's production manager for over two years, sees a need to increase quality in local commercial production. "Even the local furniture store is in competition for the viewer's attention with regionally- and nationally-produced spots on which thousands of production dollars were spent," he relates. "Clients see it, too. We're getting requests to do quality

commercials from clients who, two or three years ago, never would have spent more than \$50 or \$75 on producing a spot. Now they want location filming in their places of business. Both the viewer and the local advertiser are becoming more sophisticated in their tastes."

When the need for location production became apparent, Perkins brought in Chris Taylor as writer/producer/director. Taylor has a strong background in advertising agency work and in film production, and devotes all his time to commercials.

Recently he added to the commercial production capability when Paul Bateman, former news cameraman, was transferred to the Production Department. For the past two years, Bateman has worked on commercials and documentaries when his news assignments permitted, but this was mostly at night or on weekends.

What started as a service to "get the advertiser on the air" has developed into a highly efficient, self-contained production unit. Not only are personnel assigned specifically to the unit, the department also has its own equipment

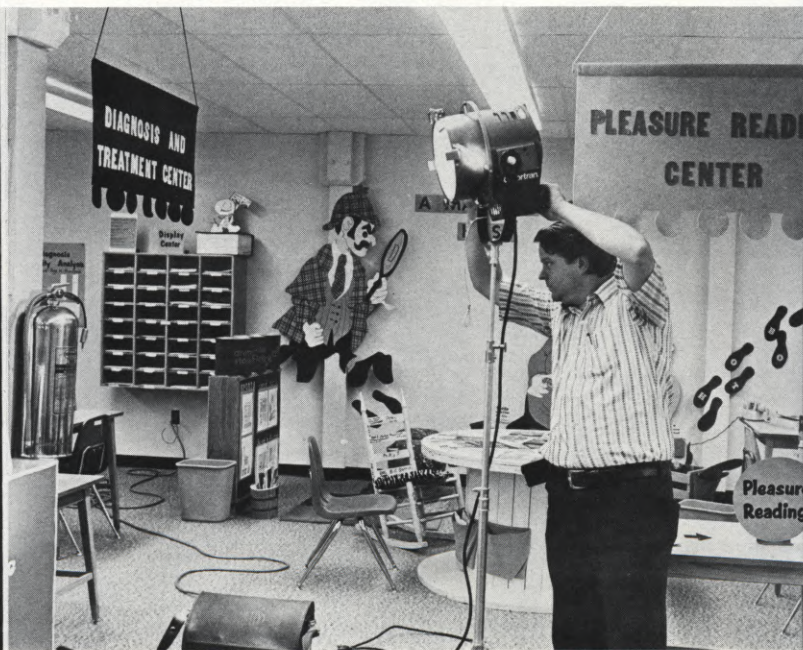
now — no longer needing to borrow from the news department.

Camera equipment consists of a complete Arriflex-S System and a complete Arriflex BL System with single-system sound module. For sound, Nagra full-track and two-track recorders, Sennheiser shotgun microphones and Sony lapel microphones are used. All lighting equipment is from Berkey Colortran. "I feel we are totally equipped with professional film production equipment," says Taylor, "and are capable of doing almost anything a client would request."

Sometimes the requirements are almost staggering. One series of commercials required a male actor to emerge from a building — at night and in a rainstorm. Unable to wait for nature, Taylor had a large sprinkler grid built and connected it to a fire hydrant by 300 feet of firehose. A large segment of the building front had to be lit, so the local electric company supplied a special 200-ampere power drop.

The building front was lit with two 5,000-watt spots, while 20 1,000-watt Colortran spotlights were placed around the plaza for key lighting. After

**(LEFT) Silhouetted against a lighted set, WMC-TV cameraman Paul Bateman shoots a scene for a public service school commercial. (RIGHT) Bateman lights the set for the public service commercial with two Colortran 8-inch Ring Focus Fresnel lights, which provide enough illumination for a lens aperture setting of f/8, thus making possible a greater depth of field.**







**(LEFT) Two 5000-watt lights were used to illuminate the front of the building, and 1000-watt Colortran lights were strategically placed around the plaza for shooting an insurance company commercial. (RIGHT) WMC-TV crew sets up to shoot a location scene for a bank commercial. What started as a service to "get the advertiser on the air" has developed into a highly efficient, self-contained production unit.**

four hours of shooting (the actor had two wardrobes) they had enough film for both originally-assigned commercials (one 30- and one 60-second spot) and for an additional 30-second spot requested by the client.

"Even though we used as many lights as we could beg, borrow or rent, I feel the scene was still slightly underlit," says Bateman. "To maintain the quality of the finished commercials, we usually shoot them on Eastman Ektachrome Commercial film, 7252. This is a slow film and it requires a lot of light. And, as we've been getting into increasingly larger productions, we've accumulated our own lighting equipment to fit our needs."

The accumulation includes four Colortran Focusing Floods (Multi 10's), six Colortran Fill Lights (Mini-Lite 10's), four Colortran 8" Focusing Fresnels, two Colortran Multi Pan 20's and complete accessories (barn-doors, scrims, etc.). Six older Quartz-King 1000-watt kits are used as backup. Also available are two Colortran Soft-Lites which are used both for the studio and location work.

In addition, five sets of Colortran Pole-Kings are used for mounting the lights. "We can go into a location and put up an artificial grid with the Pole-Kings," says Taylor, "thereby keeping a lot of lighting off the floor. And we use an assortment of Pole-King clamps to mount the lights with. For example, the Mitee Grip, which looks like a strange C-clamp with an arm on it, has been helpful in spots where we need to clamp a light on a grid, a pipe or even a dolly. It's amazing how often you get into that situation."

"Since all of our work is done on location, the Colortran equipment is exceptionally well-suited for our use," Bateman comments. "It's lightweight and easy to handle, which I really appreciate at the end of the day."

### LAMP COLOR TEMPERATURE CRITICAL

The color temperature of the light also is critical to Bateman. "These lights give you a true 3200°K when you're shooting Ektachrome Commercial film," he says.

For exteriors, the dichroic filters included in the kits are used to raise the color temperature to 5400°K.

The big jobs, like lighting a corner of a three-story warehouse for a forklift commercial, or the entire service department of an auto dealership, are the spectacular ones. But often the schedule calls for shooting in tight, cramped spaces, where carefully-placed small-wattage light is needed.

"We were borrowing a Mini-Pro kit from the news department; now we have one of our own," Bateman says. "This is the basic kit for all news cameramen, and we find it useful for almost every lighting situation. We use the 650-watt lights for kicking and filling, and they're small enough so we can hide them all over the set. If we need a light directly over the camera, we usually use a Mini-Pro and scrim it down to soften it."

One example was a commercial for an apartment complex. The footage was shot in cramped quarters inside the apartments, with sunlight coming in the windows. Dichroic filters were added to the Mini Pro's, which were placed to kick and fill the actor's faces.

"In a situation like this, I often look for a hanging acoustical ceiling," Taylor says, "because it's a great way to mount the lights. We clamp gaffer grips right onto the ceiling grid and hang the lights that way. It's almost like having a built-in artificial grid, and the lights are off the floor and out of the way."

### UNIQUE LIGHTING SITUATION FOR DISCOTHEQUE SPOT

One recently-completed spot posed quite a challenge. The client was a local

discotheque owner, and his prime attraction was a sublit dance floor in a variety of colors. The flashing lights under the floor are controlled by a disc jockey, sitting on a stage at one end of the room.

"The challenge was to light dancers, the disc jockey and a drummer without spilling any light onto the dance floor, so we used controlled lighting from the sides."

To light the T-shaped floor the crew used two 2,000-watt lights — one in each corner — to kick across the crowd. Three 1,000-watt lights were then placed on either side of the base of the "T", and a 650-watt was used to kick right into the center of the "T". A 1,000-watt fill was used over the heads of the disc jockey and drummer, and a 650-watt was used to kick the front of them.

Using barndoors, Bateman and Taylor tightly-lit the dancers only from their heads to their knees. "The floor showed up beautifully," Taylor recalls, "but the scene still looked stark for a discotheque. Fortunately, I had Berkey Gelatran color filters which I hung over the lights to get the effect we needed."

All lighting had to be placed among the tables on the floor, on stands. The relatively small size of the lights permitted them to disappear in the background fall-off.

The discotheque owner was amazed by the results, Perkins recalls. Other film producers had tried to produce films on location there before, and the results were always disappointing. Now, he had a commercial which really communicated his message. It made his television time work harder for him.

And that's what Perkins' job is all about. Producing commercials that work at a price sponsors can justify. When he does this, he's not only selling production, he's helping the station's sales representative sell time. ■

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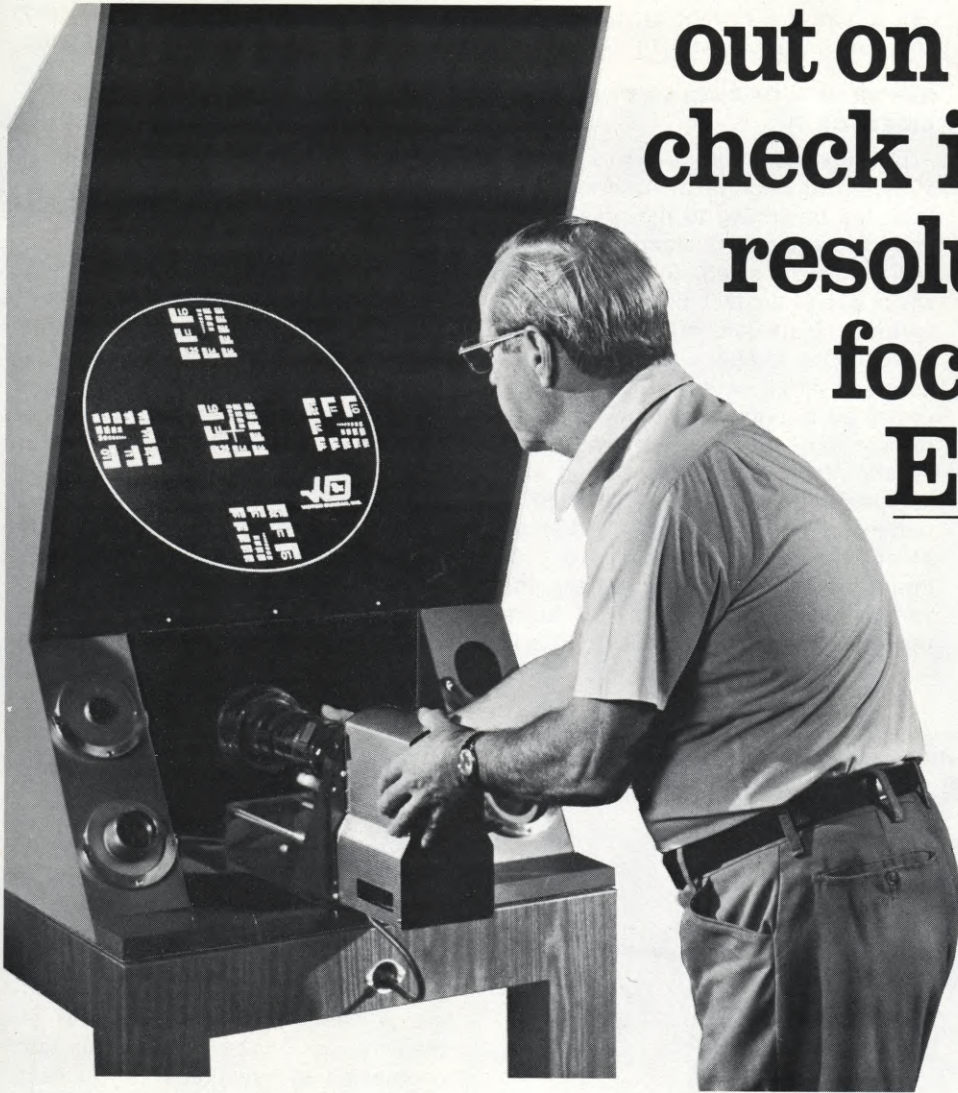


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Our exclusive rear projection test machine lets us do the job in only sixty seconds.

If a lens is three inches off indicated focus at six feet, we can see it easily. (Looking through the camera with a groundglass and a magnifier, it's hard to tell a three foot error.) And we can check the focus at every point of the zoom range. We can and we do. *Every time.*

## HOW IT WORKS

The lens is positioned on a precision standard, in the appropriate camera mount. A front-surface glass U.S.A.F. test chart is placed at the film plane. Positioning accuracy is within 1/10,000 inch.

By rear projection, the target's image is visible two feet from the operator on a darkened screen. At that distance, it's easy to count the lines per millimeter, and to check the focus, from in tight to wide angle.

An overlay cel with the same crosshairs is positioned on the screen itself, in register with the projected image. As our service man zooms the lens in, he can see at once if the tracking is centered properly, and if there are any bumps.

None of these tests is new, of course. What's new is that they can be done with high precision in sixty seconds. Without a darkened room and without a distant screen to peer at.

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At Duncan, we test everything before it goes out. (For example, we run film through every rental camera—every time.) But collimation tests take forever. So we've designed our own lens test machine.

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## BICENTENNIAL EXHIBIT

Continued from Page 289

such as "In 1876 it took one hour to go six miles; in 1976 a satellite circled the globe in the same amount of time" will be on them.

### Exhibit #5 — WHAT DO YOU SAY?

An important effect of change in America has been to bring the country together, unifying lifestyle, dreams, movement. One place where differences persist is in language, regional accents and expressions. This exhibit is primarily audio. A viewer will plug into a switchboard map of the country and hear someone talking from that area. A scene will be taking place on a TV monitor placed above the viewer, for example, of someone asking directions of someone else. When the viewer plugs into the map, he will be able to hear the conversation and hear how directions are given in Georgia, Maine, New Mexico, etc. There will be a Speak Machine, a voice-activated instantaneous playback machine, geared

**Images of rising cities at Philadelphia's Living History Center will be projected around a large square of mobile screens. Visitors will see the cities going up from the prairies, struggling and surging through decades of evolution and finally achieving the skyscraper cityscape of today.**



to a four-second message. The Speak Machine will enable a person to hear his own voice, realize his own accent. Being considered is a machine which can guess the accent of the person speaking into it.

### Exhibit #6 — CHANGING FACE OF AMERICA

Immigration has been a major stimulus of change in American life from the beginning to the present. Its importance in the history of America will be emphasized, in part, by the sheer size of the technique used, a 20-foot high multi-screen slide projection system. One image, a few images and as many as 20 or so images may be projected at once for whatever length of time is desired. A sound system is synchronized to the multi-screen projections, but will be heard through a battery of "Hear Phones." This is an effective way to tell the story of immigration in America: where the various groups (Chinese, East European, English, French, African, Puerto

Rican) came from, what their trip was like, what they looked like, how they were received in America, what they did, how they lived, how American life changed their customs and culture and what various groups have contributed to American culture.

### Exhibit #7 — DAY-IN AND DAY-OUT

Daily life in America has changed dramatically in the past 200 years: for example, the way Americans get dressed in the morning, what they eat, how children go to school, how they clean their homes, wash their clothes, their leisure-time pursuits. In this exhibit there will be several large structures which resemble oversized rolo-dex files. Each file will represent a different era (1776, 1828, 1870, 1919, 1976). On each file will be pictures (drawings, paintings, photos) of Americans going about the same daily pursuits in the different eras. The files will be motorized so that the pictures drop into view rhythmically. Each file will be synchronized with the others so that the viewer will see one activity (e.g. dinner time) in different eras at the same time.

### Exhibit #8 — MADE IN USA

The purpose of this exhibit is to show American inventiveness and industry, the range of goods produced and to celebrate American industry and production methods. The technique which will be used is the Kaleidoscope Theater which, like a hand kaleidoscope, can break up, multiply and diffuse images. This technique lends itself to showing an invention or product and its impact; for example, one car will change into a scene of one thousand cars. We will show the variety of products, eccentric inventions and assembly line production which was the great American contribution to industrialization.

### Exhibit #14 — AMERICAN DREAMS

This exhibit is divided into four parts:

- a. *American Dreamers* — The important reform movements in American history will be covered by focusing on the lives of the great leaders of reform. Short biographies of the lives of such people as Ralph Waldo Emerson, Martin Luther King, Elizabeth Cady Stanton, Thoreau, John Brown will be presented. The technique has not been definitely set; possibly, the biographies will be narrated as viewers look at hologram images of the reformers.
- b. *American Goals* — The audience will stand in front of an angled screen which will be of a glittery,

translucent material. Rear projected onto this will be images of the dreams of different eras in American history. These images will seem to float onto the screen and disappear into space. This effect is achieved with crawl projectors which project an image and move so that the image glides across the screen. Examples of some of the images which will be used are: Declaration of Independence, preamble to the Constitution, wagon train going West, underground railway, robber barons.

- c. *What Am I Going To Be?* — This is an exhibit for children only. There will be a row of panels with cut-out holes at the level of children's heads. When children put their faces into the cutouts they will see themselves as an adult in different periods of history: for example, as a soldier in the revolutionary war, a slave, a cowboy, gold miner, suffragette.
- d. *The American Quest* — With the same technique used for American Goals, visitors will see personal goals of Americans in different eras.

#### Exhibit #15 — TURNING POINTS

This exhibit deals with political events that dramatically changed American history; for instance, Constitution and Bill of Rights, election of Jackson, Lincoln-Douglas debates, Spanish-American War, FDR and the New Deal, Watergate. The audience will be seated on chairs in front of a screen onto which films of the events leading up to the turning point will be rear-projected as a narrator explains what these events are. As the turning point itself is being described the audience will revolve their chairs toward a larger wall onto which will be projected the effects of the turning point on American history.

#### Exhibit #17 — RISE OF CITIES

The change from a rural to an urban society has had a profound effect on American lifestyle. Viewers will experience this change by watching as in a time-exposure photograph — the change from rural to city environments take place. They will stand inside a square space delineated by four green, organic-looking shapes with slots on the top of each one. Slowly out of each slot a screen rises up. At first teepees are seen, then farmland, then scattered villages and as the screen rises up (on wires), to full height a city grows around the viewers. Film can be projected onto the full-sized screens with their cityscapes as background. In this way the



The story of American immigration at Philadelphia's Living History Center will be told on a 20-foot-high multi-screen slide projector system. One image or a dozen will be shown on this "wall" for varying timespans synchronized to a sound system heard through batteries of "hear" phones.



AMERICAN JUBILEE, the showcase exhibit at Philadelphia's Living History Center which invites visitors to "come see what's here." Exhibit includes giant pop images — a huge baseball, a 10-foot telephone, hanging TV monitors, appearing and disappearing "flying fact" banners. During the Bicentennial year, 1.5 million visitors are expected to go through the Center.

growth of cities will be shown: fires, the influx of immigrants into tenement areas, the development of transit systems, scenes of city life in different eras, the problems of modern-day cities such as congestion, pollution and a suggestion of what cities may look like in the future.

#### Exhibit #18 — ON THE GO

Transportation has had a special role in the U.S. since a good portion of our history has been involved with exploring and settling the continent. There were some key innovations in transportation that revolutionized movement, and, therefore, the look of the country. This exhibit takes people through these developments and explains the impact of each invention. At the same time the history of the settlement and growth of the USA is told

chronologically from the point-of-view of movement. The technique is to move people through a tunnel on a moving sidewalk. On the wall of the tunnel will be projected a film of the scenery that the viewers would be seeing in whatever conveyance is being talked about: on a Conestoga wagon, a canal boat, a steamboat, a train, a plane, a rocketship. Although the speed of the sidewalk is constant, the illusion of varying speeds is affected by the speed of the filmed scenery that surrounds the viewers. The audio will be a combination of explanatory narrative and ambient sounds (e.g., a train whistle, a steamboat rolling through water). On the outside walls of the tunnel, different vehicles of transportation will be projected so that the exhibit will be of interest to viewers outside as well as inside the tunnel. ■

  
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# MAKING IT IN FILM

"We originally wanted to title our movie 'I Was an Infant Con Man' or 'I Was an Adult Con Man Who Ought to Have Known Better.' It ended up 'Marjoe.'

"Marjoe' is a documentary about a man who repented and exposed an evangelist racket. And he did it right in front of our cameras.

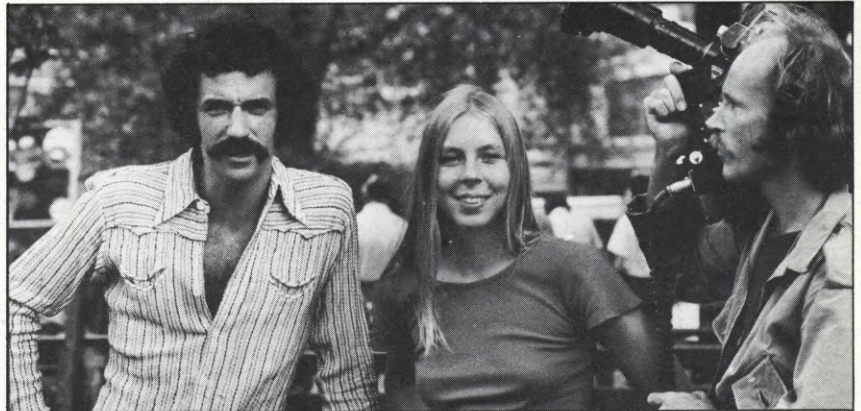
"Our contract with the distributor required us to deliver a 35mm picture 'first-class in artistic, pictorial and dramatic quality... of such exhibition, entertainment and amusement value as shall make it suitable and desirable for presentation to the public in the highest class motion picture theatres in the United States of America and elsewhere.'

"Verbatim. To us that meant a 16 to 35mm blowup without grain the size of grapefruit and a distorted, incoherent sound track.

"We chose 16mm because it's certainly not an 'underground,' 'educational' or 'senior thesis' film anymore.

"In fact, we couldn't have done it without 16mm. We chronicled Marjoe's last months as a boogie-woogie evangelist in churches and tents all over America. We recorded the private, intense, bizarre and beautiful spectacle of human faith. We had to be practically invisible so as not to disrupt this ritual. No towering cranes, tracks, dollies; no slates, no bullhorns, booms or second takes.

"The types of Eastman film stock available in 16mm are better quality, and the ongoing improvement has given rise to a breed of cameramen highly skilled in cinema verite work. We chose cameramen by checking their unedited sample footage for smooth movement and quick, accurate response to significant images in a charged crowd situation, and who could slide through a throng of people as if their cameras were a natural part of their anatomy.



Howard Smith and Sarah Kernochan. Producers/Directors of "Marjoe."

"The presence of cameras, microphones and spots made no change in the proceedings, because of the size and mobility of 16mm equipment. Most of our sound track was mixed on the spot into a single recorder from mikes near the audience and the preacher's mikes onstage.

"We chose Eastman color negative film 7254 because it best suited our needs since we were headed for a blowup to 35mm. After shooting, we went to TVC, a lab in New York that takes unusual care in processing 7254, to develop our negative. EUE/Screen Gems blew it up to a 35mm CRI (Color Reversal Intermediate). Release prints were made from this CRI and the 16mm negative was stored as our protection.

"All of us, together with TVC and EUE, were knocked out when we saw our first answer print. What we saw was not a blizzard of grain, but a sharp 'first-class' image, and above all, living color as deep as real.

"At a college campus screening, most of the audience thought they were watching a studio-produced, scripted dramatic film with professional actors. We had avoided the primary stigmata of cinema verite films: jerky, grainy, lurching contrasty images with an indistinct location track.

"Prospects for quality blowup

are even better now for 16mm filmmakers; we've seen tests for the new fine-grain Eastman color negative II film 7247. The image is superb.

"We want to credit everyone involved. Now that 'Marjoe' has been a critical success, has had its first run in domestic distributions, is opening all over the world and has won an Oscar, we as the producers can at last write our own ticket to direct scripted dramatic films with actors, top production value and comfortable budgets.

"We hope that in reading this, other people starting out as we did, having to make low-budget films in difficult conditions for quality theatrical distribution, will be encouraged."



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(Be sure to watch "The Men Who Made the Movies," an eight-part series made possible by a Kodak grant and scheduled for PBS broadcasting in November and December.)

11-3



**(LEFT)** The Atlanta Race Track was lit with banks of metal halide lamps around the track, radiating 16 foot-candles at the hottest point. The pit area in the center had to be lit to 16 foot-candles, as well, in order to balance. The film was pushed one stop and looked excellent. **(RIGHT)** Despite abominable weather on the last day of filming, the shooting was completed on schedule, with the final few minutes being put "in the can" between showers.

