

HOLOGRAPHY: TECHNOLOGY AND ART

20 MAY - ¹⁰/₇ JULY, 1977

GALLERY 1134

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DIRECTOR,
GALLERY 1134

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May, 1977

HOLOGRAPHY

HOLD- /hō-lō-/ COMB FORM (ME, FR. OF, FR. L, FR. GK, FR. *holos* WHOLE): COMPLETE.

-GRAPHY /g-ra-fē/ n COMB FORM (L -GRAPHIA, FR. GK, FR. *graphein*): WRITING OR REPRESENTATION IN A (COMPLETE) MANNER OR BY A (COMPLETE) MEANS.

ORIGINALLY CONCEIVED BY DR. DENNIS GABOR IN 1947 AT THE RUGBY ELECTRICAL CO., SCOTLAND. FIRST PROPOSED AS A METHOD OF IMPROVING ELECTRON-MICROSCOPY.

A HOLOGRAM IS A COMPLETE REPRESENTATION, RECORDING THE FULL DEPTH QUALITIES AS WELL AS THE RELATIVE BRIGHTNESS OF A SCENE.

LASER

LASER//lā-zər/ n *Light Amplification by Stimulated Emission of Radiation:*

A DEVICE THAT UTILIZES THE NATURAL OSCILLATIONS OF ATOMS FOR AMPLIFYING OR GENERATING ELECTROMAGNETIC WAVES IN THE VISIBLE REGION OF THE SPECTRUM.

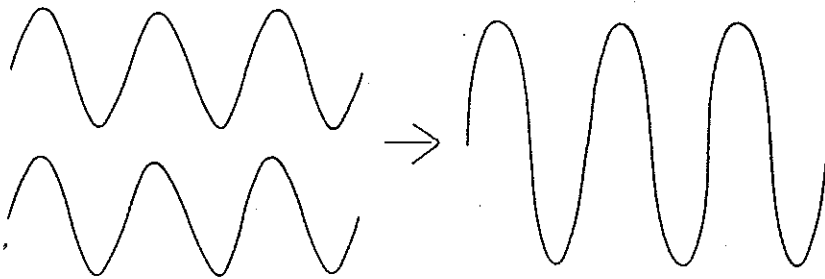
A SOURCE OF LIGHT WHICH IS FREQUENCY COHERENT (MONOCHROMATIC, ALL WAVES ARE THE SAME LENGTH), SPATIALLY COHERENT (UNIPHASE, ALL WAVES ARE IN STEP), AND COLLIMATED (PARALLEL, IN A TIGHT BEAM).

FIRST OPERATING LASER REALIZED IN 1960 BY DR. THEODORE H. MAIMAN AT HUGHES AIRCRAFT CO., CALIFORNIA. MADE PRACTICAL OPTICAL HOLOGRAPHY POSSIBLE.

INTERFERENCE

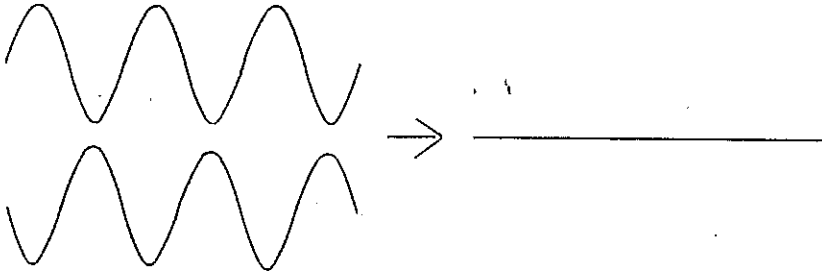
A HOLOGRAM IS A PHOTOGRAPHIC RECORD OF INTERFERENCE BETWEEN COHERENT LIGHT WAVES (BEAMS) FROM TWO DIFFERENT SOURCES: A REFERENCE BEAM (CARRIER WAVE) AND OBJECT BEAM (SIGNAL, IMAGE).

WHEN WAVES INTERFERE IN PHASE (I.E. CREST TO CREST OR TROUGH TO TROUGH) CONSTRUCTIVE INTERFERENCE OCCURS. THIS FORMS A COMPOSITE EFFECT EQUAL TO THE SUM OF THE COMPONENT WAVES.



