A CAPSULE HISTORY OF 3-D

Since the very beginning of motion picture history, pioneer filmmakers and studio entrepreneurs have tried to create an artistically interesting and commercially viable 3-D film process. With its stunning dimensional images, in outer space and on the surface of a plague-ravaged world of the 22nd Century, Columbia Pictures' "Spacehunter: Adventures in the Forbidden Zone" takes an ambitious and spectacular quantum leap over all previous 3-D ventures. Its "state of the art" technology, engineered and refined by 3-D expert Ernest McNabb, is the product of nearly a century of research and experimentation in the 3-D field.

Interest in dimensional art forms actually dates back to the ancient Greeks, Romans and Egyptians, who utilized "interposition" to obtain depth and perspective in their magnificent sculptures. In that ancient world, the Sphinx, the Colossus of Rhodes and the Temple of Zeus were the 3-D creations of their day, designed to impress the public with an outsized portrait of reality.

A continual fascination with dimensional art proceeded down through the ages, advanced by such masters as Michelangelo and Da Vinci, and it was only a matter of time before such creativity could be applied to more complex mediums.

Interest in 3-D began to build following the birth of modern photography techniques in the mid-19th Century (Mathew Brady and daguerreotype). Three-dimensional images were first introduced in
film form in 1838 when Englishman Sir Charles Wheatstone invented the stereoscope, a viewing apparatus in which individual "slides" were presented in three dimensions through a prism technique. Brought to America as the "Stereoptican," this device was greeted enthusiastically by the public and, right up to the 1950s, the 3-D viewer was a popular item among school children.

Beginning in the early 1900s, several attempts were made to create 3-D motion picture films. One of the earliest was that of William Friese-Greene, the British motion picture pioneer, who patented a 3-D movie process that used two films projected side by side on the screen. The viewer had to use an actual stereoptican to see the depth, at that time making it impractical for theatrical use. Many of the 3-D experiments completed in the early 1900s were similarly clumsy and ill-suited for mass-market exploitation.

The first major breakthrough came in 1921 when pioneer stereographer Jacob Leventhal, with the aid of Billy Bitzer (D.W. Griffith's cameraman), introduced the "Plastigrams," the first of the "anaglyphic" 3-D movies. This method utilized two cameras photographing separate images, which were then projected through red and green color filters. To unscramble the image, the patron was given the first 3-D glasses, each lens coated with a similar red and green filter. When the eye looks through the corresponding colors in the glasses, the images separate and the one eye sees only red images and the other eye, green images. Presto! 3-D movies.

Abandoning the purely documentary approaches to 3-D films, feature films began to appear in U.S. theaters, the first being "The Power of Love," which opened at the Ambassador Theater in Los Angeles on September 27, 1922, to favorable reviews.

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Throughout the 1920s and 1930s, filmmakers experimented with various 3-D systems. In addition to the "anaglyphs," there was the "Teleview" system in which each theater seat was equipped with motor-driven viewing devices synchronized with the projector, which alternately blocked the left and right eyes. The "parallax stereo-sphere," developed by the Russian Semyon Ivanov, projected double images on a specially constructed grid screen made up of 36,000 copper wires radiating in three directions. Although the expense of constructing the Ivanov screen was enormous, the system eliminated the need for glasses. Finally, the "Polarized" system began appearing in Europe in the late 1930s.

In 1932, while still an undergraduate at Harvard, Edwin H. Land developed a light-polarizing material that could be manufactured economically. The principle of "polarizing" filters had long been understood, but Land was the first to find a way to make polarizing material in quantity. Basically, the polarizing filter acts as a comb that allows light to pass through only if its waves are oriented in the same direction as the lines on the filter. Two filters placed across each other at right angles effectively block out all light. Polarizing filters could be made to do what anaglyph filters had done before: block out one of two images projected on a motion picture screen, with the added advantage that they caused no color distortion. Polarized light at last allowed the projection of full-color, three-dimensional films.

The polarization breakthrough was first exploited by German filmmakers in 1937. "You Can Nearly Touch It" (utilizing polarized viewers made by the Zeiss Company) became the first color 3-D feature
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(with sound). American filmmaker John Norling then followed with a 15-minute short about the construction of a Chrysler motor car which had a spectacular debut at the New York World's Fair in 1939.

The outbreak of World War II temporarily halted the expanding tide of three-dimensional films. Between 1939 and 1951, the "polarized filter" system was refined, but it wasn't until 1952 that a shrewd Hollywood showman engineered the first commercial film blockbuster to take advantage of "state of the art" 3-D technology.