## FILMING "MOONRUNNERS"

Continued from Page 293

hanging signs or beams. Bert Bertolami, key grip, and Jim Latham, gaffer, whose speed and experience made this and many other setups seem like a breeze, have a grip and lighting truck that has just about every piece of equipment you could need, and if it isn't there, they'll build it. We used many local people as extras and they were extremely enthusiastic and patient, despite the heat, the smoke, and the logistics involved in shooting such a major scene. Here again, I believe we achieved the desired look. The brothel scene was a similar situation. However, it was decorated rather garishly and had white muslin draped over the entire ceiling, rather like the inside of a tent. Behind the muslin, we placed at various points throughout the ceiling, RFL's, which appeared in the

**Being in the sound crew has its exceptions. Here Jim Hawkins and Joe Clayton have the pleasure of wiring Chris Forbes for sound.**



shot and gave a low-key over-all ambient light. Key sources were then placed where they would be most effective. The scene calls for Lee, at the opposite end of the room, to run the entire length of the room and dive into the middle of a bevy of beauties, before Jake, played by George Ellis, comes in and puts an end to the shenanigans.

We have a very funny scene that takes place in the dining room of Jake's house, where he and Zeebo, played by Chuck Monroe, are seated facing each other and are discussing how he, Jake, has bought the local judge and the Sheriff and how this is going to ensure Zeebo will get through with his load of liquor and Lee and Grady (Jim Mitchum) will be caught. Zeebo's attention is marred by Reba (Joan Blackman), Jake's wife, who keeps flirting with him. This is a very funny scene and I felt that it was necessary to keep it fairly high-key so that none of the facial expressions of the players could be missed. For this scene, I decided to put tracing paper over the windows and put lights outside, three 1000W quartz units, stacked at each of two windows which would appear in the shot. Inside I used two 1000W quartz units, one on Jake, and one on Zeebo, from the window side so as to give a little more contrast and not have them looking too flat. Reba was seated close to one of the windows. The reflected reading on the windows was T/16 while my lens setting was T/4. The windows did not flare and the overall scene was very pleasing.

In another situation, we had what I believe was a fairly tricky lighting setup. We were shooting in the bikers' hangout, a sort of beer joint, which, in fact, was very small, and had been made out of an old frame house by the art department. When I say small, I mean *small*. I'm only 5'4" and I could touch the ceil-

ing. It was full of milling bikers and their "birds" and except for some fill light packed up against the camera, I could put no other units inside. Thus, I had to light through the windows. That still didn't help much. It was like the Black Hole of Calcutta, because people were right up against the windows and blocking light from reaching the inside of the room. Of course, as they moved around, light did spill into the room occasionally. There wasn't much else I could do at this point, even if I'd had the luxury of time, so I decided to have the film flashed. I spoke to my contact at Movielab and explained the situation in detail to him. The film was flashed 10%. I could hardly believe the results. They were way beyond my expectations. I was just about able to see every detail and every face in there without losing anything of the "dingy" quality that Mann and his crew had worked so hard to achieve. On looking at the film, I might have gotten by without flashing but I didn't feel I could risk it at the time.

Lee and Beth enter the hangout and are confronted by the bikers. Lee ends up having a beer poured over his head, but retains his cool and leaves peacefully with Beth. However, they both return immediately in their car, in reverse at high speed, plunging straight through the wall of the hangout as bikers scatter everywhere. This was covered by three cameras, two inside and one outside.

Among the night scenes called for in the script, were the stock-car racing at the track near Atlanta, and also several car chases on narrow country roads in and around Haralson. The race track was lit by banks of metal-halide lamps around the track. The pit area in the center, where there would be a considerable amount of dialogue, had no light whatever. We had only 16 foot-



candles at the hottest points around the track so I shot tests to determine if it would be possible to shoot with the existing lights, and obtain satisfactory results. I had the lab process one roll normally, the second roll forced one stop, and the third roll forced two stops. The second roll which was forced one stop really looked excellent. The first roll was a little dark and the grain and slight fogging in the third became quite objectionable. So I decided to shoot the dialogue sequences in the pit area as well with 16 foot-candles. This, of course, was necessary in order that those areas around the pit would read. At one particularly dark area on the track, we put up two six-FAYS, but had to kill them when some of the race drivers complained of being blinded on the corner.

The only "day for night" photography was used on some car chases. Day for night photography, as I think most cameramen will agree, is not very satisfactory. For want of a better description, it almost always looks exactly like what it is. Again, I shot some tests based on the usual recommendations of removing the 85 filter, underexposing two stops, then processing normal. I shot with the sun in various positions, to the side, three-quarters back, and back, also in complete overcast. The latter was by far the best. During the actual shooting of the chases, we were fortunate to have overcast skies. We replaced the standard head lights of the cars with high powered beams which helped considerably.

I'd like to mention at this point that all the stunts carried out in the cars were authentic and were based on actual experiences of Jerry Rushing, who did some of the driving in the film. Jerry Randall, a stunt driver from California, performed some of the major stunts in the film and, to say the least, was absolutely amazing. I am sorry to report that Jerry Randall was killed recently in a kite accident.

Director Waldron was careful in making sure all the stunts were believable and that no car would be allowed to continue on when it was obviously "wiped out", as in the case in so many films. We had ten cars, none of which was more than two years old, and all of which had seen some rough service as New Jersey taxi cabs. Frank Harris, our chief mechanic, certainly had his hands full with this lot. Keeping them in shape, was a full time job. Some of the star cars, of course, had doubles and as we gradually wiped them out, one by one, it became necessary to use a car for several different purposes. One day a car might belong to a moonshiner and



**In a fit of pique after having had beer poured over his head by bikers, Lee runs his car in reverse at high speed, plunging straight through the wall of the hangout, as bikers scatter in all directions. This scene was covered by three cameras — two inside and one outside.**

the next day it would be a police car. Harris and his crew spray-painted the cars overnight, and sometimes, they came onto the set still wet. I can only imagine the nightmare that this must have been for production manager, Peter Cornberg, who managed to keep track of it all without losing his sanity. He did a fantastic job of keeping it together.

All in all, this was a very smooth shoot by a very professional and enthusiastic crew, who thoroughly enjoyed themselves. We completed filming on schedule and, despite abominable weather, the very last day, we managed to put the final minutes in the can between thunder showers. Just as well, as it rained everyday the following week. ■

**A major location was this house, built in 1868 and occupied by a Mr. and Mrs. Quick, both in their 70's and as charming and hospitable as could be. The first members of the crew to arrive each morning were welcomed by the Quicks with coffee and biscuits. Since the floors were weak, there was concern that they might not sustain the BNCR, the dolly and the crew, but all went well.**



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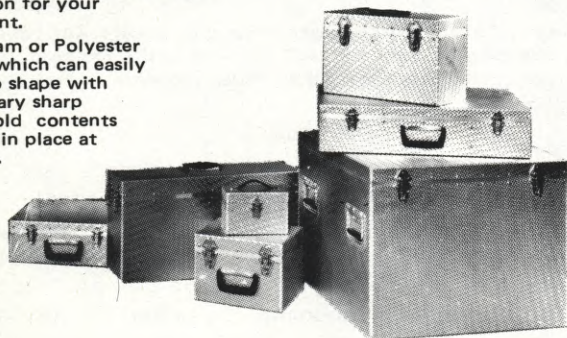
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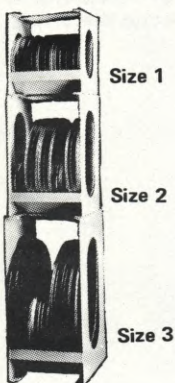
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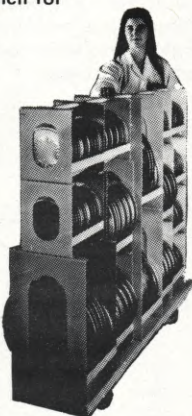
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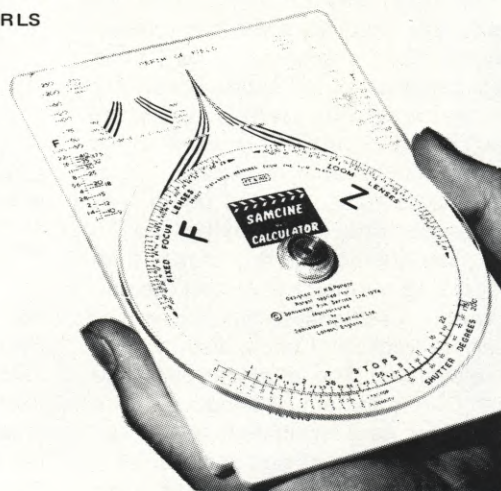


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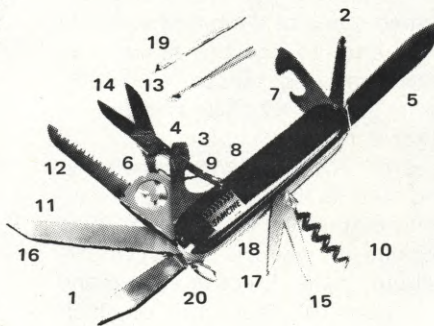
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# EXTENDED 16 AND EXTENDED 35: POSSIBLE NEW FILMING FORMATS

In these days of ever-higher production costs, a suggested new film format to eliminate the 27% waste of the 1/1.85 aspect ratio in 35mm

BY KENN DAVIS

Some three years ago, with the increased interest in Super 16mm, I felt there just might be an even better method to utilize the small 16mm format in terms of 35mm enlargement. All I had to do was think of the various problems in size-to-size ratios, grain size and image sharpness. Easy? What was needed, I reasoned, was a practical system — something that would be an improvement, and still not create confusion in the film-makers' world. At first I designed a super-wide-screen aspect ratio created by running a 16mm camera on its side, similar to Paramount's beloved VistaVision. It didn't seem practical, but the working drawings and specifications are still in my files. More recently I came up with what I believe to be a practical possibility.

I would suggest that this system take the form of a series of steps for the improvement and systemization of 16mm and 35mm film production for feature distribution. First, I saw the major problem as the cropping of the 1:1.33 aspect ratio of 16mm to the format of 1:1.85 and the grain increase that would result from such cropping (see FIGURE 1a). Obviously, not all of the available film area is being used to contain visual information, and we are wasting a large portion in order to accommodate the enlargement to standard wide-screen (1:1.85). Super-16 has alleviated the problem somewhat, but even it gets cropped slightly top and bottom to conform to the 1:1.85 shape. And there are not as many Super-16 cameras around as eager film-makers would appreciate having.

When a normal 16mm frame is used in the enlargement to 35mm wide-

screen, approximately 13½% is cut from the top and an additional 13½% is cut from the bottom — a total loss of more than 27% of the frame area. Even Super-16 is not a perfect match, for 5% is lost from the top and an equal amount from the bottom for a total of 10% of the frame area (see FIGURES 1a & 1b).

## FIRST STEP

I propose the manufacture of an anamorphic lens with a squeeze factor of 25%. The first prototype should be a simple prime lens system, because I personally hold to the opinion that a complement of prime lenses of matching quality should be used for any 16mm production that is slated for 35mm blow-up.

A squeeze of 25% introduced at the shooting stage would mean that virtually 93½% of the picture area and its attendant information would be usable in the enlargement. There is always some slight trimming to rid the frame lines of any minute irregularities (see FIGURE 2. The dotted line shows the field of actual view).

In the blow-up to 35mm an un-squeezing lens of 25% will be used in the optical printer to create the proper shape and conform to the wide-screen (1:1.85) ratio. In any enlargement to 35mm the light must pass through a lens, so the substitution of the un-squeezing element will be a simple matter. (Adrian Mosser of 16mm enlargement fame is anxious to try the prototype test film when this system is created.) The change in contrast would remain as it always has; however, there should be an increase in *apparent* sharpness, since the circle of confusion

now becomes an ellipse, a phenomenon noticeable in the Todd-AO and Panavision processes.

Any 16mm camera can be used, electric-drive or spring-wound, and no special modifications have to be made. Since the proposal is for a set of basic lenses for 16mm cameras, the lenses made should, perhaps, be manufactured in the C-mount and Arriflex configurations. Focal lengths of 10mm, 16mm, 25mm, 50mm and 75mm are suggested to start with. The lenses would, in effect, be much wider, with a 25% wider field of view. The 16mm focal length would be an effective 12mm, and so on.

A zoom lens would be expensive to manufacture, but if there were a demand and the system could prove itself, then one could be designed.

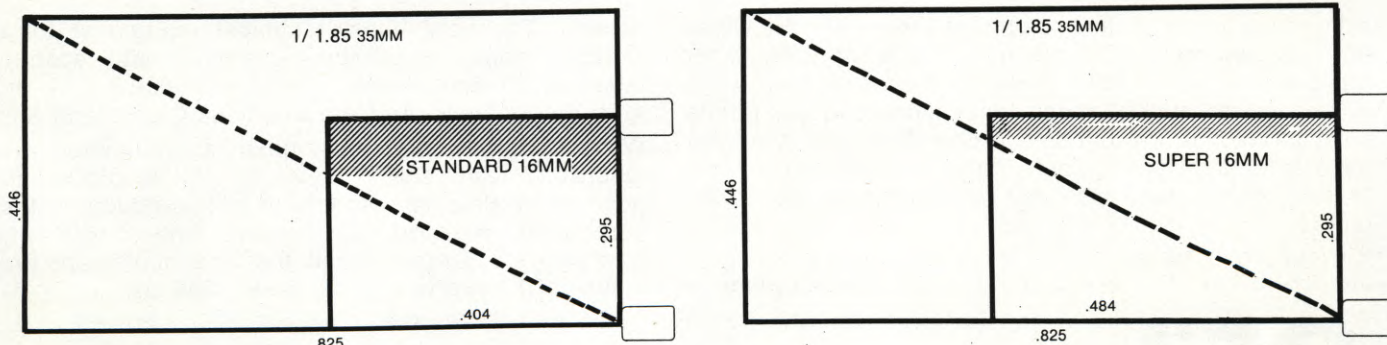
One small advantage of this system over Super-16 is that stock shots from 16mm libraries could be used. If a cut-in is needed of an ocean scene, an aircraft landing or taking off, a cityscape, etc., then the slight amount of stretch that would occur in projection would hardly be seen.

Shooting with the 25% squeeze would not be difficult, as the squeeze would not be sufficient to complicate composing and framing shots.

Editing the workprint would be the same as any normal editing function in 16mm. The slight squeeze in the viewers, editors and projectors would hardly be noticeable.

Now, if we use such a proposed lens system, we have almost the full format of 16mm for a superb job of enlarging to 35mm wide screen (1:1.85). For the lens manufacturer this should be the first consideration.

(LEFT) FIGURE 1a — The loss of frame information area in standard 16mm cropped for blow-up to 1/1.85 35mm (about 27%) is indicated by the shaded area. (RIGHT) FIGURE 1b — The loss of frame information area in Super-16 cropped for blow-up to 1/1.85 35mm (about 10 1/2%) is indicated by the shaded area.



## SECOND STEP

The second step would be the use of a similar 25% squeeze anamorphic lens on a 35mm production camera. This means that the camera would shoot a frame in the 1:1.85 aspect ratio and would unsqueeze during projection to the very wide 1:2.35 format (see FIGURE 3).

Naturally, this means that projection lenses must be used in theatres that will unsqueeze 25%. This second step proposes that the manufacturer of the basic lenses will supply an un-squeezing anamorphic lens similar to the CinemaScope and Panavision projection lenses. All the lenses in the system, both 16mm and 35mm, should be cheaper to make, since the mathematics to create a 25% squeeze is simpler than that for the 100% squeeze of Todd-AO or Panavision anamorphic 35mm.

Any camera can be used in 35mm production without special modification or special rental rates. The producer and the Director of Photography would have the option of shooting with standard spherical lenses for 1:1.85, or using the 25% anamorphic for the 1:2.35 aspect ratio. As in the first step, the lenses should be basic ones, and the same advantage in field of view applies: a 25mm focal length lens would be, in effect, a 19mm.

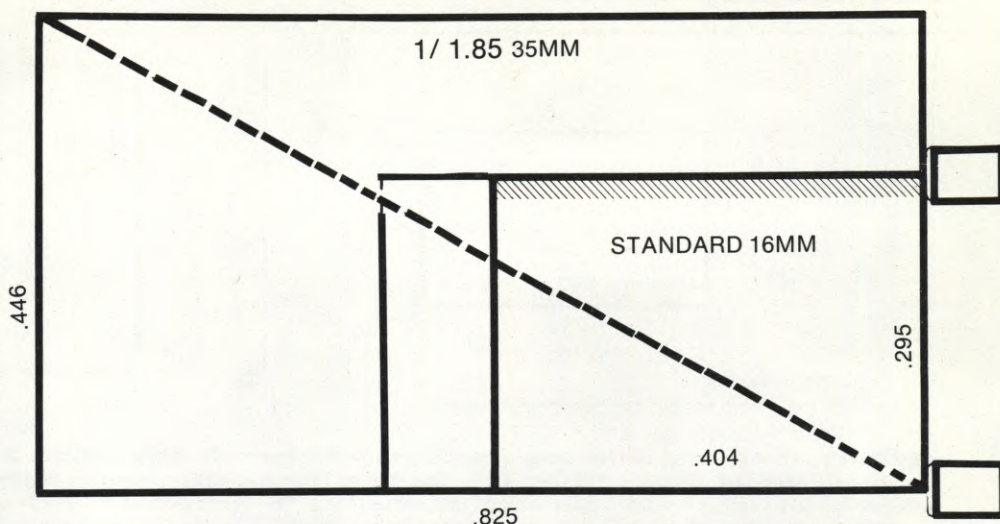
Again, the editing would be straightforward, as the slight 25% squeeze would not be annoying in the Moviola (no unsqueezing "bubble" needed) or any of the flat editors, such as the KEM or Steenbeck. Stock shots from the extensive 35mm libraries could be cut in without too much noticeable distortion in projection.

Would any of the second step be of benefit to the 16mm producer? I certainly believe so, since he would now have *two* ways to go with his film ratio. He could maintain the squeeze, as in step one, and optically print to the 1:1.85 format and project with standard lenses, or he could enlarge the entire frame, squeeze and all, and allow the projectionist to unsqueeze to the 1:1.85 format. Either way, the film projected comes out 1:1.85, with the latter method showing a slight increase in grain.

In addition, the Super-16 cameras could now be used with the 25% squeeze lenses and enlarged to the 1:1.85 shape, relying on the projectionist to perform the unsqueezing. What aspect ratio would this produce? Believe it or not, approximately 1:2.35! (see FIGURE 4), or the Super-16 frame could be utilized as it is now.

## THIRD STEP

So far, whenever I've explained the previous steps the reactions have been



**FIGURE 2 — The shaded area indicates the actual loss of space in the EXTENDED 16 system. The dotted lines extending from the 16mm frame are the indications for the actual field or view, as seen by the camera. The optical shape comes closest to the 1/1.85 format.**

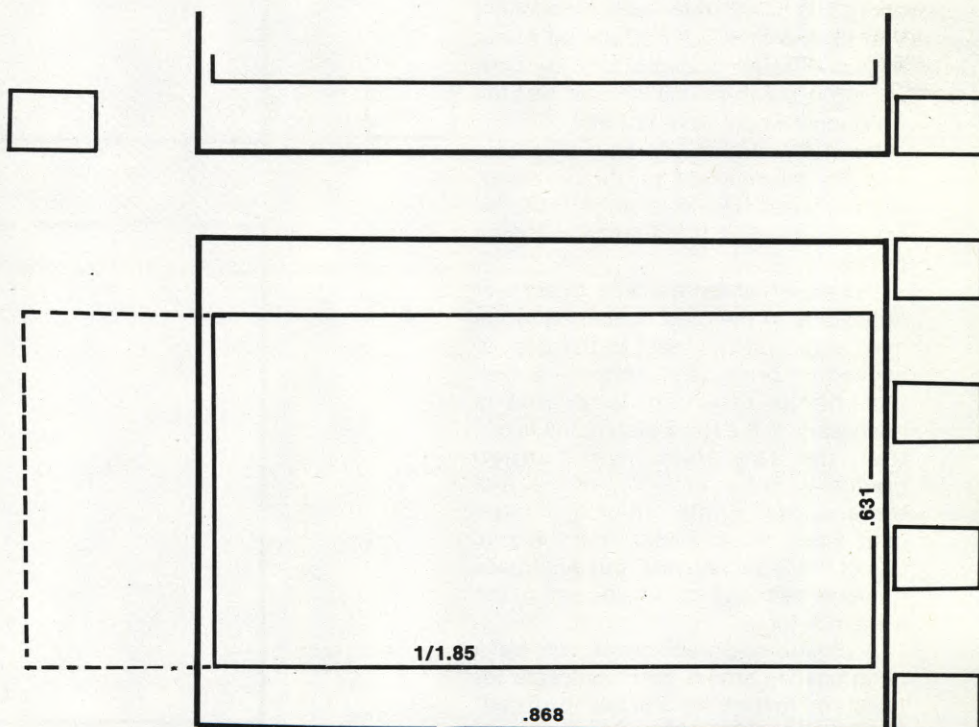
of the *WOW!* and *GEE WHIZ!* variety, though not with that exact wording. When I've explained the third step I've sensed that I've desecrated sacred ground. Apparently this part of the system is the most radical proposal that I make, and that is the elimination of the four-perforation pull-down in cameras and projectors that has been the standard of the industry for about 70 years. I suggest a pull-down of *THREE* perforations.

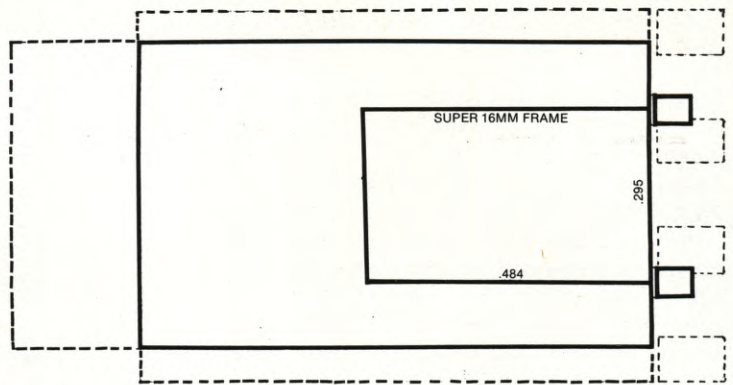
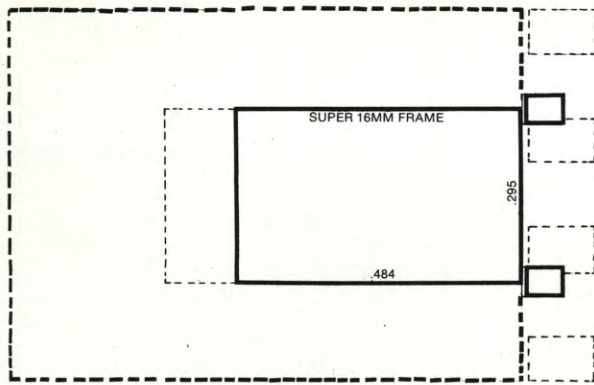
My reasons are simple. Most feature productions are released in the 1:1.85.

or 1:2.35 formats. The 1:1.85 aspect ratio is exactly three perforations high on the film (see FIGURE 5a). The producers that normally use the present 4-perforation system and project for the 1:1.85 format are *wasting* 25% of the film stock purchased (see FIGURE 6)! That is, for every \$10,000.00 worth of film stock purchased, developed and workprinted he is throwing away \$2,500.00.