CONSTRUCTIVE INTERFERENCE

WAVES OUT OF PHASE (I.E. CREST TO TROUGH AND VICE VERSA) CREATE DESTRUCTIVE INTERFERENCE. THIS NEGATES THE EFFECT OF THE COMPONENTS.



DESTRUCTIVE INTERFERENCE

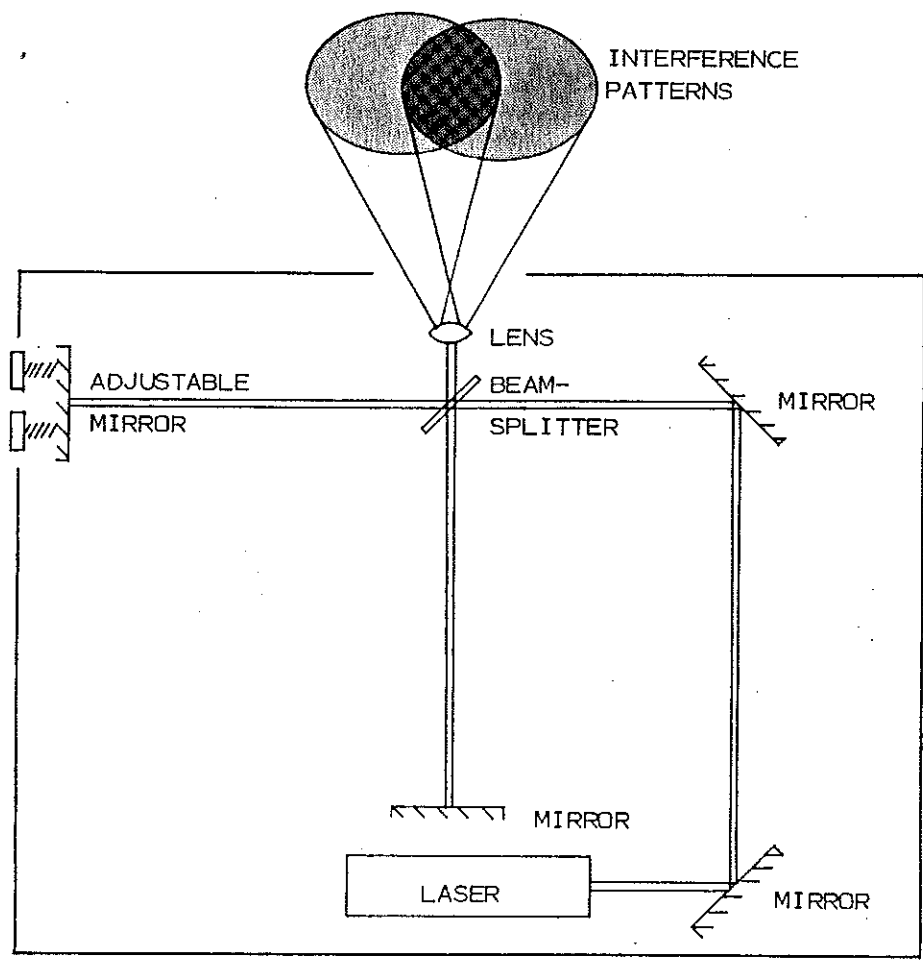
CONSTRUCTIVE INTERFERENCE EXPOSES THE FILM WHILE DESTRUCTIVE INTERFERENCE LEAVES IT BLANK. A HOLOGRAM IS THE COMPLETE RECORD OF ALL LIGHT FROM THE OBJECT AS IT INTERFERES WITH THE REFERENCE BEAM.

VISIBLE INTERFERENCE PATTERNS

IN THIS DEMONSTRATION THE INTERFERENCE OF TWO WAVEFRONTS OF COHERENT LIGHT CAN BE SHOWN TO PRODUCE VISIBLE INTERFERENCE "FRINGES."

THE COHERENT LIGHT FROM ONE LASER IS SPLIT INTO TWO PARTS WHICH FOLLOW SEPARATE PATHS. WHEN RECOMBINED AND SPREAD BY A LENS, CONSTRUCTIVE INTERFERENCE CAN BE SEEN AS BANDS OF LIGHT AND DARK.

BY ADJUSTING THE TWO EXPOSED SCREWS ON ONE MIRROR, THE PATH OF ONE WAVEFRONT IS ALTERED TO FORM OBSERVABLE CHANGE IN THE INTERFERENCE PATTERNS.