Timing was everything for ex-radio writer turned film producer Arch Oboler. In 1952, the motion picture industry was battling television in an ever-expanding war for audiences. The public was staying home to watch the little magic box, and studio executives were growing desperate to fill their dwindling number of theaters. In stepped Oboler with a little jungle exploitation film called "Bwana Devil." The film, which co-starred Robert Stack and Barbara Britton (the ad lines read, "A lion in your lap! A lover in your arms!") was filmed in the "Natural Vision" process, a polarized system refined by Milton L. Gunzburg, his brother Julian, an eye specialist, and Friend Baker, a Hollywood camera engineer.

The novelty of good-quality 3-D presented in "Bwana Devil" was immediately accepted by an eager public. Though featuring a thin story line, the film was, nonetheless, a major boxoffice bonanza because of its extraordinary 3-D photography.

Thus, in the greatest revolution since the coming of sound, Hollywood began to make 3-D movies in earnest. Ironically, the 3-D revolution lasted just a little over a year. Between the end

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of 1952 and the beginning of 1954, over 100 features and short subjects were produced, utilizing the basic "polarized filter" film format. Some of the more memorable were "House of Wax," "Dial M for Murder," "Kiss Me Kate," "The Creature From the Black Lagoon," "The Charge at Feather River" and "It Came From Outer Space." However, most others were cheaply made exploitation films that did little to advance the artistic quality of 3-D. Once the audience got their taste of these travesties, the excitement of 3-D began to wane.

Coupled with the overall quality problems was a lack of creative control in projection. Since most of the films were run on twin projectors, there was a constant need to maintain synchronization of the twin images. Eyestrain would result once an image got out of sync. Unfamiliar with the new technology, many projectionists were incapable of projecting the film correctly. Simultaneously, exhibitors continually fought with the studios over the extra prices of specialty lenses, 3-D glasses and exorbitant sales commissions.

Disabled on two fronts, with bad product and bad publicity, the crowning blow to 3-D came when Twentieth Century-Fox debuted its wide-screen CinemaScope format. This system, which utilized a single lens attached to normal theater projectors, was touted as the real revolution in film technology. Taking the line of least resistance, the major studios abandoned their planned 3-D productions and began to produce their own variations of the wide-screen format. Many films shot in the two-camera 3-D format were released "flat," and by the mid-1950s 3-D was all but forgotten.

Since 1955, when Universal released the last of the initial wave of 3-D films, "Revenge of the Creature," there have been only
a handful of major 3-D film releases. In 1962, United Producers released the soft-core "The Bellboy and the Playgirls," which featured 3-D sequences in both the polarized and anaglyphic formats. (The director was a newcomer, Francis Ford Coppola.) In 1969, the fledgling Stereovision Company released another soft-core entry, "The Stewardesses," the most successful 3-D film of its time (it grossed $26 million). Other topical and mildly successful 3-D films of the 1960s and early 1970s include Arch Oboler's "Fantastic Invasion of Planet Earth" (1966), Andy Warhol's "Frankenstein" (1974), "Lollipop Girls in Hard Candy" (1976) and "Sea Dream," a remarkable documentary film completed in 1978 as part of a Marineland exhibit in Florida. (Ernest McNabb of "Spacehunter" helped design its camera system.)

Three-dimensional films received a shot in the arm in 1981 with "Comin' at Ya," a collage of 3-D effects produced by former Xerox salesmen Gene Quintano and Marshall Lupo and actor Tony Anthony. In their recent book, *Amazing 3-D*, writers Hal Morgan and Dan Symmes explain the source of "Comin' at Ya's" effect: "Every three minutes something is thrown at or dumped on the audience: beans, bats, arrows, even a baby half-way through a diaper change..."

Several of the mechanical problems that hampered 3-D films of the 1950s have been solved recently by the newly developed technology. Most importantly, 3-D films can now be screened on a single projector, eliminating the need for constant readjustment and synchronization. Like the CinemaScope films of the 1950s, theater owners need only use a single lens for 3-D conversion. Audiences must still use polarized glasses, but even the design
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of the glasses has been refined and improved, eliminating the threat of eye strain. In terms of camera technology, the work of Canadian Ernest McNabb has certainly benefited the cause of Columbia Pictures' entry in the 3-D race, "Spacehunter: Adventures in the Forbidden Zone." "State of the art" Panavision equipment can now be used in the 3-D system designed by McNabb. Additionally, special high-speed cameras can film space effects and miniatures in 3-D for the first time.