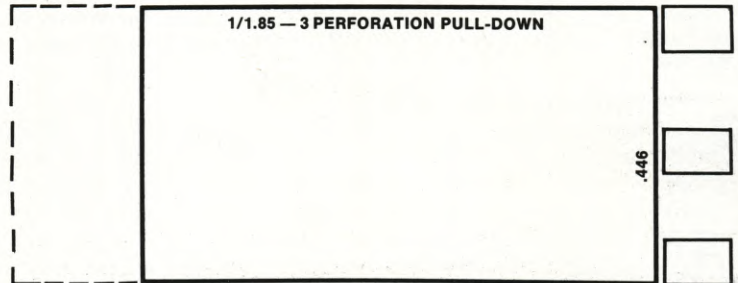
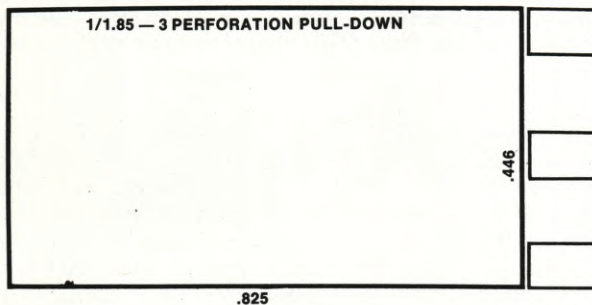
Imagine a production house that makes four feature films a year, and the standard shooting ratio is about 10-to-

**FIGURE 3 — This diagram indicates the shape of the 35mm 1/1.85 format, and the dotted line-enclosed area (left) indicates the field of view extended by using the 25%-squeeze anamorphic system. Projection is accomplished by using a projector lens with the same 25% reverse squeeze.**





(LEFT) FIGURE 4a — The dotted lines extending from the Super-16 frame indicate the optical field achieved by using the 25% anamorphic squeeze. (RIGHT) FIGURE 4b — The dotted lines extending from the 35mm 1/1.85 format indicate a widened aspect ratio achieved by using the 25% anamorphic projection lens. The other dotted lines indicate the standard 35mm frame.



(LEFT) FIGURE 5a — Diagram indicating the shape and placement of the proposed three-perforation format. (RIGHT) FIGURE 5b — The three-perforation pulldown system, with frame extended by means of 25% anamorphic lens. The dotted lines indicate the field of view, as projected in a theatre with a 25% anamorphic reverse-squeeze lens.

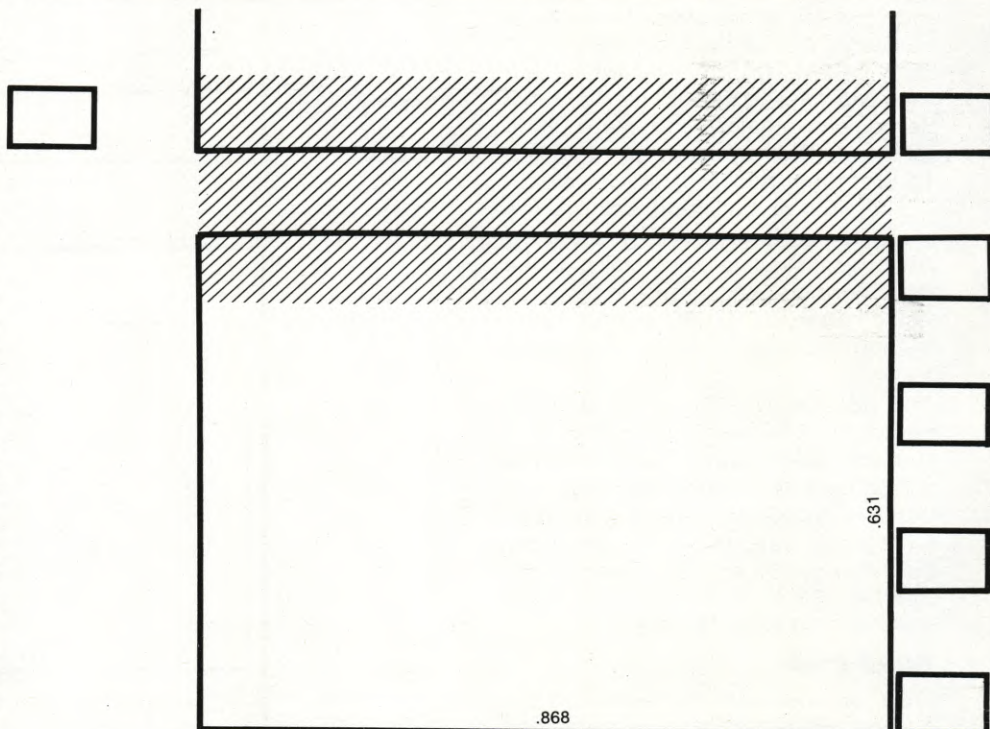
1. The film is purchased, shot and then developed. Let us assume, also, that about 50% of the takes are printed. The films are edited and then answer-printed. Assume that the production house has a distribution that requires about 100 prints from each production. The total cost of all this will be about \$350,000.00 for just the film. By converting to the three-perforation plan the producers would save \$87,500.00!

Naturally, depending on the volume and the number of prints required, these figures would change, but the essential point is the automatic saving of 25%.

I foresee that there will be all sorts of objections to the idea contained in the third step; not the least is the cost of converting projectors. Actually, a simple change of a cam is all that is necessary. If the third step gains favor, then the conversion will happen gradually. For a time I presume that there will be prints optically printed onto 4-perf stock, rather than the total use of the 3-perf system, but eventually it makes sense to me for the use of the system *in toto*.

A simple approach would be for a company or studio that contracts for television feature films to use the 3-perf  
Continued on Page 348

FIGURE 6 — Shaded area indicates the amount of waste area that occurs at the present time, when the frame is cropped to the 1/1.85 wide-screen format. The formats suggested in the accompanying article could go far to eliminate such waste.



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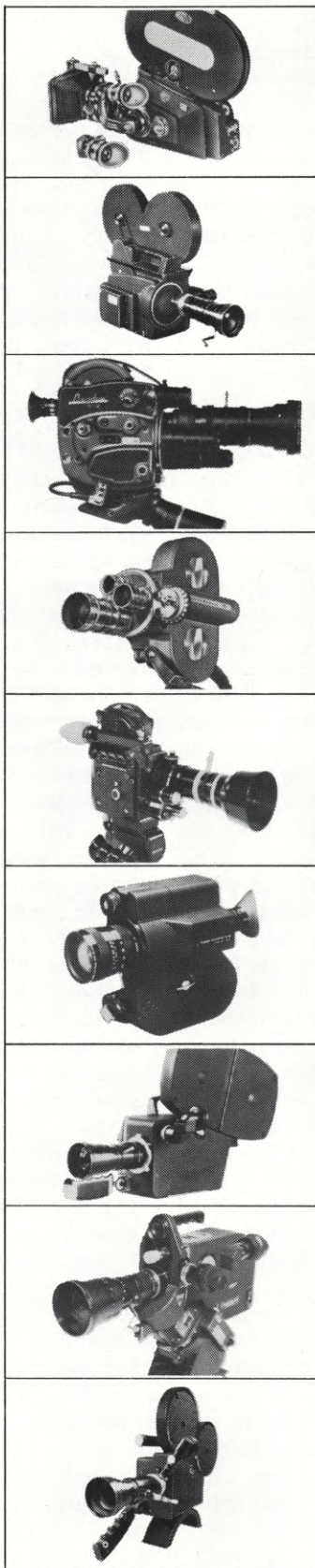
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## "EXPLORATORIUM" Continued from Page 279

exhibits, hopefully producing some kind of sensory overload. 3) PEOPLE. A section in which we would try to catch shots of the people reacting to the exhibits. We had to shoot sync-sound and we knew we had to be hidden somehow. This would be the climax of the film. The film would have no narration. Spectators' dialogue, hopefully, would supply all the needed explanation for the sound track. The music track would be a montage built from sounds of the museum.

The museum is a free-standing structure having no internal support. It is 1,000 feet long, by 60 feet high, by 150 feet wide. Roughly 750 feet toward the far end are skylights 50 feet wide

lights on we read eight footcandles. But to filter the camera, the correction was a #85 filter plus a CC30M, or about one and a third stops light loss. We would also have to put blue gel on the fill and add fluorescent corrective gel (Rosco Green). But then our fill would be about two stops down. All the practicals would go red, and the skylight would go magenta. Easy alternatives, such as gelling the skylight or replacing the fluorescent globes or getting a bunch of 10K's weren't exactly in line with the budget. We decided to overpower the fluorescents, blue the lights, and go for daylight when we were shooting in the direction of the skylight. When we shot in the opposite direction we turned off the fluorescents and went for straight tungsten. Where fluorescence did show up as a green tinge in the background, we made a point of matching that later when we shot our masters.

### STAGED EXHIBITS

To simulate this soft toplight coming from the fluorescents for each staged exhibit in their scattered locations would have been very time-consuming. But we had the help of the museum's shop and the use of their forklift. We C-clamped a sixteen-foot metal I-beam to one of the forklift forks. A ten-by-twelve-foot wood-framed white canvas was suspended from the end of the I-beam. Wooden braces running below the canvas supported four Lowell 1K's. When these were bounced into the canvas it worked like a giant softlight. We made black felt "skirts" that we could roll up and down to keep flare out of the lens and spill light off the background. Since it was attached to the forklift it could be raised to a height of sixteen feet, and it was a very portable rig. To change the intensity of the light it was simply raised or lowered. Peter Smokler, our gaffer, built the rig.

We had the shop build two more structures. One was a right-angle support for a 4' x 8' seamless (slate grey) paper cove, and the other was a baby version: 1' x 2'. They could stand free both horizontally and vertically. We used both coves to clean up ugly backgrounds, simplify lighting setups and add depth to the shots.

Time and money were saved by planing ahead. The director had hired Jeff McGrath, a designer, to storyboard every shot in the film, from beginning to end. He came up with some pretty unique angles. But as it turned out, it was a lot easier to draw a top shot than to shoot one. We solved part of the problem by having the shop build a shooting platform for the forklift. On this we mounted a hi-hat and a tilt-plate and did all our high-angle



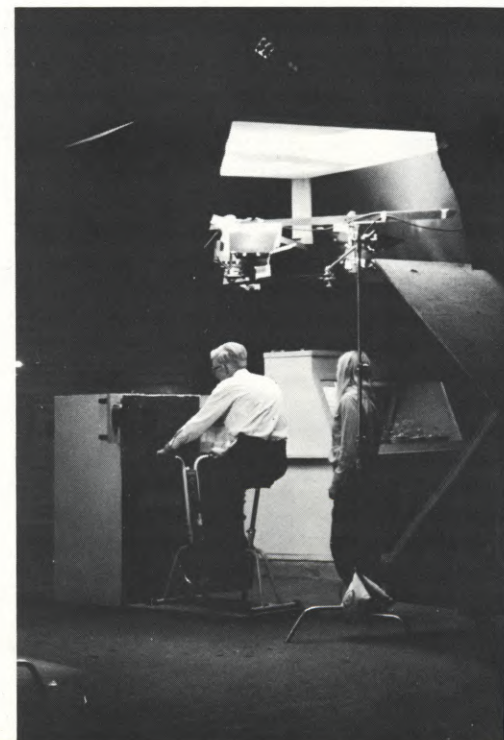
Director John Boorstin, looking suitably spooky in the light reflected from one of the bizarre light sources prevalent in the Exploratorium.

shots from it. We even found it sturdy enough to shoot sync, using a gear head and a 120S blimp. The rising action of the forklift was so smooth that at one point we even did a moving "crane" shot for one of our masters.

For most of these staged exhibits we had a limited amount of time each night during which to shoot in several different locations. Often the exhibits were several hundred feet from each other. Peter Smokler built himself a "Smoklermobile". It was a 4' x 4' rolling pallet which carried just about every-

**Continued overleaf**

**Forklift toplight at work, with plywood cove at right used as background. This exhibit shows your heartbeat on an oscilloscope as you pedal bike.**



The forklift becomes a shooting platform for top shot dreamed up by designer Jeff McGrath. Foamcore at right provides soft fill light.

and extending the width of the building. One of the trickiest problems was to establish a standardized approach to lighting. To the eye, the place looked dingy. We wanted that slightly underexposed look . . . where you could see everything, but nothing was quite up to key . . . like a good, rich, slightly overdeveloped black and white still. That way we could always match our masters, without lighting up the place like HELLO DOLLY.

Besides the source lights coming from the exhibits, the building was lit with cool white fluorescents. With these



# "MILLER"...

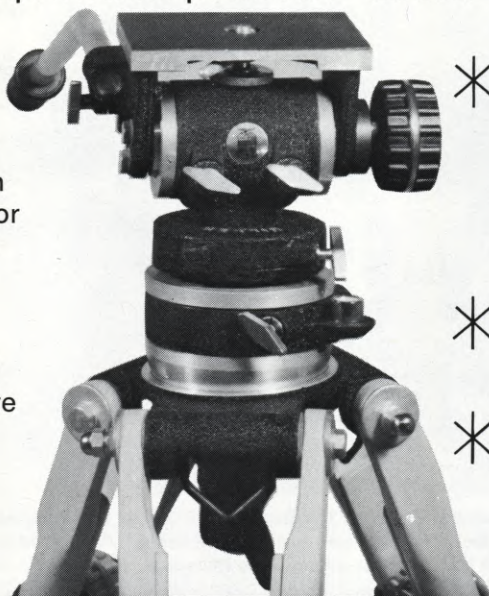
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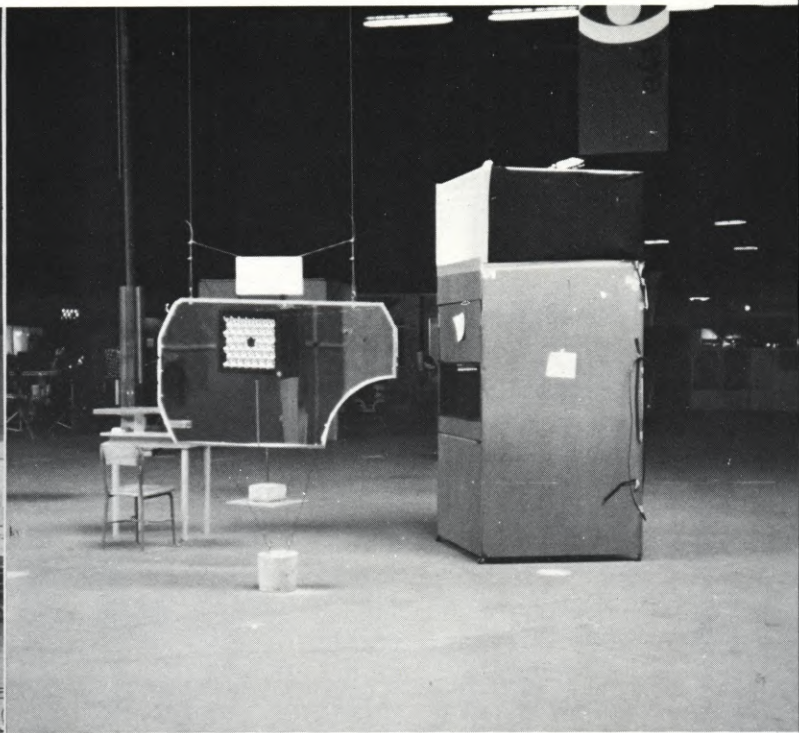
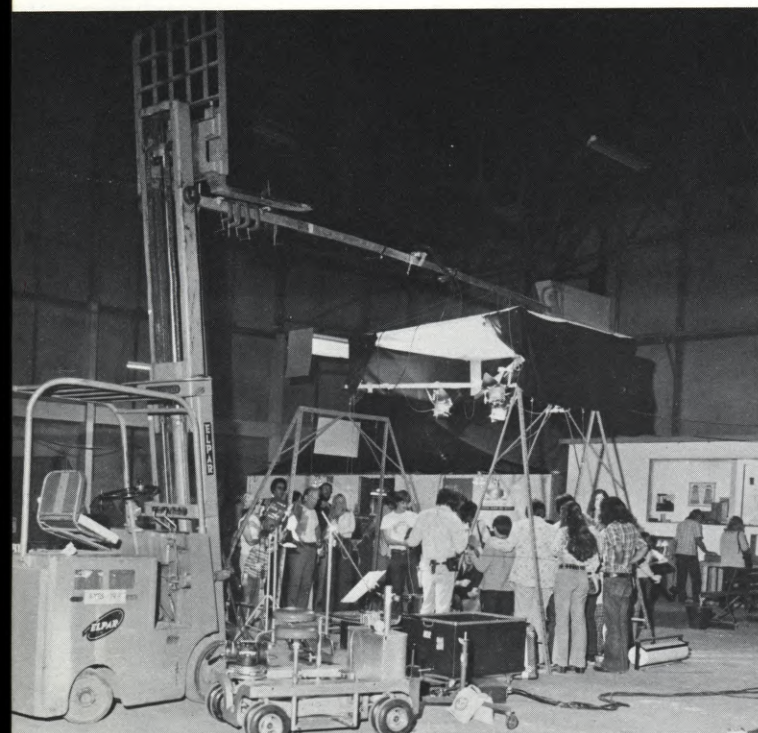
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**(LEFT)** The forklift light supplied a soft natural toplight to simulate effect of the fluorescents mounted high above. Its main advantage was its mobility. **(RIGHT)** The Black Box was actually only black inside. Mounted on casters, it functioned as a movable candid camera. It is shown here with the front fill light switched on. The museum has closed and it appears to be quietly digesting a bite it has just taken from the lighthouse lens exhibit.

thing he might need in the way of lights, except cable and rolling fresnels. Camera assistant Kit Kalionzes naturally showed up one day with a "Kalionzmobile", carrying everything he needed except the camera, which went everywhere on the dolly. These carts saved a lot of time.

#### EXHIBIT MONTAGE

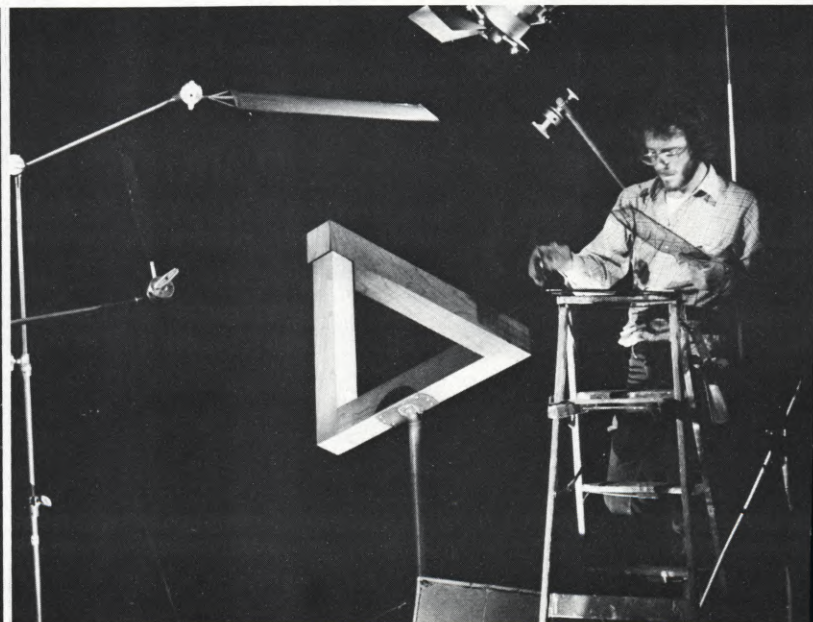
One of the main reasons for our heavy emphasis on pre-production

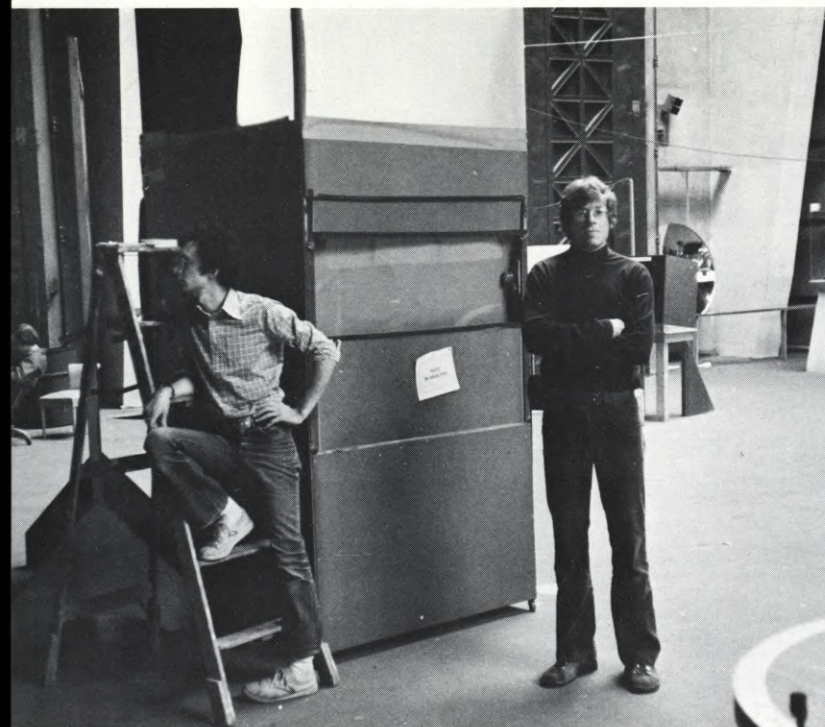
testing was the complexity of the exhibits. They displayed such varied source lights as prismatic refraction of sunlight into pure colors, latent phosphorescent images, strobe lights, polarized light from sodium vapor lamps, see-through polarized goldfish, blacklight conducted by lucite rods, color TVs, oscilloscopes, CRT readouts, laser holograms, spectral diffraction of neon gases. Clearly we had run into some pretty unique technical

problems, leading us to consider shooting the whole thing hand-held in a day and flying to Acapulco for an extended holiday.

Mentioning some specific examples and how we solved them might be helpful. One constantly recurring problem for all cameramen is how to center the camera squarely onto a flat subject (especially with writing on it). If the camera is the least bit off center the image will be lopsided in the frame. We

**(LEFT)** Director of Photography Eric Saarinen. He found the new 5247 color negative contrastier than the 5254 and slightly more magenta. He also experienced a sharper cutoff at the bottom end of the curve and was forced to fill a bit more than with the old stock. **(RIGHT)** Gaffer Peter Smokler lighting the Escher Triangle, an impossible three-dimensional form. In all of the lighting the aim was to establish an illusion and then break it.





**(LEFT)** Museum visitors didn't pay any attention to the Black Box, because it looked like an exhibit. The interchangeable panels in front made it possible to raise and lower the glass height. The box is shown here with its shade drawn. **(RIGHT)** The museum was helpful in providing electronic geniuses to help solve the camera crew's technical problems. Here Tim Erickson adjusts his custom-made integrated circuits to sync the strobblight (foreground) to the camera.



had to shoot a series of circular discs, precisely centered and square to the film plane. We discovered a simple solution: Shine a light on the *lens* and put a small mirror flat on the subject and dead center. Focus the lens on the image in the mirror and move the camera until the image of the lens is dead center in the mirror and in the viewfinder.

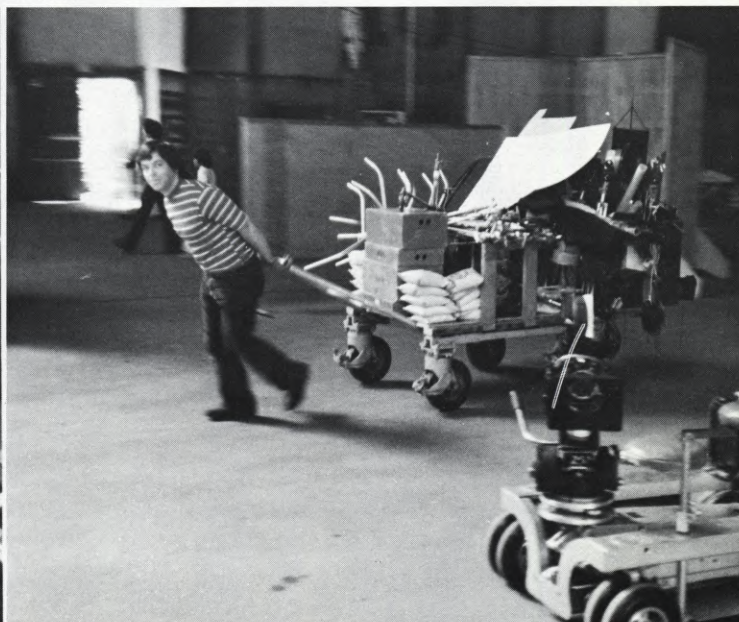
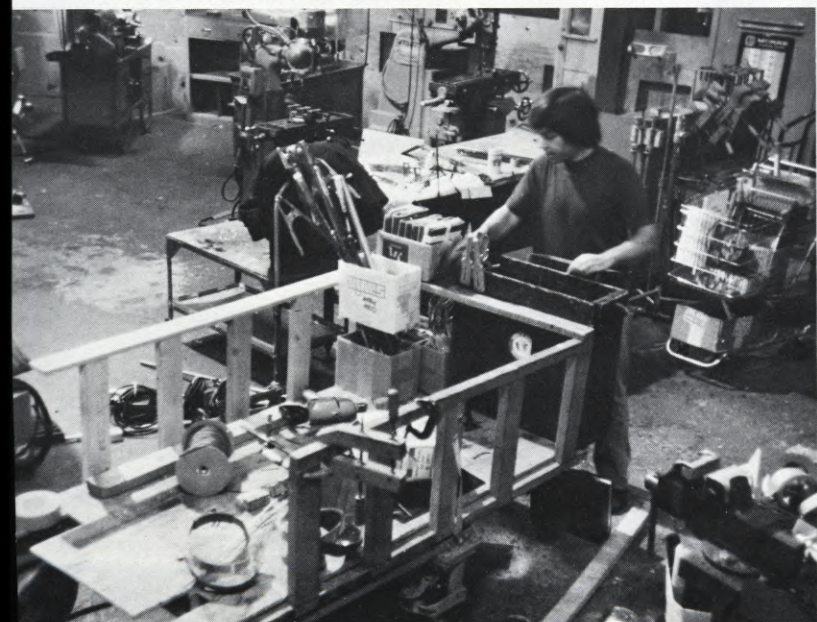
Another problem we had was how to shoot a TV set without bars. We had the

help of the electronics shop. We used an AC motor and fed the 60-cycle sync pulse from the camera into a sine wave generator. With this machine we could control the exact speed of the camera. With the magazine off, we put a prism in the camera gate. We knew that the TV frame rate was 30FPS (U.S.). We adjusted the camera speed to 30FPS and, with the vernier knob on the sine wave generator, adjusted the camera speed until the bars were eliminated in

the prism. We looked in the viewfinder. It turned out that when the bars are absent in the gate, they are smack in the middle of the frame in the finder. We threaded the magazine and (because of film drag) retuned the speed until the bar was in the middle of the finder. It worked. Most TV filming is done at sync speed, or 24FPS, or 4/5 of 30FPS. If we had had that limitation we could have adjusted a variable-

**Continued overleaf**

**(LEFT)** Best boy Bob Eber is shown assembling the "Smoklermobile", a portable lighting cart. The film crew was given free access to the Exploratorium's shop. **(RIGHT)** The Smoklermobile en route to a shooting site. It had better pickup and a higher top end than the Stindt dolly in the foreground. This filming assignment was so unusual that there were few available precedents to use as guidelines. As a result, ingenuity was constantly called upon to solve the problems.