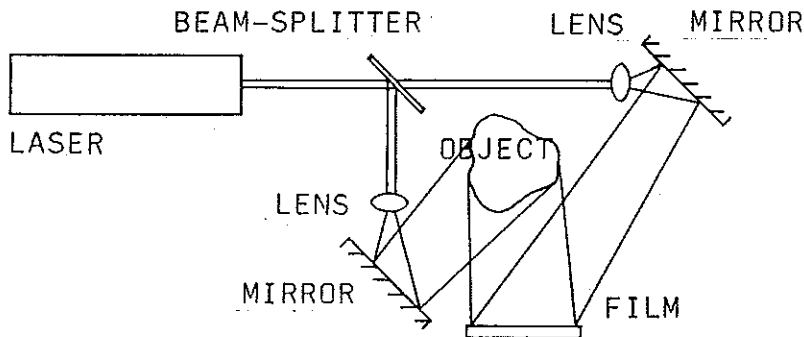


TRANSMISSION HOLOGRAM

THE "CLASSICAL HOLOGRAM" (C. 1962). FIRST REALIZED WITH LASER LIGHT BY EMMETT LEITH AND JURIS UPATNIEKS AT THE UNIVERSITY OF MICHIGAN.

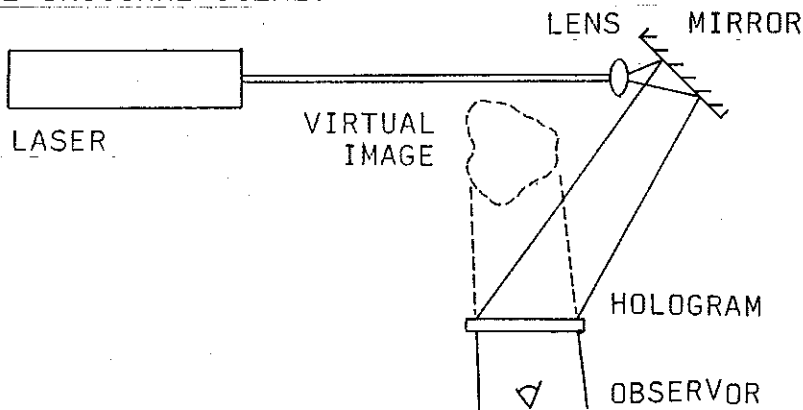
CREATED BY FORMING INTERFERENCE PATTERNS BETWEEN OBJECT AND REFERENCE WAVES FROM THE SAME SIDE OF THE FILM.

A BEAM-SPLITTER (PARTIALLY REFLECTING, PARTIALLY TRANSMITTING MIRROR) IS USED TO CREATE THE TWO BEAMS FROM ONE LASER. LIGHT IS SPREAD BY LENSES TO ILLUMINATE OBJECTS AND FILM, AND FRONT SURFACED MIRRORS DIRECT THE BEAMS.



TRANSMISSION HOLOGRAM CONSTRUCTION

THE DEVELOPED HOLOGRAM IS ILLUMINATED BY THE REFERENCE BEAM ALONE, AND DIFFRACTS (BENDS) THE LIGHT AS THOUGH IT WERE EMANATING FROM THE ORIGINAL SCENE. THIS VIRTUAL IMAGE APPEARS IN CORRECT SIZE AND RELATIVE POSITION TO THE FILM, RETAINING ALL THE OPTICAL PROPERTIES OF THE ORIGINAL SCENE.



VIRTUAL IMAGE RECONSTRUCTION

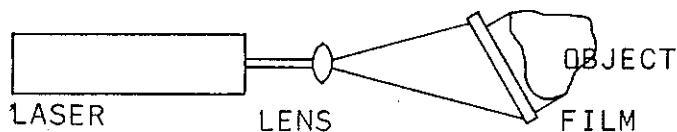


"WHITE-LIGHT" REFLECTION HOLOGRAM

WIDELY USED AS IT CAN BE VIEWED UNDER ORDINARY WHITE LIGHT FROM A POINT SOURCE (SUN, SPOT LIGHT). FIRST REALIZED BY Y. N. DENISYUK OF THE U.S.S.R.