Repeating the same tired, uninteresting, exploitation elements that originally killed the 3-D films of the fifties, many of the recent three-dimensional films like "Parasite," "Friday the 13th, Part III" and "Treasure of the Four Crowns" have still proved profitable and popular among audiences searching for a new Saturday night thrill that will rescue them from their video games and mega-channel cable-TV.

How they will greet "Spacehunter," which emphasizes story over 3-D exploitation, will be determined on May 20, 1983. Another revolution could be waiting in the wings...

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A 3-D PRIMER: HOW THE McNABB SYSTEM WORKS

From the moment you open your eyes in the morning to that last yawning glimpse of your bedroom at night, a very efficient 3-D camera system is on the job—the human eyes. We view the world around us from two distinct, separate points of view approximately 2½ inches apart, known as the inter-ocular distance. In normal vision, our brain continually fuses those two images into one; the result: depth perception and the 3-D effect. To visualize and thereby understand this concept, simply place your index finger in front of your face and alternately close and open each eye. You will see the finger move in front of you, establishing that each eye sees it from a different point of view.

WE VIEW THE WORLD FROM TWO POINTS OF VIEW 2½” APART
(THE DISTANCE BETWEEN THE LEFT AND RIGHT EYES IS CALLED THE INTEROCULAR DISTANCE)

The 3-D filmmakers' challenge has always been to duplicate the efficiency of the human eye and create a workable, very natural 3-D camera and projection system. The McNabb system, engineered and refined by Ernest McNabb of the National Film Board of Canada, accomplishes that task by utilizing a two-camera system.

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Logically, to achieve a three-dimensional image on film, the cameras would have to be placed next to each other, shooting straight ahead at an image from two separate points of view. Unfortunately, it is impossible for two modern Panavision camera lenses to be physically placed within 2 1/2 inches of each other.

To compensate for this, McNabb introduced a mirror (known as a "beamsplitter") to the process. The right camera shoots through the slanted mirror, while the left camera (placed at a 90-degree angle) shoots the image reflected in the mirror (see below). A camera technician then adjusts the "interaxial," the distance between the two lenses, to correspond to the inter-ocular distance of the human eyes.

Two images are recorded simultaneously, using this system. Although there now exist one-camera systems (using two lenses in the same camera), McNabb strongly feels that a system making use of Panavision equipment is best because of the quality and variety of their lenses, and the fact that most camera crews are already familiar with the Panavision system.

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In the McNabb system, two cameras run continuously, exposing two separate negatives. Once filming is completed, the left and right camera perspectives, from the two separate negatives, are optically combined in a single strip of film.

Why one strip? This simplifies the process for projection purposes. In the 1950s, when 3-D films were first introduced to the mass market, theater projectionists were forced to employ two projectors simultaneously, screening two separate film strips. Synchronization problems occurred and too often the image was not projected correctly. Audiences began to complain of eye strain and headaches, problems that doomed 3-D films at the time. The one-projector system, with its "over and under" single-film strip, eliminates synchronization problems.

Once the double image is printed onto a single strip of film, polarizing filters are used to create the 3-D effect. One polarizing filter is attached to the projector, and another is provided to each theater patron in the form of 3-D glasses.
Polarization, a process developed by Edwin Land in the 1930s, effectively separates two images. With polarized glasses, your left eye sees only the left-eye image, while your right eye sees only the right-eye image. Together, you see the two individual images, your brain fusing them into one 3-D portrait—just like normal vision.
WE VIEW THE WORLD FROM TWO POINTS OF VIEW 2 1/2" APART
(THE DISTANCE BETWEEN THE LEFT AND RIGHT EYES IS CALLED THE INTEROCULAR DISTANCE)

TWO CAMERAS SHOOT FROM TWO POINTS OF VIEW WITH THE SAME INTEROCULAR (2 1/2") AS THE HUMAN EYES

THE LEFT AND RIGHT EYES ARE COMBINED "OVER & UNDER" ON ONE FILM FOR PROJECTION

THE TWO "EYES" ARE PROJECTED SIMULTANEOUSLY THROUGH A SPECIAL LENS THAT IS POLARIZED

POLARIZATION SEPARATES THE TWO IMAGES LIKE VENETIAN BLINDS

ONE HORIZONTALLY

THE OTHER VERTICALLY

THE GLASSES ARE ENCODED THROUGH POLARIZATION TO SEPARATE THE TWO IMAGES, SO THAT EACH EYE RECEIVES THE PROPER IMAGE.