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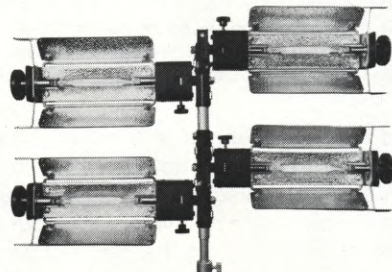


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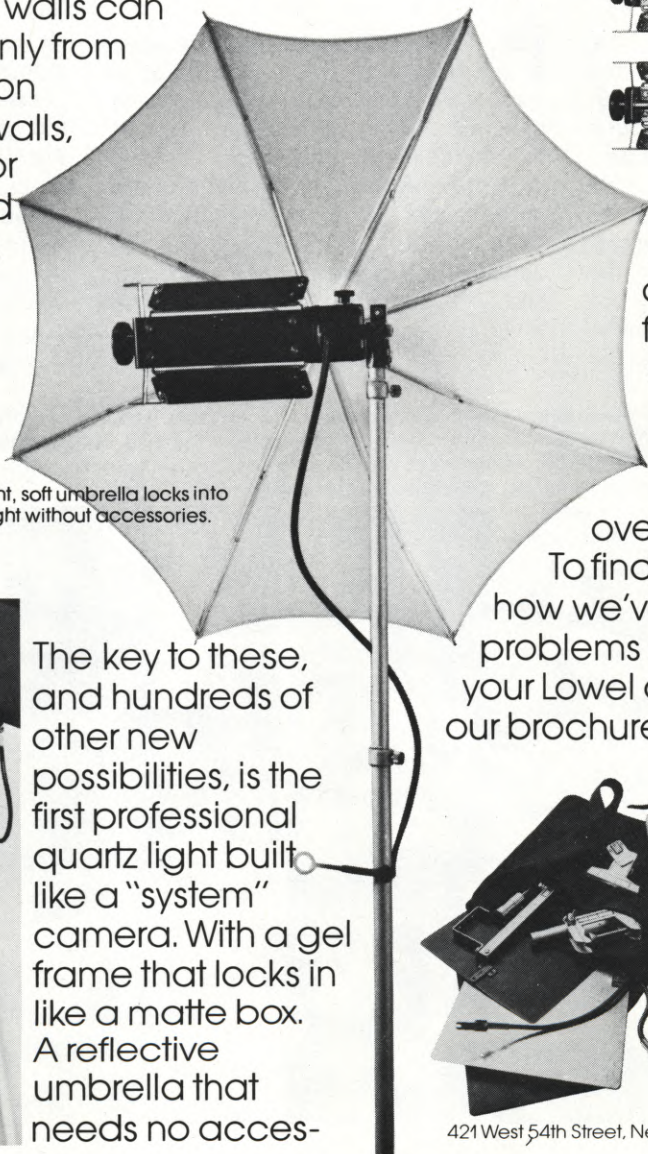
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shuttered camera as close as possible to 144° and tuned the sine wave generator the same way to eliminate the bars.

Another interesting strobe problem occurred when we had to film a room where the only source light was a strobe light. It had to be shot in real time and the strobe rate began at once-per-second, and gradually sped up until it was firing at a rate of twelve-per-second. Sound man Peter Pilafian coordinated with the electronics department to solve the problem. "Child's play," they said. They built a series of integrated circuits. They fed our sync pulse to this circuitry, which translated the pulse and triggered the strobe to fire only when the shutter was open. I am told that this was done with the aid of a "phase locked loop". A hand-control sped up the rate of the strobe while the camera-speed remained a constant 24FPS. All this had to be accomplished with a hidden camera. The strobe room was about eight feet in diameter, with the one light hanging in the center. People would come in and throw a ball around, or dance or play tag. The walls of the room were black. We took a panel off one of the walls and replaced it with our "Black Box". This phenomenon is dis-

cussed in the next section, but it is basically a way to hide the camera. Because the strobe would only fire when the shutter was open, all I saw in the viewfinder was pitch-black, making it a little hard to focus. We made a grid of focus tapes on the floor of the strobe room corresponding with marks on the lens. But in order to see the lens marks, Kit Kalionzes had to use a flashlight, which "blew our cover". He solved this by using a small penlight, and making a cardboard snoot to confine the light beam.

#### PEOPLE

We had to film people without them knowing. Since they were deeply engrossed in the exhibits, Jon Boorstin felt that if we could show that it would be a good climax for the film. Traditionally this is done with a zoom lens. but Boorstin is a purist. Also a 25-250 is a T/3.9 and a 20-120 is a T/2.8. We didn't want people to know they were lit. We needed more speed. We decided to use Cinemobile's super-speed lenses. For all hidden-camera work we used their 75mmT/1.4 lens... almost four stops faster than a 25-250. We were using 5247 and rating it for ASA 200 (without pushing). This way we only needed 12 footcandles. But

since we couldn't zoom out to the people, all of the action had to be brought to us. The exhibits and the people had to be between *three and ten feet from the camera*. What's more, they had to be filmed in sync, so we had to have some sort of blimp.

We designed the Black Box. It was four-feet square by seven-feet tall. It had masonite sides and metal conduit studs. In front there was a glass plate to shoot through. The glass was interchangeable with other panels so that if we were filming children, with an average height of four feet, we could lower the glass height to four feet. Likewise, with adults, we could raise the glass height. The glass plate deadened the camera noise so much that a blimp wasn't necessary, just as in the early days of sound they used small rooms for blimping cameras. The rear of the box was open, and had a black felt drape covering the doorway. The Stint dolly fit inside, with the Arri 2C mounted on an O'Connor 100. Inside there was a window shade which could be drawn to block the window while we were setting up or reloading. Also inside was a bloop light for slating, and two headsets so that the director and I could hear the sound mix.

**Continued on Page 360**



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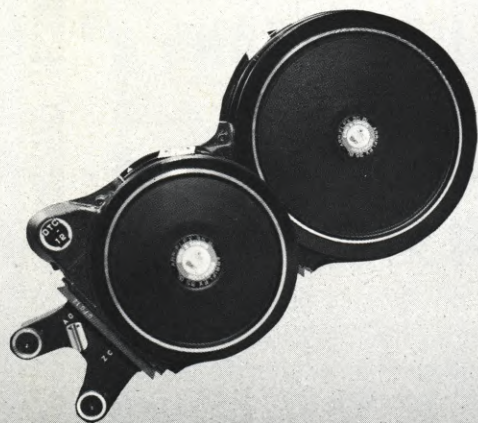
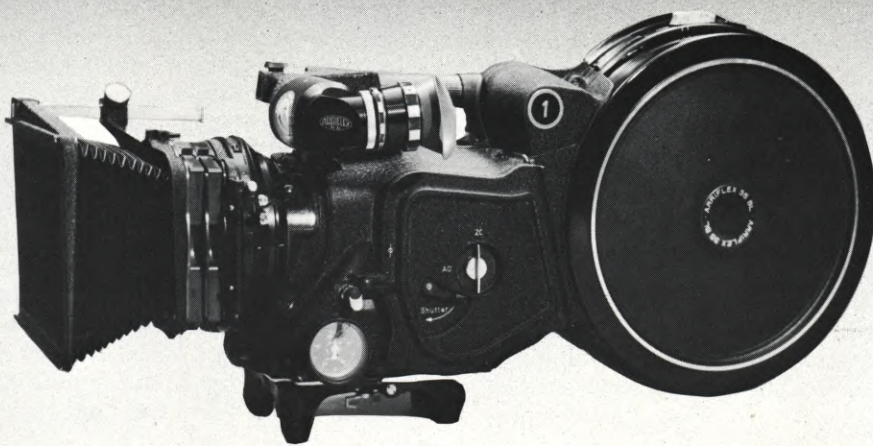
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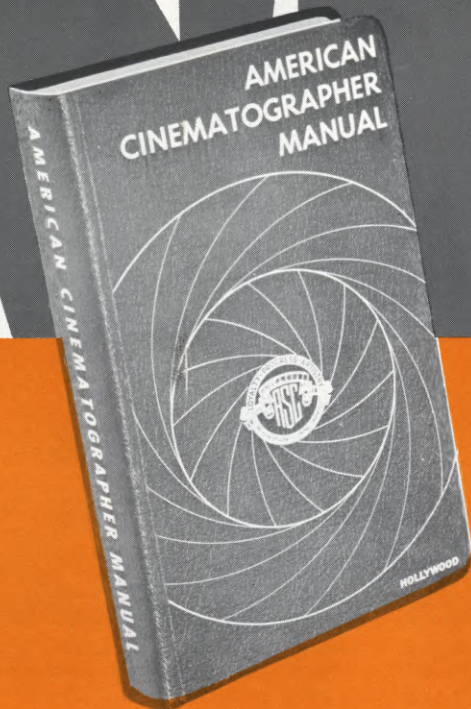


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**ON LOCATION WITH "JAWS"**  
Continued from Page 277

ing. Having no control over New England weather was a problem, but by careful choice of angle I think we can make everything match, even though the weather was often against us." Bill is a student of painting but also emphasizes the cameraman's reliance on mechanical aptitude. "A big part of what I do", he says, "doesn't have to do with shooting at all. It has to do with handling people. Knowing what gaffer or which grip is right to handle a certain problem."

Shooting on the water posed many special problems for Spielberg and Butler. As Spielberg said, "I can't think of any film about the sea that is technically as difficult as this one. Everything is actually being shot right on and in the sea. We're not going to a tank, a back lot, miniaturization, etc."

Drifting is a big problem. The crew may spend several hours setting up a shot only to find that the boats have drifted out of position. Curious boaters attracted by the action and the machinery also proved a big problem and several small boats had to be on traffic patrol at all times when the company was shooting near land.

The Martha's Vineyard shooting was originally set to be completed in June before the start of the summer season when the Island swells from a population of 6,000 to its summer population of more than 40,000 — but when the summer people had gone the "JAWS" crew was still shooting.



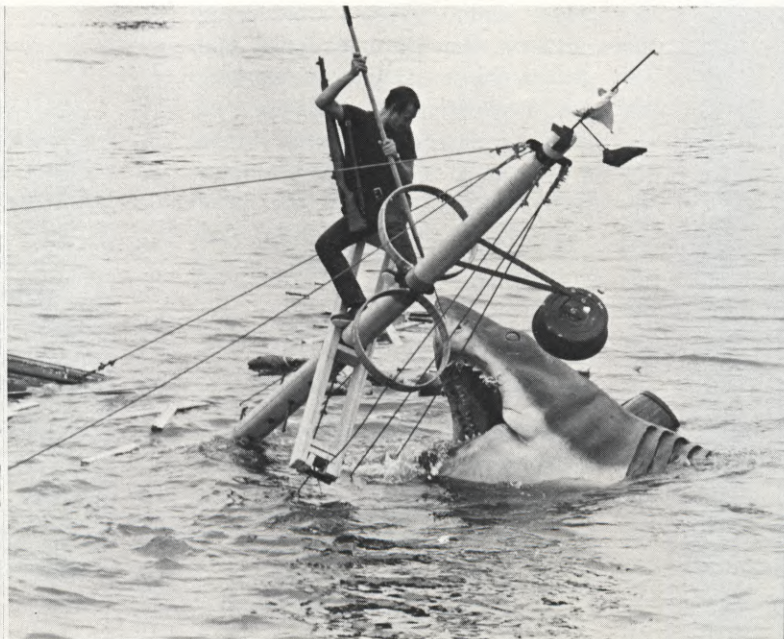
The shark viciously rams the cage in which the young shark expert is enclosed. Not a great deal is known about Great White Sharks, because they can live only a few hours in captivity. They have been sighted in most of the oceans of the world and a specimen has been recorded that had reached a length of 43 feet. They have been known to swallow swimmers whole or bite them in two, as happened off the coast of La Jolla a few years ago.

'Morally, I can account for only one-fourth of a day's work done every day," says Spielberg, "and 70% of the problem has been the water. This is the first picture to do half of its shooting on location at sea. Because it's the first, it's bloody expensive. This picture is a mathematician's dream and a film-

maker's horror."

Spielberg also attributes part of his problems to "a very enthusiastic director and art director (Joe Alves). We have been unwilling to compromise. It gets costly but it makes good movies." Another problem which Spielberg  
Continued on Page 330

(LEFT) Dolly tracks are laid in the sand for a long dolly shot in the beach resort area. (RIGHT) The character played by Roy Scheider battles for his life from the mast of the capsized boat, as the shark launches a violent attack. This boat was the "Orcha II", a special effects duplicate of the "Orcha I", designed to smash and sink when attacked by the shark. It had no bottom, just a steel scaffold to which several barrels were attached. The barrels could be filled with water to sink the boat and then filled with compressed air to raise it again.





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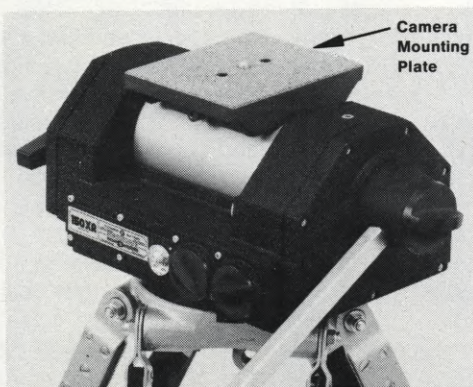
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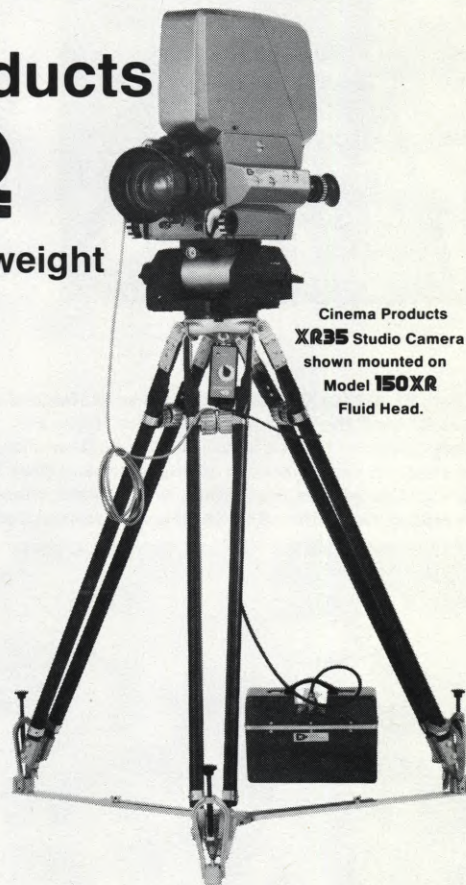
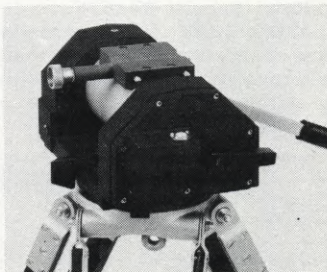


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# THE LONG WAIT FOR "PLATO'S CAVE"

**A stubborn resolve, maintained over twenty one years of yearning, results in the filming, against all odds, of a non-verbal classic short**

**By ARTHUR GOULD**  
**Author/producer/director**

## SYNOPSIS

*In a cave from which they never emerge, people live, in chains without locks, watching moving shadows on the wall. This is their reality.*

*One man is forced to face the realities which cast the shadows; demons of his own fears. Forced to overcome these fears, he emerges into the sunlit world of beauty. Maturing, he sees visions of all man can build. Struggling higher, he glimpses the limitlessness of the mind. When he returns to the cave, he is destroyed by those whose fears keep them in chains.*

For twenty-one years, through countless false starts, I yearned to make "PLATO'S CAVE" a non-verbal interpretation of the allegorical death of Socrates. It is now completed and in distribution with Pyramid Films. I was finally able to put the pieces together in Reno Nevada.

The film required a massive set, elaborate costumes, a large cast . . . elements usually out of reach for a film primarily designed for the educational market. I believed this universal story could be told dramatically . . . as a visual feast . . . without words. I was convinced it would get world-wide acceptance in both the educational and theatrical fields. But, nobody believed it. I knew the film must not reflect budget limitations, but finally realized I would have to make it with my own limited funds. The question was how?

For health reasons my family and I had to flee the smog of Los Angeles about two years ago. I took a part-time position teaching Radio and Television (with accent on film) at the University of Nevada in Reno.

In the sparkling, crisp air of the Sierras I realized this was the place to produce "PLATO'S CAVE". At first I searched for natural caves. They are inaccessible and lacked the control needed to stage scenes with sixteen people in elaborate costumes, illuminated as if by an eternal flame

emerging from the ground. When, on one of my location searches, I dumped a jeep into a ravine and had to walk fourteen miles to get out of the backside of Pyramid Lake (location site for "THE BIBLE" and "THE GREATEST STORY EVER TOLD"), I realized construction of a set was essential.

The then President of the University of Nevada, Reno, N. Edd Miller was a classicist. He liked my script and put word out to help. I knew that with the facilities of the University I could finally begin to "put the pieces together."

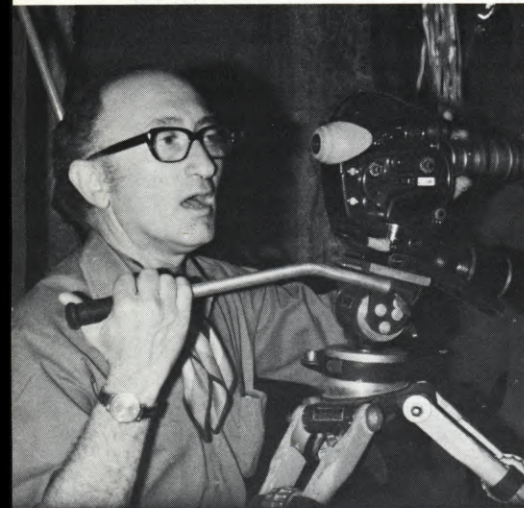
I have always regarded Victor Izay as one of the finest acting talents in Hollywood. He's an actor's actor. Until recent years I had not thought of him in the lead role of "The Philosopher". I looked again. The role was written for him. Any lesser talent would be a disaster. Vic had done other parts for me when I had my studio. He knew of my long-time dreams for this production and when I told him there was a chance we could get it off the ground, he accepted.

Many years ago, when I had a studio in Santa Fe, New Mexico, I had masks designed and made for the five fear-figures representing man's basic fears: animal, vegetable, mineral, water and air. Although they made excellent conversation pieces hanging on my wall, I never really felt they were right. Before leaving Hollywood, I became friends with the immensely talented designer, Jo Bellinger. She had just closed her boutique, "The Upstage", and eagerly accepted the challenge, despite my limited budget. She started from scratch and designed and made ten opulent classical-Greek costumes, headdresses for the five fear figures and a costume and (creepy-crawly) wig for the lead figure . . . "fear of woman".

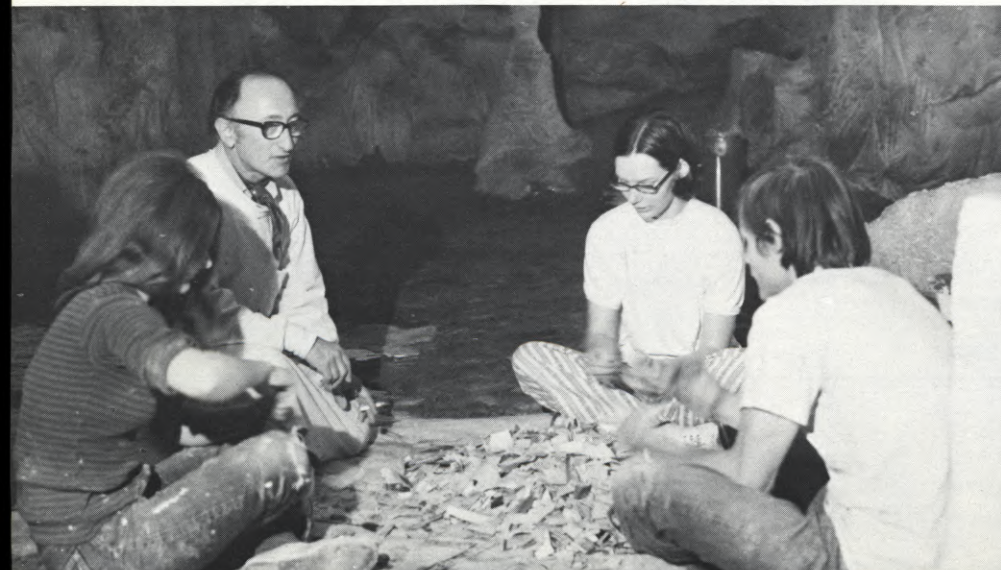
Once President Miller gave his approval, things began to fall into place. Nine miles north of Reno is former Stead Air Force Base, now a part of the University. Here, through Ted Puffer, music department chairman, I was given use of the former service club. The auditorium had a high ceiling. The dance floor was kept bright and shiny. On it we built our "cave".

The men of Buildings and Grounds were startled when told we would have to cover the shiny dance floor with

**Continued on Page 333**



**(ABOVE) Arthur Gould, film-maker at the University of Nevada, Reno, gives directions from behind the camera during the filming of "PLATO'S CAVE", a dream realized after many years of false starts. (BELOW) Gould holds production meeting with members of his student crew on floor of the cave set they have constructed. Production took place during Christmas vacation, with eight undergraduate and two graduate students receiving two units of college credit for participation in the project.**





**(LEFT)** Production took place in what had been a service club at the former Stead Air Force Base, now a part of the University. Set construction was carried on in the former mess hall adjacent to the auditorium "shooting stage". **(CENTER)** Realistic cave set, designed and built by Sparks High School drama instructor Richard Pollman with the aid of 20 of his students, was constructed of scrap lumber, old bed sheets, clothes and rugs. **(RIGHT)** Sole source of light in the cave was supposedly an "eternal flame" coming from a small volcanic cone. An inexpensive propane rig served the purpose.



Fear figures, which perform significantly in the film, represent animal, vegetable, mineral, water and air. Their startling costumes and bizarre headdresses were designed by Jo Bellinger, who included a costume and "creepy-crawly" wig for the lead figure, "Fear of Women". She also designed ten opulent classical Greek costumes for the people who live in the cave. All of this was accomplished on an extremely limited budget, with enthusiasm and ingenuity filling the gap.