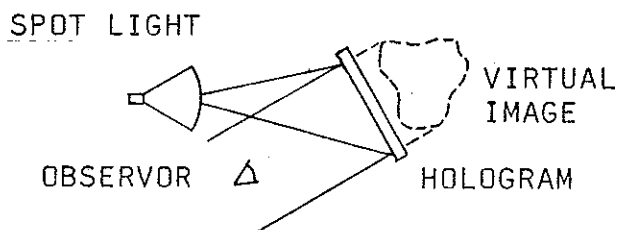
INTERFERENCE PATTERNS ARE FORMED BETWEEN OBJECT AND REFERENCE BEAMS FROM OPPOSITE SIDES OF THE FILM.

SIMPLE ONE-BEAM REFLECTION HOLOGRAMS ARE CONSTRUCTED BY SPREADING THE LASER LIGHT WITH A LENS, SHINING IT DIRECTLY ONTO THE FILM (AS REFERENCE BEAM) WHILE PASSING THROUGH THE TRANSPARENT FILM TO ILLUMINATE THE OBJECT AND RETURN TO THE FILM (AS OBJECT BEAM).



REFLECTION HOLOGRAM CONSTRUCTION

ILLUMINATING THE DEVELOPED HOLOGRAM WITH A POINT SOURCE OF WHITE LIGHT FROM THE SAME ANGLE AS THE ORIGINAL REFERENCE BEAM RECONSTRUCTS THE IMAGE.



VIRTUAL IMAGE RECONSTRUCTION

WHITE-LIGHT "RAINBOW" TRANSMISSION HOLOGRAM

A MAJOR CONTRIBUTION IN MAKING HOLOGRAMS MORE EASILY VIEWED. THIS TECHNIQUE WAS DEVELOPED BY DR. STEPHEN BENTON OF POLAROID CORP. IN 1968.

BY ILLUMINATING THE FILM WITH ONLY A SLIT OF REFERENCE LIGHT AN OTHERWISE NORMAL TRANSMISSION HOLOGRAM IS FORMED. WHEN VIEWED WITH ANY POINT SOURCE OF WHITE LIGHT (SUN, INCANDESCENT BULB, CANDLELIGHT) THE WHITE LIGHT IS DIFFRACTED INTO ITS COLOR COMPONENTS (AS THOUGH BY A PRISM) RECONSTRUCTING THE IMAGE.

MULTIPLEX HOLOGRAM OR "INTEGRAM"

INTEGRATING SEVERAL TECHNIQUES, THIS METHOD TRANSDUCES MOTION PICTURE FOOTAGE CIRCUMSCRIBING A SCENE INTO A STEREOSCOPIC 3-D IMAGE. THIS TECHNIQUE ALLOWS THE USE OF MOVING SUBJECTS ILLUMINATED BY ANY LIGHT AND CAN EMPLOY ANY STANDARD CINEMATOGRAPHIC EFFECT. COMPUTER GENERATED FILMS CAN BE USED AS THE IMAGE SOURCE, CREATING THREE-DIMENSIONAL MOTION IMAGES OF SCENES WHICH DO NOT ACTUALLY EXIST.