= 3-D
'SPACEHUNTER' 3-D FILMMAKING:
A BEHIND-THE-SCENES GLIMPSE

The first impression of the McNabb 3-D Camera System is of enormous size. Enclosed in a giant box-shaped stainless steel cabinet, the twin Panavision cameras face each other at 90-degree angles, one camera shooting straight ahead through a beam-splitting mirror, the other shooting into a mirror—right to left. During filming, black curtains attached to the cabinet by velcro strips shut out all unnecessary light.

On the set of "Spacehunter: Adventures in the Forbidden Zone," there were two McNabb camera systems in operation at all times. Two systems, four cameras, four strips of film, two distinct camera teams and a lot of technical activity. Despite 3-D consultant Ernest McNabb’s expertise, the first few weeks were still a learning experience for practically everyone associated with the film.

Peter Strauss and Molly Ringwald star in "Spacehunter: Adventures in the Forbidden Zone," an Ivan Reitman Production of a Lamont Johnson Film, produced by Don Carmody, John Dunning and Andre Link. Answering a galactic distress signal, two space tramps join forces to search for a trio of space maidens marooned on the plague-ravaged planet Terra Eleven. Co-starring Ernie Hudson, Andrea Marcovicci and Michael Ironside, this thrilling 3-D saga is directed by Lamont Johnson. The screenplay is by Edith Rey & David Preston and Dan Goldberg & Len Blum, and is based on a story by Stewart Harding and Jean Lafleur.

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Lessons were given in the adjustment of the inter-axial (the
distance between the two cameras), and the need for proper con-
vergence (the point at which both lenses meet). Camera assistants
were told how important it was to keep the beamsplitter mirror
perfectly clean at all times. It was also vitally important for
each camera to be in synchronization. Main camera operator Ron
Orieux was overjoyed to discover that he would only have to look
through one camera viewfinder (the right eye). The left eye was
always synchronized and checked, but all action would transpire
in the right-eye camera. In this way, Orieux could crank normally,
following the action without additional worries. The obvious prob-
lem in cranking through the left-eye viewfinder was the fact that
the camera operator would be looking into a mirror, with all the
action appearing to be happening backwards.

The size of the McNabb system eliminated a great deal of camera
mobility. There is no such thing as a hand-held shot in "Spacehunter."
Given its dimensions and 200-pound weight, four camera assistants
were needed to carry the McNabb rig from one setup to the next.

As explained by McNabb, 3-D filmmaking is at times a psycho-
logical process. The director, cinematographer, camera operator
and film editor have to do their homework. Otherwise, jarring eye
strain can result. Says cinematographer Frank Tidy, "When you're
dealing with camera convergence and inter-axial adjustment, you're
basically trying to reduce the amount of work your eyes do. Camera
movement is very important. You can't cut from a closeup to a wide
vista; it will immediately confuse the brain. We have to work with
natural vision limits. Eyestrain can result when shots are not
planned carefully."

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Despite some limitations, 3-D photography is quite natural, and stunning. The screen actually disappears during the course of the film and certain scenes invite you to step right into the picture and join the actors. In their strategic plan, director Lamont Johnson and producers Ivan Reitman and Don Carmody decided to avoid the typically exploitive elements normally associated with 3-D films. In "Spacehunter," spears do not come flying out of the screen every five minutes. When dimensional effects occur outwardly, they do so in a natural fashion. Wolff swings a gun past the camera, a battle trike comes roaring towards the audience, a Scavenger extends an arm towards the screen.

In spite of all the precautions and careful handling, problems occurred daily on the "Spacehunter" set. An explosion triggered by the special effects department during a key battle scene came too close to one of the cameras, splattering the mirror with debris. Nearly two hours were spent cleaning the mirror, with crew members praying it would not have to be replaced. Cinematographer Frank Tidy was continually plagued by the unusual lighting patterns required by the film. Early sequences in the film were deemed too dark and murky and plans were laid to create brighter shots.

Tidy, who worked with Ridley Scott on the film, "The Duellists," was not intimidated by the 3-D process. From the beginning, he accepted 3-D as an entirely natural method, derivative of the old front-projection process which also involved a beamsplitter. Familiar with the latter system from his early days in the film business, Tidy was immediately comfortable on the "Spacehunter" set, acting as a stabilizing influence during the frantic early days of the shoot.

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