**(LEFT)** Richard Pollman applying one of the elaborate makeups (some of which took four and a half hours to execute). In one case, where he had to duplicate a makeup on a substitute for an actress no longer available, he studied a slide of the original makeup rear-projected onto tracing paper, in order to match it accurately. **(CENTER)** Gould, acting as both director and cameraman, blocks action in the set. **(RIGHT)** Greeks consigned to the cave for eternity were played by University professors, students and other local people.



**(LEFT)** Filming a closeup of one of the fear figures. **(CENTER)** Fanciful figures crouch on the floor of the cave. Their intricate action was staged by professional choreographer Maggie Banks, who also recruited talented people to play the parts. **(RIGHT)** Veteran Hollywood actor Victor Izay plays the demanding key role of the Philosopher in "PLATO'S CAVE". With "show must go on" trouper spirit, he stayed with the project despite a painful leg injury. He is shown here emerging from the cave into the sunlight.



# SOME INTERESTING FACTS ABOUT ZOOM LENSES

**The variable focal length lens is a delicate mechanism, but a periodic check-up and maintenance can insure its top performance**

En route to the Angenieux factory in St. Heand, France, to see how zoom lenses are made, *American Cinematographer* Editor Herb Lightman stopped off at the brand new headquarters of Angenieux Corporation of America, which is located in the distant wilderness of Long Island, somewhere near a town called Ronkonkoma, N.Y.

He was warmly welcomed by General Manager John Wallace and given a guided tour of the new premises by Motion Picture Optics Manager Bern Levy.

Later, in a more rarefied meeting with Technical Director Paul Foote, he learned a few things he didn't already know about zoom lenses. In the interest of passing this information on to those among the *American Cinematographer* readers who might be similarly uninformed, the following excerpts from a conversation with Paul Foote are offered.

**QUESTION: Just what is involved when you speak of "trimming" a lens?**

*FOOTE: Actually, it means readjusting the separations between the lens elements and groups of elements to the equivalent of the original design posi-*

*tion, so that you are getting closer to the design performance. Also, as part of the mechanical tolerance package, we have to check the centering of the elements, so that the optical axis of the lens coincides as nearly as we can make it with the mechanical axis of the lens. This is the case when, as you zoom, an object in the middle of the scene stays in the middle of the frame. This is ideally within 1% of the frame width. I believe the commercial tolerance is on the order of 2% or 3%, but we find it's preferable to trim it up a little better than that. For matched lenses and things like that, we can cut it down to 1/2%, and many of the production lenses come through that way. So, the two trimming operations are (1) the axial adjustment of elements or groups of elements in relation to each other, and (2) the transverse adjustment or centering. In so doing, we can affect the aberration correction and resolution to get a fairly uniform performance over the full frame.*

**QUESTION: Since lenses characteristically come from the factory trimmed for optimum performance, under what conditions would you have to trim them here?**

*FOOTE: Either through use or misuse,*

*lenses sometimes get knocked out of tolerance, and we have to bring them back in. Sometimes we'll have a customer who is extra fussy and wants the lens a certain way. We can tailor it to the camera to get what he wants. For example, we had a fellow in our shop a while back who was only interested in the center of the scene — so, we favored the center this time instead of trying to get a good overall performance — and he was happy.*

**QUESTION: In order to get that good overall performance, what kind of compromises do you have to make?**

*FOOTE: Well, usually the basic design of the lens is tuned to a very high level of performance and our adjustments are really made just to bring the lens back as close as we can get it to those design parameters. It's true that these adjustments will have some effect on the aberrations and the uniformity of the aberrations, but the ultimate performance that the lens can give is really the design performance.*

**QUESTION: Would you say that most of the trimming you do is on misused or abused lenses that have been brought back into your shop?**

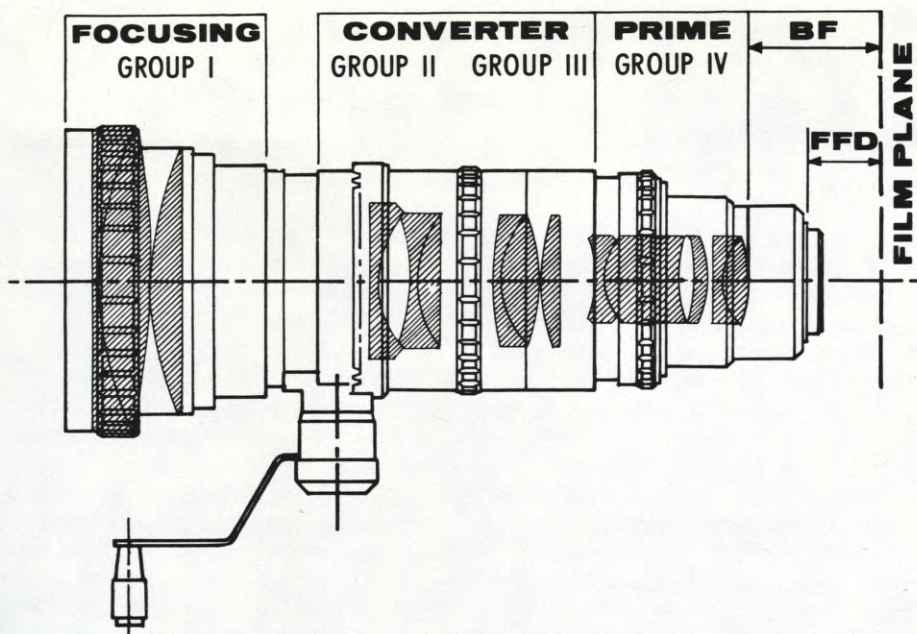
*FOOTE: A good part of the time it is. Also, when you realize that there are so many tolerances involved, there can be times when someone wants the tolerances stacked a little differently for a certain effect.*

**QUESTION: Aside from the obvious rough ride in a Jeep over a corduroy road, what would tend to throw a lens out of adjustment so that it would need re-trimming?**

*FOOTE: Unloading a crate from a delivery truck — anything from that on down. A hard bounce longitudinally will do more damage than anything else. The lens has been built with a couple of safety valves in it. For example, a little cam follower has deliberately been made weak, so that it will bend and break before you will get a dent in the cam or other fault that would really damage the lens and upset its whole performance. That little cam follower can be easily replaced and it's much*

**The lens maintenance section of the West Coast branch of the Angenieux Corporation of America. Located in Venice, California, this operation services the Hollywood film industry. Of considerable significance is the fact that the same testing techniques and equipment are used here as those that are standard at the Angenieux factory in France.**





**Cross section diagram of the Angenieux 12-120mm f/2.2 zoom lens, with standard "C" mount, showing the four groups of lens elements involved. Two of the groups slide on rods to create the zoom effect. This is a significant advance made by Angenieux over the concept of rotating cylinders.**

less expensive than having to replace the whole cam cylinder. We have lenses come into the shop with cams that are just full of dimples, so that when you zoom you'll get an irregular image all the way. Or you'll see a bump in it where the thing has had a real swat. Most of the time, though, we try to keep that cam follower taking all the damage. It's the safety valve and probably the most delicate part of the chain.

**QUESTION: You have a fine projection set-up in your shop for testing lenses, but how can people check lenses who don't have such a facility?**

*FOOTE: I should think that a good critical look through the viewfinder (when it's properly focused) would show up any gross error in the lens — that it isn't tracking right, that it goes out of focus at a certain part of the zoom. If that turns out to be the case, there's probably a testing facility within a reasonable distance. You can get a lens checked over pretty quickly. As for how often a lens should be checked, some people could go out on a single trip and practically put 10 years of wear on a lens, while others can go and go and go and the lens still looks like new. We have them come into our shop both ways.*

**QUESTION: Aside from lenses simply being out of tolerance, what other types of damage do you encounter most often?**

*FOOTE: When a camera on a tripod tips over it just seems to come naturally for the lens to get hit. The impact sometimes pushes the focusing group off the threads and that may take up enough of the shock so that nothing else is damaged. It looks horrible with that front at an angle to the rest of the lens, but that's taken the brunt of the shock.*

**QUESTION: Do I understand correctly that there are two groups of elements within the lens that move as units to create the zoom effect?**

*FOOTE: That's right. The two groups are mounted in a really lovely demonstration of geometry. The two rods form one plane, and then the roller forms the plane at right angles to it, so that you always have that moving in a straight line and a straight axis. This was the real contribution that Angenieux made when they went from the original concept of rotating cylinders to this mounting where the elements slide on these rods. The rods are extremely hard and ground so that they will last a long, long time. We've had lenses come back after ten or 15 years that are still operating beautifully. One company had one of our 10x25 35mm motion picture lenses and they built a test fixture to run the zoom in and out. It was set for a one-second zoom, so it went pretty fast. It paused and then returned, running through this cycle. It ran for 320,000 cycles when the test fixture started to fall apart. They fixed it up and kept it going through a half-million cycles. They then measured the torque that it took to drive it and it was much lower than when they started. They thought it was sloppy, but they brought it down and put it on the projector and it looked beautiful. We took the lens apart and found that the lubricant had been worked in so uniformly and so well that it had a lifetime lubrication. There was no excessive wear, but the parts had smoothed out so that it was working better than a new lens. That was an eye-opener to everybody. It proved the validity of the geometry of that construction. I think it was one of the nicest possible compliments to that design. ■*

**The Lens maintenance section of the East Coast headquarters of the Angenieux Corporation of America, located near Ronkonkoma, New York. Everything in this room is painted white and "hospital clean". The air in this section is pressurized to keep out dust and the area must be entered through a double-door "air-lock".**



# THE **angénieux** STORY

In the latest of a series of tributes to outstanding manufacturers of motion picture equipment, *American Cinematographer* Editor pays a visit to the Angenieux optics factory in France

By **HERB A. LIGHTMAN**

## ST. HEAND, FRANCE

I had stopped off to admire the handsome new quarters of the Angenieux Corporation of America at Ronkonkoma, New York (see Page 324), and then traveled from New York to Paris with that company's ebullient Motion Picture Optics Manager, Bern Levy, en route in acceptance of an invitation to visit the Angenieux headquarters and manufacturing complex in France.

In Paris we board an Air Inter plane which, after a 45-minute flight lands at St. Etienne, a bustling city of a quarter-million population located south and slightly east of the French capital in the Loire valley. Awaiting us there are Jacques and Bernard Angenieux, the

sons of Pierre Angenieux, founder and patriarch of the optics "empire" which bears his name.

Jacques is a very bright and pleasant 21-year-old University of Chicago student, on brief holiday from that institution. His brother Bernard, also a former student and graduate of the University of Chicago, I have met before and it is good to see him again. He is President of Opticam, S.A., Geneva, the marketing arm for Angenieux products world-wide, except for Japan, England, Australia and the United States.

After a drive of ten kilometers we are approaching the snug little village of St. Héand where I spy, high on a hilltop which slopes down to verdant meadows and farmland, a white modern-looking building with a glassed-in rotunda. This is the administration building and "nerve center" of the Angenieux design and manufacturing complex.

Here we are greeted by the company's very genial General Manager, Jean Moret, and his very charming wife, the former Martine Angenieux, daughter of Pierre Angenieux. The two Angenieux sons and daughter, having been educated in the United States, all speak excellent English, as does Jean Moret (who strikes me as having a slight Chicago accent). I also meet several of the top echelon executives, including the Messrs. Masson

(Research and Development), Chambron (Manufacturing), Michalet (Quality Control), and Dumartin (Marketing and Sales).

Then I have the great pleasure of being introduced to the almost-legendary Pierre Angenieux himself. He is a delightful and dynamic gentleman with a droll sense of humor. Although he has earned the right to no longer concern himself with the day-to-day functioning of the company, he still continues to originate the kind of creative ideas that have made the Angenieux establishment a foremost purveyor of optics throughout the world.

Afterwards, Bernard Angenieux very kindly consents to give me a brief oral history of the company. "The reason why the Angenieux factory is located in St. Héand is that my father was born here," he tells me. "My grandfather was a horticulturist, a landscape designer, who lived in St. Héand. Since my father was quite good in school, the teacher suggested that he should carry on into higher education, so he went to a very good mechanical engineering school, the Ecole des Arts et Metiers, in Burgundy.

"When he completed his studies there and graduated, he was wondering what specialty he should work toward. He was looking for a field that was limited enough to give him a better

**Continued overleaf**

(ABOVE LEFT) On a sloping verdant hillside near the village of St. Heand, France, stands the attractive Administration Building of the complex where Angenieux lenses are produced. (BELOW LEFT) Pierre Angenieux, founder and patriarch of the optics "empire" which bears his name, chats with Andre Masson, Technical Director for the company. (RIGHT) Mme. Jean Moret (the former Martine Angenieux) and her brother, Bernard Angenieux, shown in the Morets' home, while they were informally entertaining the author and Bern Levy (of the Angenieux Corporation of America) during recent visit.





**(LEFT)** Mr. Corbasson (Manager) and Mr. Masson (Technical Director) are shown discussing a ray tracing of one of the latest optical designs in the computer room of the Angenieux optical design department. The company creates all of its own programs for the computer. **(CENTER)** Operator checks on a tape-controlled machining process. **(RIGHT)** The optical grinding department, where the elements of a lens begin to take shape.



**(LEFT)** The Angenieux drafting department is located in a pleasant glassed-in rotunda, with an inspiring view of the surrounding countryside. **(CENTER)** Mr. Dimler (Director of the Optics Lab) is shown making MTF measurements in his facility. **(RIGHT)** Multi-layer coating equipment, employed to apply successive layers of magnesium fluoride and other chemicals to lens elements in order to minimize the degree of reflection.

**(LEFT)** Mr. Michalet (Manager of Quality Control) is shown running dichroic measurements with a spectrophotometer. At the Angenieux factory, 80 out of the 700 employees are engaged in various aspects of quality control. **(CENTER)** Row on row of sophisticated equipment in the machining department. **(RIGHT)** A corner of the electronics lab. Electronics figures prominently in the manufacture of TV lenses that have servo-controlled zoom focus and Iris.



**(LEFT)** Electronics assembly. Electronic components activate motorized zoom lenses and automatic Iris lenses. **(CENTER)** The optical polishing department, where the most critical operation in the manufacture of lens elements takes place. At least a year is required to train a technician to perform the more critical polishing operations. **(RIGHT)** Optical assembly, the last major manufacturing step.





**Jean Moret, affable General Manager of the Angenieux factory at St. Héand, checks with the plant during lunch break at home.**

chance to succeed — not one that everybody else was going into. I don't really know how it happened, but he decided on optics and went off to study optical engineering for a year at the Institut d'Optique in Paris.

"His first job was with one of the Pathé companies involved in the motion picture process. He was given the assignment of developing a color system which would use three black and white films and red, blue and green filters to create the illusion of color on the screen. That was the job he had when he married my mother and the

first thing he said was: 'I've got to work, so we will go and spend four months on the Riviera, where they are shooting a movie.'

"After a while he decided that working for a company was not fun and that he would rather be in business for himself. After a brief association with some other people, he started this company in 1935. His operation was in Paris, but my grandfather called him one day and explained that his former school in St. Héand was for rent and asked if he was interested in it. He said yes, that he would have a few people there doing work and the rest in Paris.

"Then the war came and France was divided into two areas. The north, the so-called 'occupied' area, was under the direct jurisdiction of the enemy. The south was controlled by the Vichy government and was supposed to have some kind of autonomy. It didn't last long and ultimately there wasn't much difference, but in the beginning it was more autonomous, so my father moved the family south to St. Héand. The shop in Paris was closed and was never reopened. The company is registered in Paris and we have an office there, but there is no longer a manufacturing operation.

"During the war my father found it very difficult to work. He didn't want to work for the Germans and there wasn't much activity otherwise. So this was a very dormant period, but it gave him time to think about optical design and what could be done. After the war the company started again with one building, which is where our machining operation is now located, and 20 or 30 people. It grew very rapidly.

"In 1950 our company introduced the first wide-angle lens for single-lens reflex cameras. The problem with single-lens reflex cameras is that there is a mirror in back of the lens and this means that you need a lot of space between the rear of the lens and the film plane. Long telephoto lenses, by the

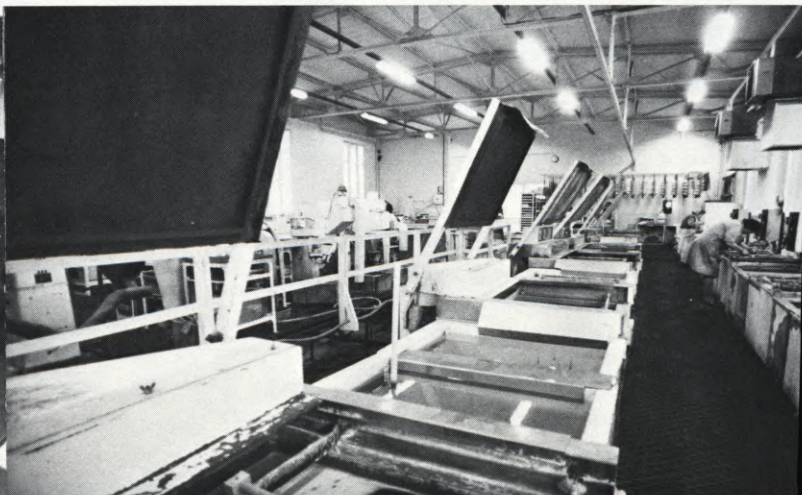
nature of their design, always leave enough space, but with wide-angle lenses it is much more difficult. Anyway, by means of a unique design, we solved this problem and the 'Retrofocus' lens was born. The word 'Retrofocus' is now considered a generic term, but it is still, in actual fact, a brand name. This was our first milestone.

"The second milestone, in 1953, was the design of a 25mm f/0.95 lens for use in very low-light situations. Since then other people have made such a lens, but we were the first to do it.

"At about that time we started getting involved in the United States by making lenses for Bell & Howell 16mm cameras. It's difficult to remember now, but 16mm was then an amateur market and Bell & Howell wanted large aperture (including wide-angle) lenses for its turret cameras — but with the proper space behind them so that they wouldn't interfere mechanically.

"The third milestone, in 1956, was when we took off with zoom lenses. There had been a zoom lens system as early as 1890, I believe, but it was totally impractical. It was f/22, or something like that, and when you zoomed it would not hold focus. The first zoom lens we designed was a 4-to-1 (which we are still making, as a matter of fact), and the idea was to make a zoom lens for the Bell & Howell 16mm amateur cameras. They were selling an amazing number of 16mm cameras each month to amateurs, but it was just at that time that they came out with the electric eye, so 8mm became the thing for amateurs (there was no Super-8 yet) and within a few years 16mm was dead as an amateur format. The result was that our plan to make a great many zoom lenses for the 16mm amateur market never materialized. However, that was probably the best thing that could have happened to us, because now we are essentially involved in supplying optics for the professional.

**(LEFT) Bernard Angenieux discusses production with technician during tour of the plant. (RIGHT) A separate building houses rows of vats from which noxious fumes arise. This is where metal parts are chemically cleaned, chrome-plated and anodized. More than 700 people are employed at this plant, 80 of whom are dedicated exclusively to some phase of quality control.**







**(LEFT) Rough blanks for zoom lens elements await grinding and polishing. (RIGHT) After rough grinding, which takes about a minute, the potential lens elements are sent along for polishing, which may take one or more hours. An individual polishing machine (foreground) works on several elements at once. Polishing is a very critical phase of lens manufacture.**

The only amateur product we make is the 13.5-to-1 f/1.2 lens for the new Beaulieu 5008-S Super-8 sound camera — and that is certainly not the average amateur product.

"In 1962 we produced the 10-to-1 (12mm-120mm) zoom lens for 16mm cameras, which has been very popular, and we recently introduced at *Photokina* our new 15-to-1 lens. In the meantime, we have developed a line of zoom lenses for film and television, trying to meet the various requirements demanded of us. It is impossible to meet all of the demands, of course, because if you ask people what they want, they want so much that it's no longer the cost that's prohibitive, but the weight. They want a very wide angle, a large aperture, a close focusing distance, etc. All this is possible, of course; it is possible to do more than we are doing now — but not within the weight limitations which we have.

"There are quite a few Angenieux lenses on the moon, because at the time that NASA was doing the preliminary Ranger missions for the landing on the moon, they were looking for a lens with a very large aperture. The Ranger vehicles crashed on the moon, of course, but they broadcast television pictures until the moment of impact. NASA felt that with a very large aperture lens they could use a faster scanning time and get information closer to the surface of the moon. By that time there were other people who had designed and made a f/0.95 lens, but NASA told us that they tested about 50 lenses and decided that ours was the best one. There were three Ranger missions, with each vehicle carrying three lenses — so that left nine Angenieux lenses on the moon.

"When the Apollo missions came along, the first picture shown on earth of a man getting out of the capsule and

walking on the moon was broadcast through an Angenieux lens. The lens used on the television cameras for all of the Apollo and Skylab missions was the 6 x 25. That lens was of a shorter range than the 10 x 25 zoom lens, but there was a 40% saving in weight, which was of major consideration in the Apollo program where every ounce of equipment counted. Incidentally, these zoom lenses were remotely controlled from the earth, which gives them the record for the longest distance of remote control."

#### **The Grand Tour**

I am very anxious to explore the Angenieux facilities and Bernard very kindly offers to be my guide. He explains that we will not visit the various operations in their logical sequence, but will simply follow the most convenient geography.

"There are about 700 people working in this plant," he tells me. "Of the optics produced here, one-third is for the motion picture industry. One-third is for television (mainly broadcasting) and the final one-third consists of special optics designed to meet specific requirements of the customers. We export directly about 75% of our production. Of the 25% that remains in France, much of it is exported by Beaulieu and Eclair, so the effective rate of export is something like 85%."

We move into an area where parts are being machined for zoom lenses, using a light alloy. The parts vary greatly in size, depending upon whether they're for lenses to be used on large TV broadcast cameras or Super-8 film cameras, but they are more or less the same otherwise.

We visit the electronics department and I am told that electronics is heavily involved, especially in regard to the

broadcast lenses that have servo-controlled zoom, focus and iris. It also applies to motorized lenses and automatic iris lenses.

We enter a separate building that would make a good setting for the prologue to "Macbeth". There aren't any witches, but there is certainly a large array of vats with noxious vapors swirling out of them.

"This building is for the treatment of metal fittings," Bernard explains. "We keep these operations in a separate building."  
**Continued on Page 342**

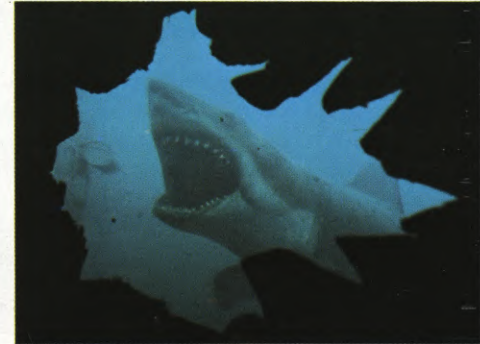
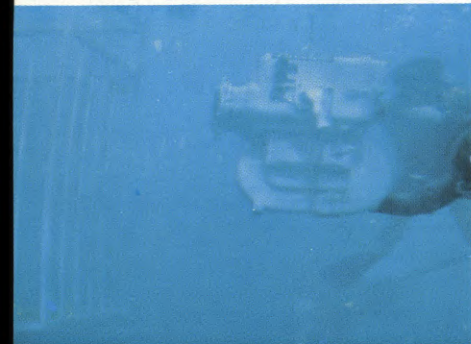
**Polished lens elements will be very carefully cleaned by means of a special process to remove human grease and fungi before final assembly.**





(LEFT) The Panaflex camera is set up for a low-angle dolly shot. Of the new camera, Operator Mike Chapman said: "We really wouldn't have been able to do this picture without the Panaflex." (CENTER) Steve Spielberg paddles out of camera range, using an inner tube for a float. Maxi-Brute light in the background has been set up right in the water. (RIGHT) The mechanized shark leaps and lunges at the camera mounted on platform at the front of the boat.

(LEFT) Cameraman, using the underwater Panavision camera in its distinctive housing, moves toward shark cage. (CENTER) Arc lights play eerily on the water during shooting of night sequence. (RIGHT) Viewed underwater, the Great White Shark is a frightening sight. A great deal of research was done prior to building the robot shark, in order to insure authenticity.



(LEFT) Operator hand-holds the Panaflex to film close shot of Richard Dreyfuss. Spielberg calls "JAWS" "the most expensive hand-held movie ever made" because so many of the shots could be made only in this manner. (CENTER) Daredevil director relaxes in the mouth of the enemy. The shark had two sets of teeth — "hard" and "soft". Presumably this is the soft set. (RIGHT) The Panaflex is operated from the prone position on a small rubber boat.