A SELECTED CHRONOLOGY OF HOLOGRAPHY

- 1947 - DR. DENNIS GABOR, A RESEARCH ENGINEER AT THE RUGBY ELECTRICAL CO. IN SCOTLAND, CONCEIVES THE THEORY OF A TECHNIQUE TO USE COHERENT LIGHT TO IMPROVE THE RESOLUTION OF ELECTRON MICROSCOPE IMAGES.
- 1948 - GABOR MAKES THE FIRST HOLOGRAM, IN "IN-LINE" TRANSMISSION TYPE, USING A FILTERED MERCURY ARC LAMP AS A LIGHT SOURCE.
- 1949/
1959 - ALTHOUGH LIMITED IN THEIR INVESTIGATIONS BY THE LACK OF A COHERENT LIGHT SOURCE, SEVERAL SCIENTISTS IN THE U.S.A. AND U.K. CONTINUE TO INVESTIGATE HOLOGRAPHY. AMONG THEM: ALBERT BAEZ, JAMES DYSON, H.M.A. EL-SUM, MICHAEL E. HAINE, PAUL KIRKPATRICK, EMMETT LEITH, T. MULVEY, GORDON ROGERS, AND GEORGE W. STROKE.
- THE THEORETICAL CONCEPTS FOR THE LASER ARE DEVELOPED INDEPENDENTLY BY DR. CHARLES H. TOWNES OF THE U.S.A. AND A.M. PROKOROV AND N. BASOV OF THE U.S.S.R. IN 1964 THEY BECOME THE JOINT RECIPIENTS OF THE NOBEL PRIZE IN PHYSICS
- 1960 - THE FIRST OPERATING LASER, A PULSED RUBY TUBE, IS CONSTRUCTED BY DR. THEODORE MAIMAN AT THE HUGHES AIRCRAFT CO. RESEARCH LABORATORIES IN CALIFORNIA.
- 1961 - TRION INSTRUMENTS INC., FOUNDED BY LLOYD CROSS, SELLS THE FIRST COMMERCIALY PRODUCED LASER TO TEXAS INSTRUMENTS.
- Y.N. DENISYUK OF THE U.S.S.R. DEVELOPS WHITE-LIGHT REFLECTION HOLOGRAPHY.
- 1962 - LEITH AND JURIS UPATNIEKS AT THE UNIVERSITY OF MICHIGAN UTILIZE AN OFF-AXIS RADAR IMAGING TECHNIQUE WITH A LASER LIGHT SOURCE TO CREATE OFF-AXIS TRANSMISSION HOLOGRAMS.
- 1965 - STROKE AND HIS COLLEAGUES AT THE STATE UNIVERSITY OF NEW YORK FURTHER DEVELOP AND PROMOTE DENISYUK'S REFLECTION HOLOGRAM TECHNIQUE.
- 1966 - DR. TUNG H. JEONG OF LAKE FOREST COLLEGE DEVELOPS THE 360° CYLINDRICAL HOLOGRAM.
- L.D. SIEBERT OF THE CONDUCTRON CORP. USES A PULSE LASER TO CREATE THE FIRST HOLOGRAM OF A HUMAN SUBJECT.

- 1967 - T.A. SHANKOFF AND KEITH PENNINGTON OF BELL LABORATORIES AT MURRAY HILL, N.J. DEVELOP DICHROMATED GELATIN AS A RECORDING MEDIUM FOR HOLOGRAPHY.
 - THE FIRST OF MANY HOLOGRAPHIC MOVIE SYSTEMS ARE DEVELOPED BY IBM, TRW, BELL LABS, AND OTHERS.
- 1968 - DR. STEPHEN BENTON OF THE POLAROID CORP. DEVELOPS THE WHITE-LIGHT "RAINBOW" HOLOGRAM. THIS TECHNIQUE MAKES THE DISPLAY OF HOLOGRAMS EASIER AS ANY POINT WHITE LIGHT SOURCE, EVEN CANDLELIGHT, CAN BE USED.
- 1970 - THE FIRST SHOW OF HOLOGRAPHY IN AN ART CONTEXT IS HELD AT THE CRANBROOK ACADEMY OF ART.
- 1971 - GABOR IS AWARDED THE NOBEL PRIZE IN PHYSICS FOR HIS DISCOVERY OF THE PRINCIPLE OF HOLOGRAPHY.
 - THE FIRST SCHOOL OF HOLOGRAPHY OPENS IN SAN FRANCISCO UNDER THE DIRECTION OF CROSS.
- 1972 - CROSS AND DAVE SCHMIDT DEVELOP INTEGRAL HOLOGRAPHY INTO THE MULTIPLEX HOLOGRAM, CREATING THE FIRST PRACTICAL TECHNIQUE OF INTEGRATING MOTION INTO HOLOGRAPHY, AND FORM THE MULTIPLEX CO. FACILITY.
- 1973 - JEONG AND HAL SNYDER AT LAKE FOREST MAKE THE FIRST INTEGRAM OF A COMPUTER GENERATED FILM. THIS IS ALSO THE FIRST CONTINUOUS INTEGRAM OF A SCENE GREATER THAN 360°.
- 1974 - BENTON INVENTS A NEW DEVELOPING TECHNIQUE FOR REFLECTION HOLOGRAMS THAT IMPROVES RESOLUTION AND IMAGE BRIGHTNESS.
- 1975 - BENTON MODIFIES THE WHITE-LIGHT TRANSMISSION TECHNIQUE TO MAKE ACHROMATIC (BLACK AND WHITE) IMAGES.
- 1976 - THE MUSEUM OF HOLOGRAPHY IS GRANTED A CHARTER BY THE STATE OF NEW YORK AND OPENS IN NEW YORK CITY UNDER THE DIRECTION OF ROSEMARY JACKSON.
 - N.I.K.F.I. SCIENTISTS IN THE SOVIET UNION DEMONSTRATE A MASS AUDIENCE HOLOGRAPHIC MOTION PICTURE SYSTEM, SHOWN DURING THE XII CONGRESS OF UNIA TEK IN MOSCOW.