(LEFT) An atmospheric night scene, in which a motor launch shines its lights on the small fishing boat. (CENTER) A "magic hour" campfire sequence shot on the beach. (RIGHT) An electrician tends an arc light against a rosy sunset sky. Of "JAWS", Spielberg says: "I can't think of any film about the sea that is as technically difficult as this one." His worn-out crew certainly agrees.



**ON LOCATION WITH "JAWS"**  
Continued from Page 331

didn't discuss was the speed with which the project happened. A lot of thought was given to the feasibility of the project, but once the go-ahead was given things happened very fast. Probably more time experimenting and preparing during the pre-production period would have helped, but because of the schedule the time was scarce. All experimentation was done on first unit time. Spielberg would often shoot what normally would have been a rehearsal just to be safe, especially those shots involving special effects.

Spielberg considers "JAWS" to be "probably the most expensive hand-held movie ever made." Because of the movement on the boat caused by the waves, Butler and his operator, Mike Chapman, found they could get a steadier shot by hand-holding the Panaflex camera for many situations. I asked Mike Chapman how he liked working with the Panaflex camera: "At first I was worried about the viewing system. The eyepiece is up against the camera and it took me a while to get used to that. As a hand-held camera it's rather heavy, 34 pounds, but it's balanced very well. We really wouldn't have been able to do this picture without the Panaflex. It's not as big as the PSR and we had to do sound shots where we just couldn't bring the PSR and go jumping from boat to boat eight and nine times a day."

One of the interesting pieces of equipment that Bill Butler developed for this marine movie was a special raft that could be raised or lowered (on its pontoons) out of the water to different levels. It also had a section cut out on one side that would fit the water box that was used to protect the Panaflex camera during shots that were done right on or in the water.

After the director, the second man to join this project was Joe Alves, the production designer. The most difficult part of Joe's job was, of course, the shark. The producers had to be sure a realistic shark that would fill all the requirements of the script could be built before they could commit big money to the project. A shark was needed that was twenty-five feet long, that could jump out of the water and smash a boat, and eat people. To help build the shark Joe Alves got Bob Matthey, for years head special effects man at Walt Disney. Bob did the giant Squid for "20,000 LEAGUES UNDER THE SEA" but both he and Joe Alves agree that this was the toughest assignment either one of them has ever had.

The shark cost a quarter of a million dollars to build and twice that to operate. To start, Joe did a great deal of research on sharks at the Scripps Institute and the California Academy of Science. Not a great deal is known about great white sharks because they can live only a few hours in captivity. To help him with research, Joe found Leonard Campango, a young ichthyologist with a vast knowledge of sharks. Joe then started making small clay models, then full-scale drawings. When he had the drawings he was ready to make the full-scale clay model with a plywood armature that was to serve as a mold for the plastic body of the fish. Actually, three sharks were made: a right-hand shark that had machinery exposed on its left side, a left-hand shark that was open on the right side, and a full shark that was also called the sled shark or the floater. The third shark was the one that was pulled behind a boat for certain shots. The other two work with a platform that is sunk to the bottom and has an arm, or powered gimbel, that moves back and forth to activate the shark. Bob Matthey tried to explain to me how it all worked with hydraulics, pneumatics, and electronics, but it was all beyond me. I can tell you that the movements looked

Continued on Page 350

**David Brown and Richard Zanuck, top executives of the Zanuck-Brown organization, which has produced such films as "THE STING", "SUGARLAND EXPRESS" and "THE GIRL FROM PETROVKA". Both men, having formerly been top executives at 20th Century-Fox, have a strong feeling for dramatic values and showmanship. Releasing through Universal, they head one of the most dynamic production units in Hollywood.**

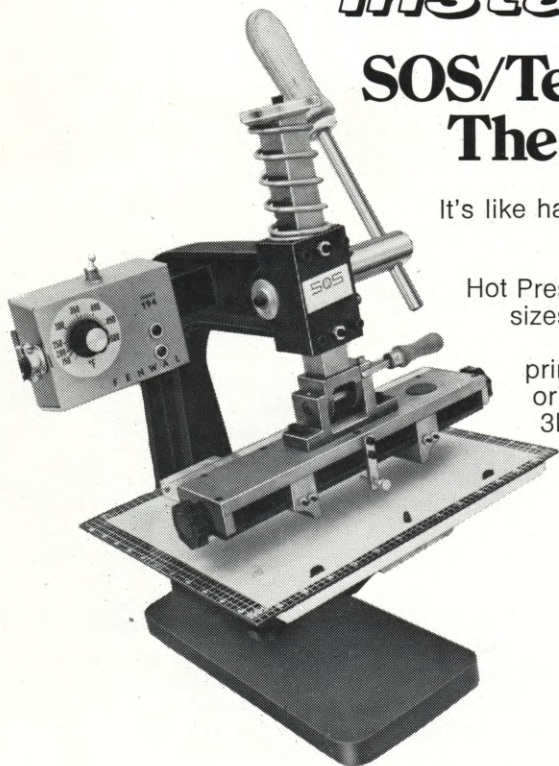


**What do you do with a director who insists upon sitting in the water? Get him a chair! "JAWS" is the second theatrical feature for the talented 26-year-old Spielberg, his first having been "SUGARLAND EXPRESS", after an auspicious television debut as director.**



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**"PLATO'S CAVE"**  
Continued from Page 322

earth. Next day, the floor had a layer of heavy tar-paper covering the high shine. To this we later added plastic sheets and old rugs (contributed by the Retarded Children's Association) for further protection.

Beyond the auditorium was a huge room, the former mess-hall. It lent itself ideally to set-construction. Formerly occupied by the University computer center, it still had a wall full of computers which threatened to take over the world when we threw the switch. We were assured they were obsolete. By the time we got through sawing lumber and styrofoam, mixing plaster and paint . . . we were sure the computers were obsolete.

In my own Hollywood studio I had built many sets. Never a cave. Friends told me about Richard Pollman, drama teacher at nearby Sparks High. His reputation for inspiring work from students, turning kids on to theater . . . and his abilities at set design and construction, had to be over-rated. I called him. All I had heard was true.

Richard Pollman showed up with a University student who was working as his tech-assistant. The youth, Kerry Farmer, was to play a vital part in my life for a long time to come.

Both of them thought I was nuts. Later I found out they were confused. Somehow they thought I wanted to build "a mountain" inside the barn-like auditorium. It didn't faze them. When they discovered it was "a cave" I needed, they plunged in and went to work. Pollman designed and structured the cave and Kerry Farmer was foreman of the crew.

Crew! Richard Pollman supplied me with about twenty of his eager Sparks

**Gould discusses script changes with two of his key assistants. Cave set took three weeks to build. The sequence was shot in two days.**



**Victor Izay, as the Philosopher, wanders through the spectacular wilderness of the Pyramid Lake area, where sequences for "THE BIBLE" and "THE GREATEST STORY EVER TOLD" had also been shot. Other exterior sequences were filmed near Reno in the Sierras, at Yosemite National Park, and in the Redwood country of northern California. Snow scenes were shot high on Mount Rose above Reno.**

High drama students who worked long hours just for the experience. It was during the Christmas vacation and I was able to offer a short, intensive course entitled "Motion Picture Workshop — Plato's Cave". My eight undergraduate and two graduate students received two units of college credit. Pollman, who as a teacher needed to take courses to keep up his teaching credential, earned his credits for "set design, make-up, and assistant director" as one of my graduate students.

We built the set on stage platforms supplied by Ted Puffer's music department. Walls, twelve to fifteen feet high, made of scrap lumber and old bed-sheets from St. Mary's Hospital, rose from these platforms without a single nail going into the shiny dance floor. Scrap materials abound in former Air Force bases and the set, which would have cost twenty-five to thirty thousand dollars in Hollywood, was completed for under two hundred dollars.

All this took place during the coldest winter Reno had experienced in twenty-five years. The day before we were to shoot, it snowed. Bob Underwood, of Buildings and Grounds, went out with a bulldozer, shovelled off the snow, and brought us our earth. Next day, the texture was just right. The violently erratic movements of our "fear figures" didn't raise dust.

Apparent illumination was an eternal flame coming from the ground. It was this that threw the "shadow reality" of the Greeks on the wall and illuminated the fears (creators of the shadows).

Local propane operators either wanted to put in great installations with permanent plumbing and large tanks . . . or they wanted no part in it, saying, "I don't want to blow somebody up!"

Using a five-gallon propane tank, a precision valve, a length of copper tubing, and a burner from an old stove we bought for a buck, the "boiler man" at Stead came to our rescue the very morning we were to shoot. This rig was built into an old pot, covered with

**Continued on Page 353**

**Many times the only way to shoot a scene was to hand-hold the camera from a very high or low angle. Gould perches on a ladder to shoot.**

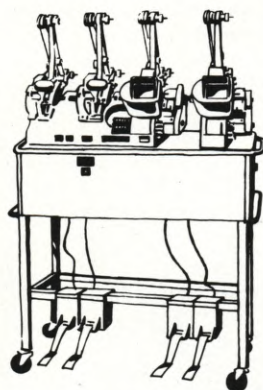


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## JOHN BOORMAN TALKS Continued from Page 285

almost no dialogue and very little action, really. The story had to be told through the expressions on the faces of the two men. That was my principal dramatic weapon, and I felt that to degenerate the detail through flashing would mean throwing away the best thing I had. So we counted that out.

We did, however, shoot some tests with over-exposure and under-exposure and, in the end, this is what we used. Connie did a very interesting thing, something which nobody had ever thought of before. We were using over-exposure in a very limited way, but he wanted to find out how far you could go with it. So, on every slate he shot, he would over-expose another stop. He would use the slate as a test and be able to compare it with the shot itself. This was very interesting, because we made about 600 takes and that added up to a very exhaustive form of testing. He later used the over-exposure technique to a great extent on "TELL THEM WILLIE BOY IS HERE" and "BUTCH CASSIDY AND THE SUNDANCE KID".

### On the subject of using color in a very daring (and controversial) way for psychological effect:

When I made "POINT BLANK" at MGM I decided to shoot each sequence in a different color — with the costumes, the sets and everything in the same color. It was a kind of spectrum thing. The story was about a man who comes back from the dead and he sort of warms up at the end. I started in the cold colors, gray and silver, then went up into blue and green, and on up until, eventually, the last sequence of the film was a kind of rusty red.

Well, when you come up with an idea like that you have to be absolutely consistent. You have to make a decision and then stick to it. It's very easy to be deflected, because an actress will come up to you and say: "Why can't I wear this dress?" And you say: "Well, listen, you just can't." This is very hard for them to understand, because they aren't looking at it from your viewpoint. I remember that with Angie Dickinson I had to make her dye her hair a different color for each sequence, and she didn't take too kindly to that. But you've got to stick to it.

It came about that as I was planning the film, the head of the art department at MGM called a meeting of all the department heads, because he was very much opposed to what I was doing. They met in his office and everybody was there and he said: "I've called

this meeting because I want to disassociate myself from the art direction on this film. Boorman insists on doing this and I've voiced my objections and they've been overridden. I want to make clear, at this time, my strong feeling that this film will be a disaster. Take this scene, for instance — it has seven men in an office. The office is green; the curtains are green; the furniture is green; the carpets are green; they are all wearing green suits, green shirts and green ties. This picture will never be shown. It will be laughed off the screen."

It was interesting that he didn't know more than that about color — which is a problem. There's been a lot said about the transition from silent pictures to talkies being a problem, but there are a lot of people working in films who have never made a successful transition into color. What happens in a scene where everything is green is that there are many different greens. You never get any kind of pure color. Some of the greens go yellow and some go brown and some go blue. When you look at the scene, what you get is a sense of harmony.

What was fascinating was that when we showed "POINT BLANK" the effect of my color scheme was totally a subconscious one. In other words, it contributed to the ambience, to the atmosphere of the film, without being at all obvious or self-conscious. What I felt was successful about it was that nobody ever mentioned it.

Of course, this use of color is something that painters have been aware of for years — the black-on-black, the white-on-white, the use of a single color or motif. You can even go back in the use of color to very traditional painters like Constable, who hated the color green — and he was a landscape painter in England, which created a lot of problems for him. He said: "Nature is too green, and badly lit" — which is a terrific remark. But he didn't use any green.

The trouble with color is that it distorts realism, and you have to deal with it in some way. You have to find a way, in your film, of managing it. Otherwise, you are lost.

**On the subject of the advantages to be derived from the post-synchronization of the dialogue of an entire feature film:**

In my pictures I use the technique of post-synchronizing all of the dialogue. This is something I've grown into because I came out of the documentary tradition in England — which I never felt comfortable in. I was never truly a realist, so my movement has been away from realism — at least, the kind

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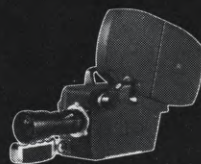
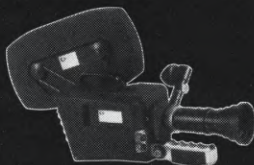
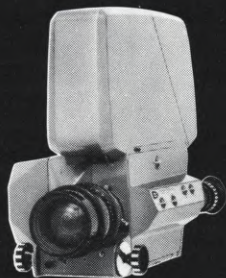
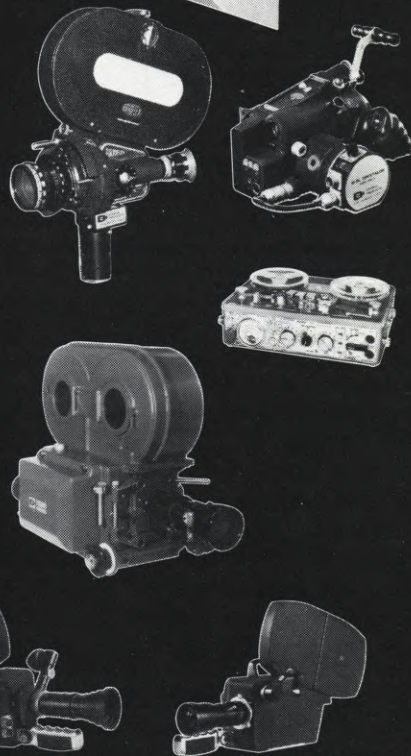
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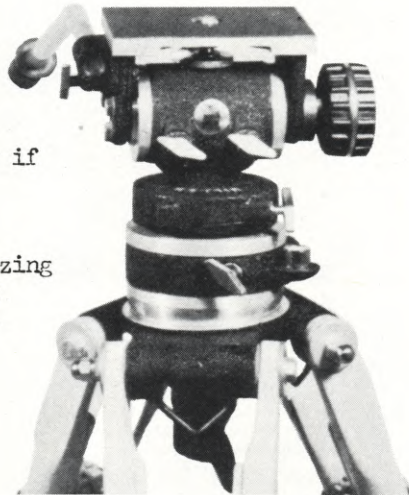
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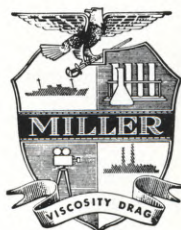
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of realism that involves going out into the street and shooting stuff — and more towards maintaining total control over the material.

Now, I find that actors, particularly, are bitterly opposed to the idea of post-synching or "looping", simply because it has such a bad name and is usually so poorly done. But I've been able to convince most every actor that I've worked with of its advantages, including Jon Voight, who was very much opposed to it. He came out of a very realistic school of acting and had worked very successfully in "MID-NIGHT COWBOY" with John Schlesinger, who is also very opposed to looping. So, when I told him that I wanted to loop everything he was horrified, but he was quickly won over when he saw the way that I do it.

My point is this: When you make a picture you very often shoot scenes under very difficult conditions which make it impossible to get really good sound. If you're after perfect sound, there's just too many things to get right. You must get the action of the performance right, because there is nothing you can do about that afterwards, but if the inflection or the delivery of a line is not quite right, I don't have to lose time by going again for the dialogue. I know that I can fix that later.

Of course, I shoot the dialogue as we go along, but I never intend to use it. The idea of post-synching, in some way, liberates the actors. It liberates everybody. It means that you don't have to have that artificial quiet on the set. To get a set quiet, to stop shoes creaking and all those things, is such an artificial strain that it makes everybody nervous and it's just not worth the candle. Another factor is that I don't like the kind of peripheral sound you get when you record dialogue on location. You are stuck with the sound of distant traffic or the birds singing or whatever it may be, and you are not able to control it. I like to use sound to direct the eye to something on the screen that I would like people to look at, and this is another reason why I post-sync.

Most people felt that "DELIVERANCE" was a very realistic film, but the entire picture was looped and all of the sound effects were made in a tank in my local studio, Ardmore, in Ireland, and built up. There is a problem involved in getting the maximum sound onto an optical track. I use the Moog Synthesizer to create sounds that are at the top or bottom of the spectrum, so that you can get them onto an optical sound track without getting roll-off. Roll-off thins out the top and bottom sounds. By using the Moog Synthesizer to create the roar of the river for "DELIVERANCE", I was able to hit



exactly the bottom of the optical track. A naturalistic sound of the same thing (the actual river) would contain lows that are beyond the capacity of the optical track to accommodate. The lows would roll off, making the sound very much thinner than it was on the original recording.

I'm also very interested in foreign versions. This is something that people don't consider enough. If you build a perfect sound effects track, you are able to make foreign versions much more successfully. A lot of films are spoiled by being badly dubbed into foreign languages. Sometimes the actors are sent along to the recording studio and the director isn't even there — just three engineers.

My method is to show the cut film to the actor. Then he is able to see things which have been cut out, the odd line which has influenced his performance. He is able to make adjustments. We discuss the whole thing. I take each actor individually, except where there are two in the scene and it's important to have them come in together. I spend several days with them on the looping stage, very quietly. There are no other pressures or problems.

We talk about the whole performance and then the actor modulates it. We try things and we change things and we improve things. We change the odd word or the odd emphasis and gradually build up a performance that has to do with the finished film, and not with a lot of separate shots. To give an actor this opportunity to look at the finished film and reshape and modulate his performance to the cut, rather than what you were aiming at in isolated scenes spread over ten weeks, is something that any actor, when he comes to understand this method, appreciates tremendously.


I don't just record the sound with a microphone. I take a great deal of care to recreate the quality of the sound that the scene should have. We change microphones and we shift the baffles around to get the right voice quality. I've never yet failed to convince an actor of the efficacy of this system.

There is no doubt that it is very liberating to shoot without direct sound. You can move around much more. Fellini said: "If the Americans ever find out about looping, then we are finished, because they will be able to do all the things that we do." ■

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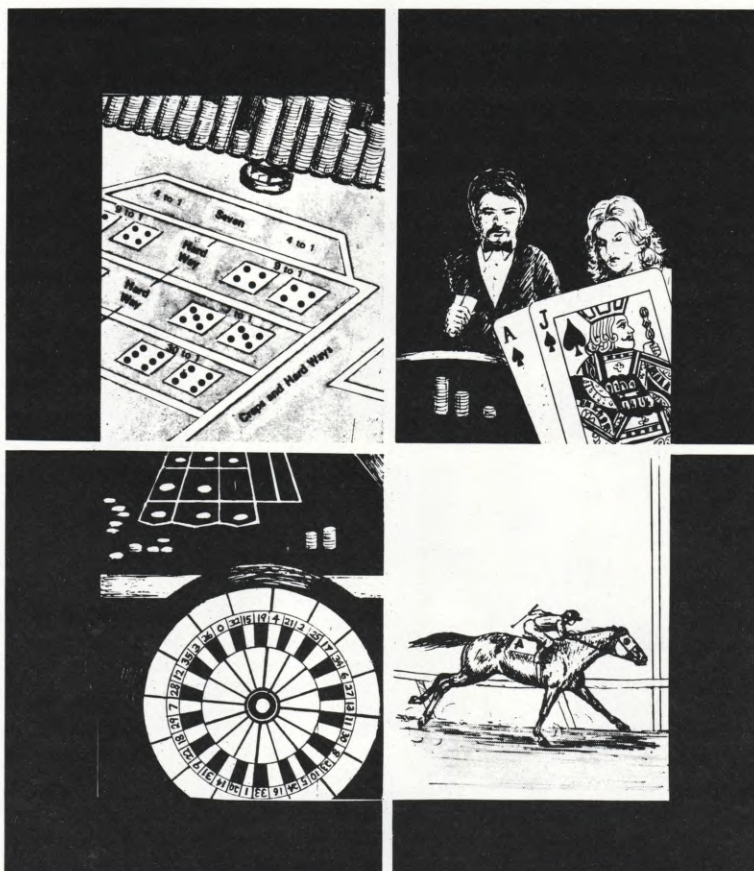
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## PREVIEW OF THE USA FILM FESTIVAL

A preview of the best United States films coming up in 1975, as selected by four of the nation's leading film critics, will highlight the USA Film Festival, March 17th through 23rd at the Bob Hope Theatre in Dallas.

William Wyler has been chosen as the Festival's Great U.S.A. Director of 1975, and will be honored by a retrospective of seven of his films, one each day of the week-long event.

Mr. Wyler, along with film critics Judith Crist, Hollis Alpert, Arthur Knight, and Barbara Bryant, and stars and directors of the new feature films, will be on stage to discuss the films with Festival audiences in Southern Methodist University's Bob Hope Theatre.

Now in its fifth year, the USA Film Festival is unique in that it is devoted exclusively to films directed by U.S. citizens, according to its director, Dr. G. William Jones. Jones said, "It's really a critics' choice festival and the only one in which the critics appear onstage to discuss their selections with the audience."

## WYLER RETROSPECTIVE

William Wyler is not only the most honored of motion picture directors, he has also created the industry's greatest variety of films. Ranging from "DEAD END" to "THE BIG COUNTRY", from "THE BEST YEARS OF OUR LIVES" to "BEN HUR", from "WUTHERING HEIGHTS" to "MRS. MINIVER", Wyler has brought his many gifts as a filmmaker to bear on pictures that have become classics of the screen.

Wyler's career in the motion picture industry began in 1921 in the New York offices of Universal Pictures, where he first did general clerical work and then, because of his knowledge of languages, served as foreign publicity representative.

Determined to become a director of films, he managed a transfer to Universal Studios in California in 1922, where he first became a prop boy, then a script clerk, then an assistant director, and finally a director of low-budget westerns. He soon graduated to full-length sound films. It was the success of his film version of Elmer Rice's "COUNSELLOR-AT-LAW" in 1933, starring John Barrymore, that placed him on the top list of Hollywood directors. In 1936 he made a film of Sinclair Lewis's "DODSWORTH" for which he

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# ACTIVITIES

received his first of eleven Academy Award nominations as Director of the Year. Since then only two of Wyler's films have not received Academy Award nominations. His films have won, exclusive of technical awards, 125 nominations and 40 Oscars. Wyler himself has won the coveted award three times. He is said to be the most consistent director in cinema history.

His choices for the retrospective screenings at the USA Film Festival include:

"DODSWORTH" (1936) starring Walter Huston in one of his finest performances. Exploring the social implications of a troubled marriage and material success, this Wyler film is a true masterpiece, years ahead of its time.

"JEZEBEL" (1938) starring Bette Davis and Henry Fonda. Ms. Davis won an Academy Award for her role as the self-centered Southern belle in this film that is frequently said to have painted a more accurate picture of the Old South than "GONE WITH THE WIND".

"WUTHERING HEIGHTS" (1939) starring Merle Oberon and Laurence Olivier as Cathy and Heathcliff. This all-star cast and crew also features superb performances by David Niven and Geraldine Fitzgerald, screenplay by Charles MacArthur and Ben Hecht, and photography by Gregg Toland, ASC.

"THE LITTLE FOXES" (1941) starring Bette Davis gives her another role as a, this time updated, ruthless Southern belle. The scene in which Ms. Davis stands by and watches her husband die of a heart attack has become a screen classic. The screenplay is by Lillian Hellman based on her acclaimed Broadway play.

"DETECTIVE STORY" (1951) starring Kirk Douglas and Eleanor Parker in a story that revolves around one day's happenings in a New York squadroom of plain-clothes detectives. Hollywood's cops-and-robbers genre here takes a turn toward realism through a series of vignettes in what was then a bold expose—.

"FRIENDLY PERSUASION" (1956) starring Gary Cooper, Dorothy McGuire, and Anthony Perkins in the story of a warm-hearted Quaker family's turmoil during the Civil War, inspired by a group of short stories by Jessamyn West. The theme of pacifism vs. patriotism serves as the foundation for Gary Cooper's most memorable performance.

"THE COLLECTOR" (1965) starring

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### THE CRITICS

Film critics Alpert, Crist, and Knight will select twelve feature films from major studios as well as independents to premiere in Dallas. All three were critics for the 1973 and 1974 festivals, which presented a number of films that have proved to be boxoffice successes. They included "THE SUGARLAND EXPRESS", "BADLANDS", "CLAUDINE", "LORDS OF FLATBUSH", "MACON COUNTY LINE", "BANG THE DRUM SLOWLY", "IMAGES", "LOVE AND PAIN AND THE WHOLE DAMN THING", and "THE LONG GOODBYE".

Ms. Barbara Bryant of Chicago and New York, a national film-consultant, will devote an entire day, Friday, March 21st, to her selection of short films and documentaries.

Judith Crist, one of America's leading film critics, is a regular for NEW YORK MAGAZINE and T.V. GUIDE. Author of many articles and two books on film, she also teaches a film criticism class at Columbia University.

Arthur Knight, film critic and professor of cinema at the University of Southern California, is the author of probably the most popular film history text, *The Liveliest Art*, as well as other books on cinema and numerous documentary scripts. He and critic Hollis Alpert co-authored *The History of Sex in the Cinema*, taken from his film writings for PLAYBOY MAGAZINE.

Hollis Alpert, film critic for SATURDAY REVIEW/WORLD MAGAZINE, is also the author of books on film criticism, novels, and short stories. He is a member of the New York Film Critics Circle and founder of the National Society of Film Critics. He has contributed to THE NEW YORKER, ESQUIRE, NEW YORK TIMES MAGAZINE, and HARPER'S BAZAAR, as well as other publications.

A consultant to university and public film libraries, Barbara Bryant is an organizer and leader of film study conferences across the country. She has served as coordinator of film library services in Israel and North Africa for the International Red Cross. She is the former technical assistant to the director of research and development for the Office of Economic Opportunity.

The USA Film Festival in Dallas seems to have found a winning formula: the best films of the past, plus the best of 1975, with the added ingredient

of a chance to talk to the directors, the critics, and the stars. Waiting lines that stretch far beyond the doors of the Bob Hope Theatre evidence the approval of students, film-makers, and the general public. Past honored directors have been Joseph Mankiewicz (1974), Raoul Walsh (1973), Frank Capra (1972), and George Stevens (1971).

For ticket information write USA Film Festival / P.O. Box 3105 / Dallas / Texas / 75275 or call (214)-692-2979.

#### CINEMA WORKSHOP Continued from Page 256

convention. Note that there are three diagrams. In the first two (2a & 2b), the ground (PIN 1), bloop (PIN 2), and pilotone (PIN 3) are transferred to a 3-pin Canon XLR which accepts the sync cable for the Nagra. Diagram 2c is a straight 4 pin XLR battery connector with no provision for bloop or pilotone. It has been used by Eclair over the last two years, since all new cameras are crystal.

Now it should be obvious why the 4-pin XLR cannot become the universal standard. It is 12 volts only. The other two pins are used for bloop and pilotone. If a 4-pin XLR were wired for multi-voltages — say, 8.4 volts on PIN 2 and 16.8 volts on PIN 3 — an existing ACL or NPR would be burnt out by these voltages on PINS 2 & 3. Thus, the 4-pin XLR must remain as it was designed, 12 volts only. (FIGURE 2).

The future seems to belong to the 5-pin XLR system. It can provide all necessary voltages, plus PIN 5, for special or as yet unthought-of applications. But what about the ACL and the NPR? Remember that the entire premise of the 4-pin system is the two conductors for pilotone and bloop. Yet every ACL ever made and every NPR now being sold is crystal-powered. Moreover, most NPR users are updating their cameras to crystal operation with one of the many new crystal motors available for the NPR. To top it all, the ACL does not have a pilotone output at all. PIN 3 on the ACL is a power output (12 volts DC) instead of pilot, and a standard sync cable cannot be used with an ACL. Thus, there is a diminishing need for pilot and bloop connections and the 4-pin XLR connector may be outliving its usefulness.

Crystal NPR's and ACL's can be wired with a 5-pin XLR connector like any other 12-volt camera. The power cable need only have two conductors: PIN 1 from the camera (FIGURE 3) goes to PIN 1 on the 5-pin XLR, and PIN 4 from the camera goes to PIN 3 on the XLR-5. It appears as if the 4-pin XLR may go the way of the banana.

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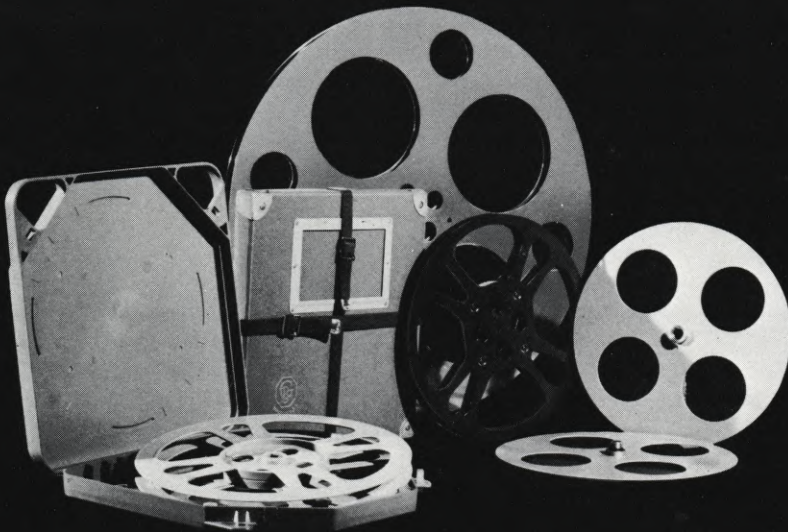
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### THE ANGENIEUX STORY Continued from Page 329

facility because of the vapors and chemicals used here. There are cleaning baths for metal which is to be black anodized later. Chromium plating is also done here."

Our random wanderings bring us to the computer room. "This is the guts of Angenieux," says my guide, "and the reason for its success and ability in the creation of designs. The computers are extremely helpful. One of the technicians was telling me the other day that he had just finished doing a computation in a very short time which, if done by hand 20 years ago, would have taken all of the attention of a man working eight hours a day for 50 years.

"Formerly we rented an IBM computer, but then we found this Phillips machine which suits our purpose very well. All of the programs we use are our own, not IBM programs. The computer is used essentially for optical design, but it is becoming more and more useful for production control, also. Some of the broadcast lenses have 3,500 different parts, so it's nice to have the computer helping out."

We walk through what looks like a schoolroom with little cubicles adjoining it and I am told that this is a language laboratory. The program was started just a year ago and the company's engineers and lower management personnel have been encouraged to learn a foreign language. Many of those who have seized the opportunity are doing very well. Sometimes the "schoolroom" is pre-empted for classes in lens repair held for foreign technicians, especially those from the eastern countries, like Hungary, Romania and Czechoslovakia.

In the lens grinding department, trays loaded with blanks arrive on a conveyor belt. The blanks go through a rough grinding process that gets them down to approximate size and shape in one minute — a very short time compared to the hours required for final grinding and polishing. These rough lens elements are now patched to the holding tool by means of pitch and are then sent to the polishing department. This area is temperature-controlled, because the radii of some of the elements could vary with temperature changes. All of the polishing machines used here have been designed and built by Angenieux.

Polishing a lens, as I have already learned, is a very precise science. The polisher has to know exactly when to stop his machine and eventually, in some cases, he has to scrape the tool

to change the radius of the curvature ever so slightly.

After polishing, the lens elements must be separated from the pitch that holds them. This is done by putting the holding tool in a "cold box" containing liquid nitrogen. The metal, the pitch and the glass do not shrink at the same rate, so separation becomes easy. Afterwards, the lens element is put through ultrasonic cleaning. It is most important that the glass be thoroughly clean before the lens coating is applied. Otherwise, the coating will not hold. Each lens element will be very carefully cleaned one more time, just before final assembly, to make sure that no dust is sealed into the lens.

Apropos of all the precision work that I have been observing, Bernard says, "One of the things we have to face here is the fact that there is no other optics industry and we have to train absolutely everyone. In machining you can find people, but for optics we have to train them all ourselves."

We move into the edge-cutting department, and it is explained to me that because a zoom lens has so many elements, they must be very precisely aligned. They are not aligned by the optical axis, but by the mechanical axis, because they will be supported in a mechanical mount. However, it's essential to make sure that all of the elements are cut to a cylinder all the axes of which are the same as the optical axis.

Lens coatings are applied at Angenieux (as they are in other optics plants) by means of equipment that combines a vacuum with high temperature to vaporize a chemical — usually magnesium fluoride.

"A piece of glass that is not coated (like a common window pane) will reflect about 4% and transmit 96% of the light hitting it at a perpendicular angle," Bernard explains. "That's not so bad for a single pane of glass, but when you have 20 to 25 elements in a lens, it adds up to too much of a light-loss. So, by coating the surfaces, you can change that 96%-to-4% ratio to 99%-to-1%. The ratio will vary with the index of refraction of the glass. Therefore, the coating process will be more or less efficient, depending upon which glass the optical designer happens to have chosen for his specific design. It so happens that for most of our designs one layer of magnesium fluoride provides a very efficient coating. However, we have the capability for applying multi-layer coatings, which can improve the efficiency even more, reducing the reflection from 1% down to .1%. We can actually bring it down even farther than that, but beyond that point it's purely academic, because it

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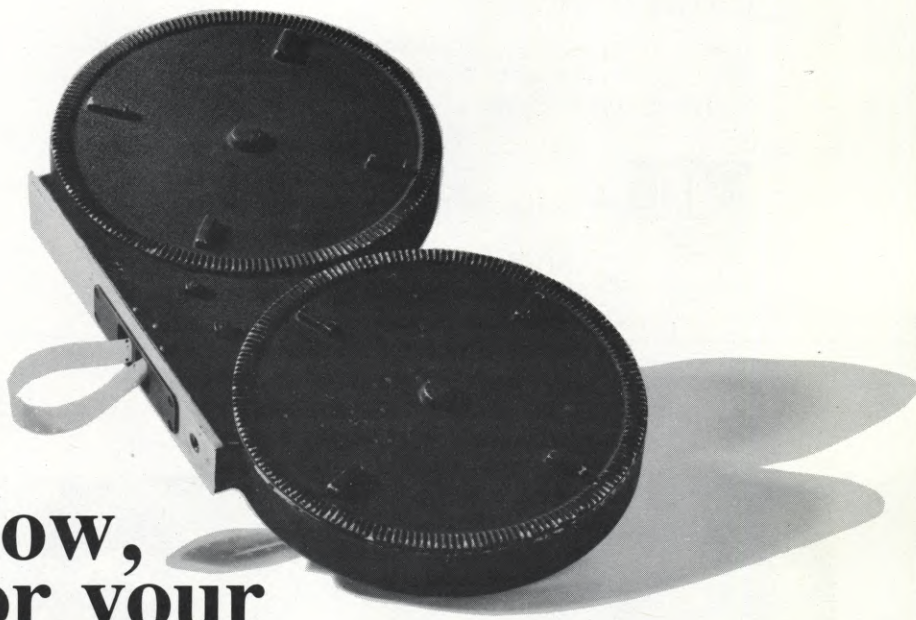
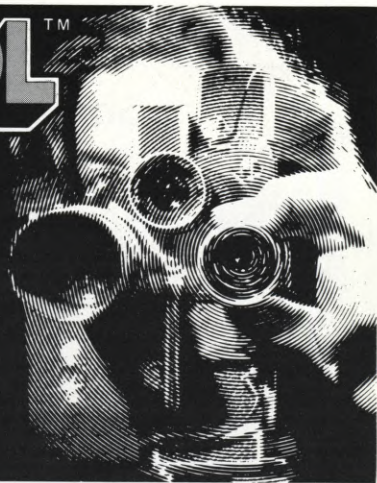
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doesn't make that much difference to the user. Of course, when you apply multi-layer coatings you need much more sophisticated equipment, because you require a better vacuum and more precise control over the thicknesses of the various layers — which is very important."

I ask him if any of the Angenieux motion picture lenses have multi-layer coatings and he says: "Some of them do — for example, the 6x20 zoom lens that we make for 35mm photography — but most of the multi-layer work done here is on the splitting systems used inside TV cameras to separate the colors into red, blue and green on the three tubes. We do a lot of this for other companies, in France and Germany and in the States."

In our wanderings through the plant we pass a really gigantic lens on a test bench. It looks like something Paul Bunyan would use on his Instamatic. "I don't know if you were aware that we are making lenses of that size. Maybe it's what you want for your Beaulieu Super-8 camera," my guide says, jokingly. "This is a lens of very long focal-length with a very large aperture. It is used for exterior telecasting — football games and things like that. However, it is not the largest lens we have ever made. We've built special ones for the military with focal lengths up to 10 meters — that's almost 40 feet — and these are zoom lenses, by the way. With such lenses you can fill the TV screen with an aircraft that is five or ten miles away and tell if it's friend or foe — provided that there's no fog. If there's fog, you've had it."

We are now in an area that is approaching final assembly and I am told that all of the air that comes into this section is specially filtered to be clean and dust-free. In addition, it is slightly pressurized to keep dust from blowing in. Bernard speaks again of the very careful cleaning that the elements are subjected to just before final assembly. "One of the major problems is that when you touch a lens surface with your hands, you leave a thin layer of human grease," he tells me. "It is perfectly transparent and the surface may look very clean, but six months or a year later, it will turn a bit gray — and, again, with 20 elements, it would be too much — so, we have a process which we have developed here which effectively removes that grease and also does away with the fungi that could cause problems in tropical countries."

In final assembly, it all comes together. The many bits and pieces that make up a modern zoom lens are carefully aligned with the aid of collimators — but the overall quality of the





lens is still a guessing game at this point.

"One of the major problems in applying quality control to lens optics is that you can find out if the lens is good or not only when it is totally completed — unless there is something obvious, like a big scratch," says Bernard.

Beyond that point, everything possible is done to analyze the present state of the lens and fine-tune it for optimum quality. This is done by means of collimators and projection. A test target projected onto a large screen immediately reveals the idiosyncrasies of the individual lens. Perhaps there is a difference in sharpness between the top and the bottom of the image, or the left and the right sides, or the center as compared to the edges. The lens does not pass inspection until all or any of these aberrations are adjusted to meet very critical standards.

Our last stop on the "tour" is the optical laboratory which is used for evaluating designs and prototypes. "The computer gives us a piece of paper telling us what we can expect in the way of quality," Bernard explains, but we will make our own further analysis, because, to some extent, evaluating the quality of a lens is like trying to decide whether a girl is more or less pretty. There are so many variables. How do you balance the separate characteristics? Aberrations are more or less important, depending upon the application of the lens. A visual projection test is the best way to decide.

All throughout our tour of the facilities, I have been impressed by the consistency of the quality control, as I've seen it applied to just about every major operation. I ask how it is organized in order to effect the necessary checks on so complex a project as the manufacture of zoom lenses.

"Quality control begins with the parts that are sub-contracted and which we purchase outside," I'm told. "Within this factory, quality control is separate from manufacturing, but there is one phase of quality control for machining, another for the optics, and still another for the finished product. These are carried on in different areas, physically, but they are all part of the same department.

"I would say that there are about 300 inspections for the parts of a 10x12 (16mm) or 10x25 (35mm) lens. There are 60 major components, each of which has an average of five dimensions that are critical — so there are 300 dimensions which have to be checked and measured on each lens. As for the finished product, as it is

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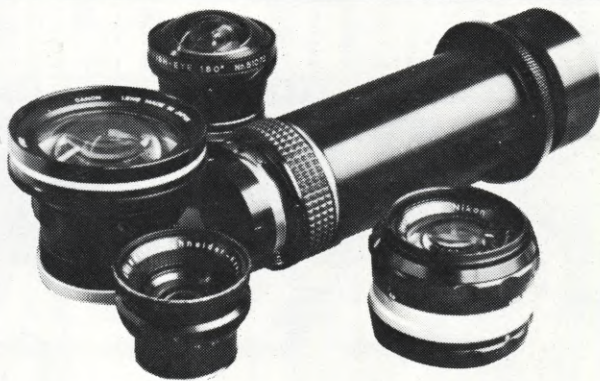
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delivered for final inspection, there are about 60 different values which must be checked before the lens is recognized as being accepted. The important characteristics are checked out 100%. Less critical characteristics are spot-checked through random sampling — such things as operation in extremely cold temperatures or operation in the vertical position (which is rather untypical).

“Out of the 700 people employed in this facility, at least 80 of them are working exclusively in quality control. That's more than 10%, so I certainly would reckon that quality control is one of the major aspects of our operation.”

Later on, I have a chance to talk with André Masson, Technical Director for the company and head of Research and Development. I ask him what factors motivate the design of a new lens, and how it develops from that point.

“The starting point is the existing technology,” he tells me. “For example, our new 10x15 zoom lens which we introduced at *Photokina '74* started with our 10x12 lens, which has been very widely used in the motion picture industry for several years. With that lens as a basis, we found that people would like to have a wide angle, a longer focal length and a closer focusing distance — but they did not want more weight. We were quite sure that this was the combination the market wanted, and we set out to see if we could achieve it. Having established a goal, we moved in a series of small steps beyond the lens we already had and, step by step, hoped to arrive at a significant new design. That was basically the evolution from the 10x12 to the 10x15 lens.”

“What were some of the major changes effected during the course of that evolution?” I ask.

“Well, a zoom lens has three groups of elements: a Focusing group, a Converter group and a Prime group. For the new lens, we added one more element to each of these groups. There were other changes affecting radii, curvatures and dimensions. Also, the 10x12 lens was designed almost 10 years ago and since then new types of glass have become available. The highest index we could find at that time was 1.73. Now it's 1.81.”

“Since most lenses are now designed by computer, a lot of people think that all you have to do is push some buttons to get a new lens design,” I observe.

“It's not quite that simple,” says Mr. Masson. “Optical design is still as much of an art as it is a science. The computer is a tremendous aid, however,

especially in terms of saving time. To a certain extent, the evolution of a new design is an experimental production. You start at a certain point and keep changing things until you arrive at something which is satisfactory. The computer draws each element and a tracing of how the light rays converge when passing through it. If the rays don't converge properly, you optimize the programming until they do. Each lens element has five variables: two radii, two indexes of refraction and the thickness. You multiply the number of lens elements by five to get the number of variations that are possible.

"Up until now, all we have been doing is playing with diagrams on paper, but when the optimization is complete and the optical design is as good as we can get it, we can start making the drawings for the mechanical design, which deals with certain alignments and tolerances. To arrive at a good, smooth zoom, the mechanical design in itself is not a simple thing. On top of that, you've got to make sure that your design is something that is possible to manufacture, because you may come up with a fantastic design that is not economically feasible."

"Do you base your final judgment on feedback from the cameraman as to whether or not a new lens design is successful?" I ask.

"The final judgment is whether the cameramen like it and buy it," he answers, "but the problem there is that if you ask the average cameraman what he wants in a lens, it's very hard for him to make a decision. It's like asking someone what kind of girl he wants to marry. He'll tell you that she should be pretty, she should be smart, she should be rich, she should have a sense of humor — but when he says this, he says nothing, because no one has all of that. So, in that respect, it's difficult to go to the cameramen for a judgment. But, on the other hand, they're the ones who buy it and decide that they don't like this and they don't like that. Often it has taken us time to find out *why* they don't like this or that — but, in general, we feel that we now have a good understanding of their requirements."

Judging from the number of Angenieux lenses in use today, they certainly must.

On the following day, Bern Levy and I are invited to luncheon at the attractive indoor-outdoor (and, to me, quite Californian) home of the Morets. Bernard and Jacques Angenieux are there also, of course. We spend a thoroughly pleasant afternoon with these delightful, down-to-earth people before taking off for Paris — and nobody even once mentions lenses. ■



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## EXTENDED FILM FORMATS

Continued from Page 310

cameras and editing equipment. This will be less of strain on the change-over, since the movies created for television are not normally seen in motion picture houses. There will be a slight loss of image on the sides of the wide format, but television loses this anyway on every hard-matte 1:1.85 film made today. Certainly the small quality loss is not a factor anymore.

The use of 5247 negative will help rather than hinder quality and I, for one, do not believe that film quality and grain size are going to remain at the present status. I think they will only get better as film chemistry progresses. I don't know any film-maker who believes otherwise.

Oddly enough, even the two-perforation pull-down system known as Techniscope would work well in the system. The Technicolor labs would have to change their optical lens in the print-up system. It would raise the height of the .373 frame to .466 with a 25% stretch-up. This would be slightly taller than the 3-perf .446, but still within the bounds of the frame lines. In projection the 25% unsqueezing would make everything correct. No sense in wasting any cameras that now exist.

There are a number of other advantages in the use of the 3-perf format, both in camera and in projection. One seemingly minor point (I consider it very important) is that in using less film we also use less SILVER than we have in the past in 35mm production. The photography industry as a whole, last year used about 48 MILLION ounces of silver. That is more silver than was actually mined in the United States. I think that Hollywood used about 3 or 4 percent of that figure, or about 1½ million ounces. Figure it from there how much silver would be saved in the use of a simple camera and projection conversion.

The film would run through the cameras and projectors at 67½ feet per minute, which would mean more time between magazine changes on cameras, and more time between projector changeovers. A 1,000-foot magazine would now run almost fifteen minutes, rather than the 10½ minutes at present. The camera would also run slightly quieter, and with the usage of more self-blipped cameras, such as the Panaflex, the Mitchell Mark III and the Arri 35 BL, this could be significant. The projectionist would change a 2,000-foot reel only once every 29 minutes rather than the current 22 minutes.

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to contain a full-length feature, so there would be a savings in shipping and storage costs.

There would be corresponding savings in the sound tracks, as the 35mm mag track would also conform to the 3-perf pull-down. The 25% saving seems to pass itself completely down the production line.

Naturally there would be no change in recording double-system sync-sound, as the frame rate would still be 24 frames per second.

Now we return to the eager 16mm film producer who wants to do a feature film. He has at his command a completely compatible system for enlarging to 35mm that offers higher quality than he has at present. He has all the aforementioned options (see FIGURES 4 and 2 again).

To date, I have not been able to interest any lens manufacturer in this proposed new system, but then I have not been able to meet *all* of them. At first the system was going to be named after the production company which my partner, John Stanley, and I have in San Francisco: Xeromega. But I thought better of that idea, as Xeromega 16 and Xeromega 35 seemed quite a mouthful. Instead, we called the system Extended 16 and Extended 35, which seem to describe it very well.

Where will the 25% anamorphic lenses come from? If any part of this idea seems viable and there is enough interest, then any manufacturer that is now making lenses for the motion picture world will create them. The mathematics are relatively simple. The lenses could be sold or rented. It would seem more practical to rent the lenses, as is done with Panavision and Todd-AO lenses, since the main reason for this system is for the production of feature films, rather than the making of documentary or industrial films.

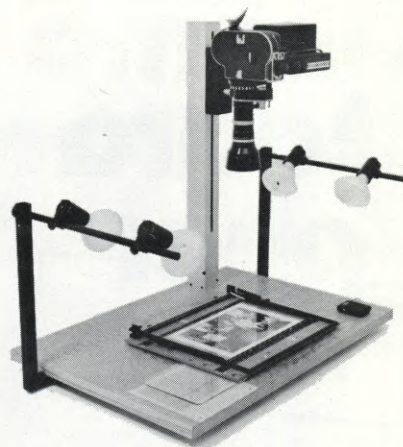
I firmly believe this method of creating feature films will be necessary if we are to progress in film-making. We are beset on all sides by inflation, runaway costs, increasing budgets, and I don't think costs will decrease. *Any* idea that could reduce film costs substantially should be considered seriously. This is *not* a traumatic proposal. The film world is always searching for ways and means to better itself and to improve the methods of creating films for theatrical release.

This is one possibility. ■

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## ON LOCATION WITH "JAWS" Continued from Page 331

real. The skin for the shark was made from Lasmer, a liquid plastic. The shark had two sets of teeth—a hard set and a soft set, the latter designed to go easy on stuntmen. The skin was painted with silica sand to give it a sandpaper shark-skin texture so that the water would bead and run off it realistically. "Bruce", as the mechanical monster is known to the crew, is stored and repaired in "Shark City", a 200-by-75-foot shed where over a score of special effects men wait in attendance to this sea king. When "Bruce", during a difficult dive, rammed into his platform, the production was delayed for a week while "Bruce" got a nose job. The salt water corrodes everything metal, including "Bruce", and his skin gets sun bleached, so every week he gets a new skin. Inside the mechanical star is a mass of nuts and bolts. The backbone is made out of yellow tubular and spring steel. About 500-feet of plastic tubing, 25 remote-controlled valves and 20 electric and pneumatic hoses provide the power.

The second big design problem for Joe Alves was the boat which is the set for the whole last third of the picture. "For Quint's boat the 'Orcha'", explains Joe Alves, "we bought a Nova Scotia boat and totally redid it, because we wanted Quint's boat to have a special character."

Actually, there were two boats, the "Orcha I" and the "Orcha II". The "Orcha II" was a special effects boat designed to smash and sink when attacked by the shark. Made from fiberglass using the "Orcha I" as a model, it resembled it in every superficial detail. The "Orcha II" had no bottom, just a steel scaffold to which several barrels were attached. The barrels could be filled with water to sink the boat and then filled with compressed air to raise it again. The boat was built in levels so it could be dismantled and fitted into its storage shed. The engine hatch was made of balsa so it would splinter when the engine exploded. Three transoms were also made of balsa so they would break away when the shark crashes down on the end of the boat in the climax of the story.

Besides the robot there are some real sharks in the picture. A 13-foot Tiger Shark was flown up from Florida for use in a scene in the picture where the townspeople in the picture think they've captured the killer shark. A lot of real shark footage was shot for the film by Ron and Valerie Taylor, two Australian shark experts who were responsible for the film "Blue Water,

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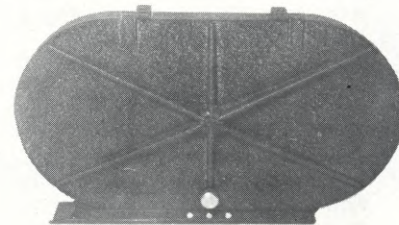
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White Death", which was a big box office success a while ago.

The timing of my visit to the set of "JAWS" was quite fortunate. My first trip out to the many boats and barges that made up the set was on the day when they were shooting the most important scene in the picture, the one in which the shark leaps out of the water and crashes down on the back of the boat. The whole afternoon was spent in preparing the shot and as it approached 5:30, the end of the day, it looked like they were never going to get the shot off, but just before 5:30 everything came together and Steve Spielberg decided to go for the shot. He called, "Action" and he got a lot more than he called for. Steve, Roy Scheider, Dick Butler (Robert Shaw's stuntman and no relation to Bill), Bill Butler, three camera crews and three cameras were all aboard the "Orcha II". When the shark came down on the boat it looked like an explosion and for thirty seconds all hell broke loose. The weight of the shark caused the boat to fill up with too much water and it started to go down like a stone. I saw Roy Scheider dive into a mass of nail-filled pieces of wood splintered from the transom by the shark and did not see him come up for a long time. Other people were jumping clear of the boat and people on other boats were rushing to help them. There was much confusion and people were shouting, "Save the camera!" and "Save the lights!"

As the boat started to sink it also started to tip over. Some crew members on the work boat, "The Ruddy Duck", also dove clear of their boat when they saw the 30-foot mast of the "Orcha II" coming down on them like a tall timber. Fortunately the "Orcha II" was attached to a crane on one of the boats, "The Whitefoot", and this kept the "Orcha II" from sinking or tilting too much. To top it off, a sudden squall came up and it started to storm. After it was all over no one was seriously hurt but the number one camera had been submerged and the magazine with the hard-earned footage was filled with water. Everyone thought the footage was lost and the whole thing would have to be done again, but Bill Butler had the magazine immediately taken to shore and fresh water was exchanged for the brine. The magazine was carried in someone's lap on the next plane to New York and was processed by Technicolor in New York under the supervision of Otto Paoloni that night. They got the results the next morning. The footage was fine. No second take was made, and that is the footage that the public will see in the film. ■

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## FILMING PAINTINGS Continued from Page 283

ing from sources which determine its shape, and striking surfaces which affect how much and which way it is reflected. Standard copy lighting (two lights at 45 degrees to the subject) would give a hot spot on each side of the frame every time, and some of the impasto surfaces would have been unmanageable. Having foreseen this, we used large softlites.

Essentially, the solution is a tent minus its back. We used two 4K Color-tran softlites pointed at each other — 90 degrees to the subject. This setup worked most of the time, only giving us problems when we had to shoot in corners or the work was extraordinarily large.

Using the lights in this way eliminated hot spots on the frames and seemed to put all specular reflections outside the axis of the camera. Also, it was very quick to rig. Each luminaire acts as the wall of a tent for the other. A still photographer found the solution elegant, and discovered he could substitute bedsheets for softlites. Of course, the intensity was less, but ASA 25 ECO is not used for stills.

For large gallery photography, with people wandering through the scene, we used three or four 10K Bashers from Chicago's Studio Lighting. These are five-foot circular lamphouses with the inside painted reflecting white. There is a plate in front of the bulb to prevent any direct light from reaching the subject. When used from maximum height, they simulate nicely the prevailing softness of the ambient illumination and provide sufficient intensity for an ECO exposure.

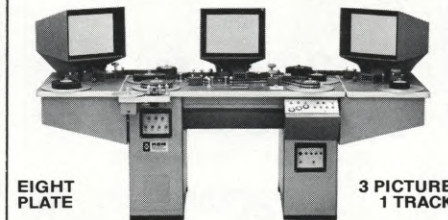
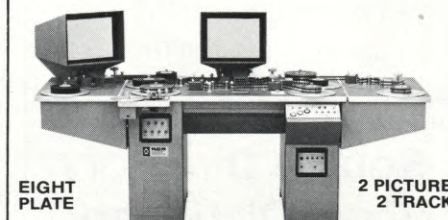
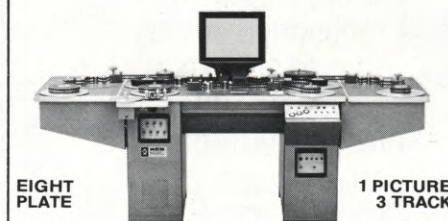
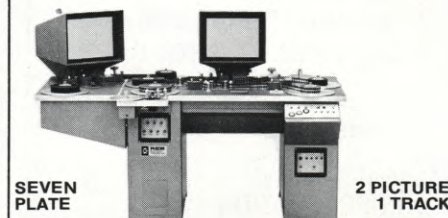
A great deal of care was necessary in filming objects of such value. We had a person stand by and hold each light used in order to prevent any accidents. A member of the Conservation Department of the Art Institute was also with us during all shooting. He made certain that our lighting was not too hot for the surface of the paintings, and in general guarded against any situations which would have been dangerous for either paintings or people.

The Renoir special has been shown both locally and nationally on Public Broadcasting stations, and the program on the permanent collection, "PAINTINGS", was premiered recently before a select audience of patrons and staff at the Art Institute. All remarks have been favorable, but our greatest pleasure lies in having given high concentration to works of monumental excellence — discovering significance, awareness and understanding. ■

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### "PLATO'S CAVE" Continued from Page 333

asbestos to simulate a small volcanic cone. This was our "eternal flame".

I thought he had made a fitting for the tubing to screw into the burner, but discovered he had merely wedged it in with that old reliable "gaffers tape." Gas did build up a bit dangerously to ignite with a small "boom" when we used it in the bucket. We had no trouble dismantling it and mounting it on a light stand where it was easily adjusted to the proper height in front of our B & M "Slimline" 2K quartz-light used as a key to simulate firelight.

Through Ted Puffer I met former Hollywood choreographer Maggie Banks. She had staged many of the industry's biggest production numbers and was now in Reno for the same reason we were. Maggie used to suffer from asthma. She agreed to stage the "fear figure" sequence and supplied me with talented people to play the parts.

During the long hours of the three weeks of set construction, many were discouraged. At one point, the student workers, despondent over what looked like a lack of progress, nearly revolted. Young student-foreman Kerry Farmer, one of the hardest-working people I've ever known, brought in a libation . . . and the revolution was "quenched". Even Building and Grounds cooperation cooled. But, when in the last day or two the whole thing came together, all of the work paid off. An enthusiastic crew pitched in to active work on the production of "PLATO'S CAVE".

We had other bad scares. At one point, Victor Izay's availability was in question. He was due to put in eight weeks repeating his success as the Doctor in the sequel, "THE TRIAL OF BILLY JACK". Fortunately the production was delayed. Then the worst happened. Victor Izay is a jogger. Three weeks before we were to shoot, he jogged into a gopher hole. He got the cast off just in time and with a tightly-bound ankle, was able to perform on schedule.

Most interiors of the cave were shot in two long days. Greeks were played by University Professors, students, and other local people. Despite his leg problem, Victor Izay gave a sensitive performance in a highly demanding role. Four days later our rushes arrived. One hour of shooting completed pick-up takes. All gathered on the set where a projector and screen had been set up. Everyone involved had the opportunity to view the rushes.

Then the set was torn down. Three weeks of work came down in thirty-minutes. It took longer to clean up the

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debris. One memory was seeing my script clerk (later winner of the title "Miss Nevada"), diminutive Jacques Barker, handling a huge shovel and working like a stevedore.

One major sequence, following the philosopher's emergence from the cave, called for his seeing his reflection in a pond. Several weeks after I first arrived in Reno, I took my young son up a dirt road above the city to see the aspen leaves turning golden. On our way up the mountain we discovered this lovely location: pond, aspen, ponderosa pine. Our idyllic setting awaited us only four and a half miles off the main interstate highway.

In the spring, Victor Izay came back to Reno. We filmed the pond sequence. Then he, Kerry Farmer and I went out on location for three weeks. Kerry assisted me and doubled in stunts for Vic. We filmed in Yosemite, the Sierras, and the redwood country of Northern California.

We had to wait for the following winter to film snow scenes high on Mount Rose above Reno... and on the same day, shot Vic struggling in a torrential rain. Fortunately, later in the day, winds whipped up, as they often do in Reno, to provide the perfect background just outside my home. The camera stayed protected in our family room while one of my student assistants held a lawn sprayer, connected to the "hot" water tap in our kitchen, high in our Ponderosa pine tree, trained on Vic, to complete the illusion.

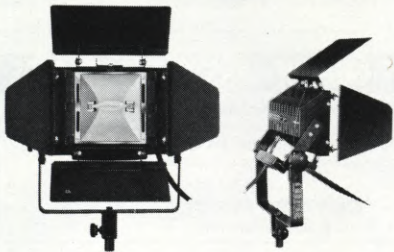
Later, portions of two sequences were shot in Los Angeles. A fifty-cent bag of sand gave us the addition we needed to a desert scene, shot initially at Pyramid Lake. In this scene the Philosopher gets the feel of warm sand, runs it through his fingers, then playfully tosses it in the air only to experience the unpleasant tactile experience of sand in the eyes. The other scenes shot in that same small park in Burbank near Vic's home involved discovery of a small animal eating nuts. Here the philosopher, and I believe most of the audience, discovers the sound, sight, smell and texture of almonds in their felt-like hulls. The small animal was a Chinchilla shot outside my studio at the University, courtesy of the Biology department.

In addition to the challenges involved in putting fear, horror, spectacle, and beauty on the screen, there were other dramatic and visual challenges. These involved functional use of modern film techniques. They had to be used to heighten audience reaction if they were to be more than mere disturbingly fast cuts or the now somewhat commonplace "light show."

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In one sequence, the Philosopher is in a quiet forest of giant redwoods. I call it "the forest of insights" for here he glimpses what man can build. The sun glittering through the tops of the trees gives way to the magnificent "Rose Window" of Notre Dame Cathedral. Images appear out of natural objects of the Watts Towers, a modern and monumental fountain and, in a lily, he glimpses the massive, pyramid-like Hyatt-Regency Hotel of San Francisco.

Each of these natural objects had to be roughly rotoscoped on a Moviola. For months I carried these crumbling drawings in my wallet until I could find just the right images to match. Culminating this sequence, golden aspen leaves begin quaking in the wind, go out of focus, and dissolve through to introduce a twelve-second glimpse of the future. Here we encompass all from Stonehenge through modern times and on to travel through distant galaxies. Then the aspen leaves reappear to come back into sharp focus as the "winds of change" die down.

This Kinestasis consisted of cuts as short as four frames. Selection was from both still-pictures and motion picture footage.

Another major cinematic challenge was the abstract sequence, designed to illustrate the limitlessness of the human mind when unencumbered by fear.

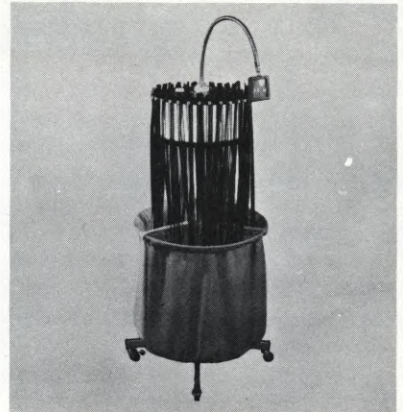
After the sequence previously described, the Philosopher wanders through the great forest contemplating all he has seen. Then he looks up. There is a magical mountain, beckoning him on to greater heights.

Filming of this scene was done by shooting Slide Mountain near Reno in stop-motion. Clouds in movement obscured the television towers at the top of the mountain. Then vividly-colored sunset clouds in movement in the opposite direction were simply superimposed in A and B printing. Bright areas at the bottom of the sunset clouds flashed out buildings which were in the mountain long shot so they could not be seen.

The sight of this magical mountain makes the Philosopher decide to go higher. He struggles against the full fury of the opposing elements and finally reaches the top. Here the clouds withdraw. Looking up, he sees the sun disappear behind high clouds and visions of color and movement in abstractions of great beauty appear.

Many techniques were tried. Many were abandoned. Some of the techniques used were commonplace and others were both technically sophisticated and novel. The sequences were kept short and, by intercutting to the elation of the

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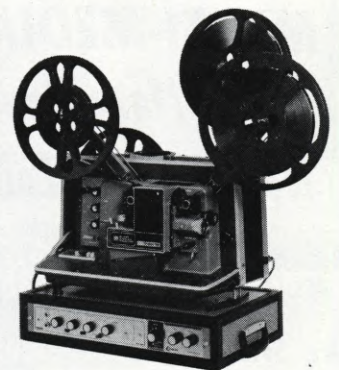
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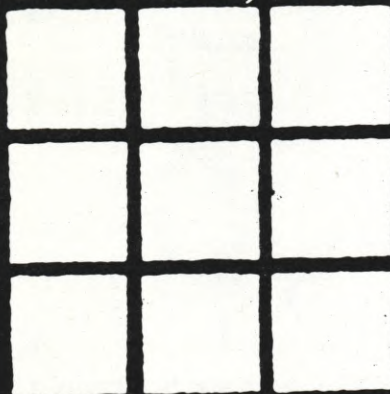
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Philosopher, we hoped we could create an abstract sequence with emotional impact.

In the final sequences, there are extremely close macro photographs (using a plus-20 macro attachment) of common household items: shells, beads, jewelry, kitchen foil, and flashing Christmas tree lights thrown into circles of confusion. Often the results were striking textures in movement used as backgrounds for the more sophisticated visual devices.

Film-maker Ivan Dryer, who has worked extensively in laser imagery, both for films and planetarium shows, made available over forty minutes of his best footage. From this I selected less than thirty seconds and combined that with material from other techniques.

Bill Ritt, Technical Director for the Medical School Division of Educational Support videotape facility at the University, helped me develop material by a process of "video feedback". It works just like the annoying audio feedback when sound waves travel from a mike into a speaker. Here, the result is often beautiful abstractions.

This system involves pointing a video camera into an ordinary television set which has been tilted. The scanning beam in the camera then gets confused and picks up imperfections in the blank receiver screen. From these it generates abstract patterns. Bill used three Marconi black and white cameras pointed at the same screen, each run through a primary color encoder. This gave us color.

Most of the images created in this way are center oriented. By filming off an ordinary color television receiver, I could control color balance, intensity, and film the portion of the screen I wished to use. We even got some spectacular results by having the three cameras move slightly to effect separation of the individual colors. Filming speed with my Beaulieu was at about ten frames a second, as I had to keep below a thirtieth of a second to eliminate appearance of television bars.

This sequence is the climax of "Plato's Cave". It had to really build to grab the audience. I wanted it to end with the "essence of matter" the form of the atom.

Hollywood film-maker and long-time friend, Robert Karl Cohen, visited me in Reno and saw this sequence in rough-cut. He made me realize I had left out one vital element: humanity.

I filmed a silhouette in hi-con of a man's hand and a woman's hand reaching for each other. This, too, needed special treatment. Here, using the hi-con negative as one matte and a



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positive hi-con as another, I combined these with contrasting video feedback abstractions in a 16mm Bell and Howell stop-motion projector and rephotographed them a frame at a time. The result was one piece of film with black background and floating abstract colors moving within the hands. The other was black hands on a center-oriented abstraction in violent movement. By printing these, slightly out of alignment in A and B, the result was a total abstraction representing human love. Throwing them out of alignment gave them a partial halo. From the moment the hands touched, a pulsing dot of light emerged to grow into the classic pattern of spinning electrons.

Ivan Dryer supplied the electrons in laser imagery. But, this was in black limbo. So, back to the poor man's optical bench: the 16mm stop-motion projector. One of the center-oriented video abstractions resembled the nucleus of the atom. It had a complex center from which lines radiated. But, it was too sharp and concise. I had one take in blue and one in green. I combined these, one head-up and one tail-up, in the projector gate. I wanted the outer edges of the field darker, so I attached a deep yellow gelatin filter with a small punch-hole in the center to the lens. Again I rephotographed the small projected image a frame at a time. The effect is something like a moire pattern, a dark brooding, live image ... over which was superimposed Ivan's laser electrons. These grow, loom large and bright, blindingly bright, to dissolve into the image of the sun emerging from behind the clouds.

In film we do have the opportunity of correcting our mistakes. Hindsight is great, as long as it's recognized before the final Answer print. I guess I stressed "fearsome beauty" too much to my designer. Her fear-masks were magnificent but not fearsome enough. This forced me to work harder, and resulted in some interesting techniques.

The two things our modern society seems to fear most are radiation and its resultant destructive mutation. In an attempt to achieve the ultimate in fear I set about to try to create both.

At the point of final challenge to the Philosopher by the "fear figures" they loom slowly and menacingly toward him. Here I ordered negative color images printed from the reversal original. To eliminate excess clear-film areas, I optically masked them with positive hi-con dupes. Excess white light eliminated, these were then dissolved in perfect alignment from the natural-color images. That gave me a sort of radiation effect. Now to add the "destructive mutation."

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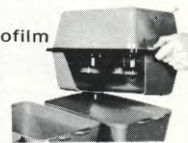
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I rotoscoped each fear-figure's negative image at several points in the movement toward camera. From these drawings I sculpted clay figures of the "fear figures". These were made in wet clay and lighted with garish yellow gels. Then, as I continued the move, in single-frame, I animated the destruction of tissue by gouging and smearing the clay figures a little at a time. The results are short but effective. And I believe the combined techniques helped heighten the effectiveness of the fears which attack the Philosopher.

Still, there was one disturbing element. This we did not identify until the last few weeks before wrapping "PLATO'S CAVE". It was the woman. If the Philosopher, a man, was afraid of all reality other than the shadows on the wall of the cave, one of his major fears would be of woman. Our re-examination revealed that the woman just didn't look horrible enough. Something would have to be done. We checked and found that the woman we had used a year earlier was not available.

Since coming to Reno my position at the University has changed. I now no longer teach in the formal sense. Instead, I am a full-time film-maker for the College of Agriculture at the University of Nevada. I do, however, take on four or five students each semester as crew. One of my students agreed to subject herself to the agony involved in creating "the essence of fear of woman." We substituted her for the original and were able to "change women in the middle of a scene."

Richard Pollman again came to the rescue to handle the difficult makeup chore. Background plates of the set, projected by an ordinary Carousel projector onto a sheet of tracing paper, proved adequate for process shots. We had the original (creepy-crawly) wig.

During makeup, while we had the process screen up, we projected the image of the original "woman fear figure" on the screen so Pollman could see where to build tissue where before only make-up lines existed. He used latex and dermawax, built boils, oozing open wounds, face hair, and jagged blacked-out teeth. He had forgotten running blood. My ten-year-old son helped out with his tube of "Vampire Blood". My student had practiced for days and learned to turn her eyes up into her head.

Again with the help of my son, I supplied the final touch. This was a forked reptilian, textured tongue cast in latex, mixed with green food coloring, on a thin rubber base, in a horned toad "Plastigoop" mold.

Makeup took four-and-a-half hours. We shot for less than five minutes. Ten

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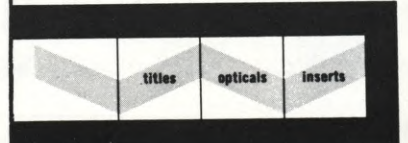
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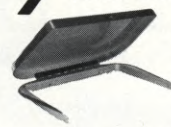
seconds of film was used in five separate cuts . . . and our gal suffered for over half an hour as Pollman removed the make-up. But, that ten seconds of film was vital to capture "the essence of fear of woman." So far, no one has noticed substitution of Joan Arrizabalaga for Delores Ondrejcek, until these two unusual names appear in the end-credits.

There are two lines of dialogue in "PLATO'S CAVE". They are in Ancient Greek and mean "Fear Not! Turn your eyes to the light", an obvious non-verbal communication repeated by the Philosopher as he is beaten to death by the chains of fear.

"PLATO'S CAVE" is far from a simple film. To me, it had more creative challenge than the most complex theatrical feature film. We completed production for under fifteen thousand dollars. It would have cost ten times that under normal production procedures. I'm grateful to a great many people who helped me "put the pieces together."

One of those I'm most grateful to is Jaime Mendoza-Nava. His magnificent, complex, original musical score, so essential to a non-verbal film, required twenty-one recording channels . . . one for each year I wanted to make "PLATO'S CAVE". ■

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**"EXPLORATORIUM"  
Continued from Page 317**

The whole idea of the Black Box was to make it look like an exhibit that was out of order. It would then be in a natural environment if it was surrounded by other exhibits. We found that we could bring three or four other exhibits near the box and compose them to our best advantage. Peter Pilafian would then wire each exhibit for sound. When the museum opened the box would become surrounded by spectators who never had the slightest suspicion. In fact we have sync scenes of people asking each other about the Box: "What's that? ... Must be some kind of exhibit ... See the sign? It's not working." They would be looking smack into the lens. Filming from inside was like being the invisible man. The box was painted black inside and we wore black clothing. On top of the box we had extended the metal studs by two more feet, wrapped marlox around them, and hung two Lowell 1K's inside. We used these for soft front-fill. The entire contraption was on casters, so we could change location fairly fast. We, interestingly enough, had considered using an Arri BL to save time through not having to go in and out of a blimp. We decided not to because we needed the speed that could only be gotten with a hard-front camera and superspeed lenses. If we had used a BL we never would have made the Black Box ... and never would have gotten the incredible footage that we did. ■

**FINAL CREDITS  
Exploratorium**

Produced, Directed, and Edited by Jon Boorstin  
Director of Photography, Eric Saarinen  
Sound, Peter Pilafian  
Gaffer, Peter Smokler  
Camera Assistant, Kit Kallionzes  
Best Boy, Robert Eber  
Key Grip, Earl Rabb  
Production Designer, Jeff McGrath  
Assistant Editor, Sean Daniel  
Script Girl, Marilyn Curry  
Production Assistant, Melody Lane

Sponsored by the Exploratorium with a joint grant from the National Endowment of the Arts and the National Science Foundation.

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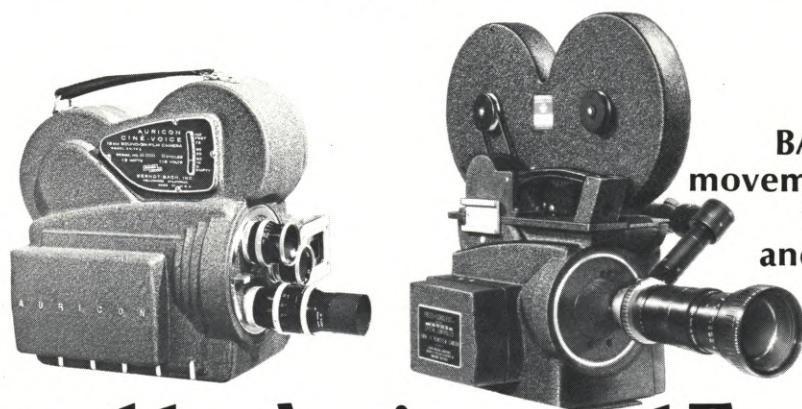
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