EXHIBITORS

PORTRAIT OF DENNIS GABOR

R. RHINEHAART

TRANSMISSION HOLOGRAM: 1971

FACILITY: MCDONNELL DOUGLAS ELECTRONICS CO.,
ST. CHARLES, MISSOURI

COLLECTION: COOPER-HEWITT MUSEUM OF DESIGN,
SMITHSONIAN INSTITUTION, WASHINGTON, D.C.

THIS PORTRAIT OF HOLOGRAPHY'S INVENTOR WAS MADE POSSIBLE WITH A PULSE LASER. THE SHORT BURST OR PULSE ACTS TO RECORD OR "FREEZE" A MOVING HUMAN SUBJECT MUCH AS A FLASH FREEZES MOTION IN CONVENTIONAL PHOTOGRAPHY.

TRAINS

E.R.I.M. SCIENTISTS

TRANSMISSION HOLOGRAM: 1976

RESEARCH

FACILITY: ENVIRONMENTAL INSTITUTE OF MICHIGAN,
ANN ARBOR, MICHIGAN

COLLECTION: E.R.I.M.

FROM THE LAB OF JURIS UPATNIEKS AND EMMETT LEITH, DEVELOPERS OF THE OFF-AXIS TRANSMISSION HOLOGRAM IN 1962. A FINE EXAMPLE OF THE INCOMPARABLE RESOLUTION, BRIGHTNESS, AND DEPTH OF THE "CLASSICAL" HOLOGRAM.

A

"TIME AND SPACE"

DR. TUNG H. JEONG

TRANSMISSION HOLOGRAM: 1968

FACILITY: LAKE FOREST COLLEGE, LAKE FOREST, ILLINOIS

COLLECTION: U.S. GOVERNMENT, VETERANS ADMINISTRATION

INTERFEROGRAM

DR. TUNG H. JEONG

INTERFEROMETRIC TRANSMISSION HOLOGRAM: 1971

FACILITY: LAKE FOREST COLLEGE, LAKE FOREST, ILLINOIS

COLLECTION: DR. TUNG H. JEONG

HOLOGRAPHIC INTERFEROMETRY OR "HOLOMETRY". CREATED BY EXPOSING THE FILM ONCE, STOPPING THE EXPOSURE, STRESSING THE OBJECT (HERE BY TIGHTENING THE SCREW), AND EXPOSING AGAIN. MICROSCOPIC DEFORMATIONS IN THE OBJECT APPEAR AS DARK LINES OR "FRINGES". THIS TECHNIQUE HAS BECOME HOLOGRAPHY'S GREATEST PRACTICAL ENGINEERING APPLICATION.

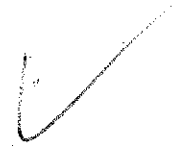
HORSE

DR. TUNG H. JEONG

CYLINDRICAL TRANSMISSION HOLOGRAM: 1966

FACILITY: LAKE FOREST COLLEGE, LAKE FOREST, ILLINOIS

COLLECTION: DR. TUNG H. JEONG



ONE OF THE FIRST 360° SINGLE EXPOSURE HOLOGRAMS BY THE INVENTOR OF THAT TECHNIQUE.

CATHEDRAL

DR. TUNG H. JEONG
AND HAL SNYDER

COMPUTER GENERATED INTEGRAL HOLOGRAM: 1973

FIRST CONTINUOUS INTEGRAL HOLOGRAM OF A SCENE GREATER THAN A 360° LOOP. FIRST "INTEGRAM" FROM A COMPUTER GENERATED FILM (FROM LOS ALAMOS SCIENTIFIC LABORATORIES.)

"SEE NO EVIL, HEAR NO EVIL, SPEAK NO EVIL" (CHILDREN)

DR. TUNG H. JEONG

MULTIPLEX HOLOGRAM: 1974

THE MULTIPLEX HOLOGRAM COMBINED SEVERAL TECHNIQUES TO ALLOW THE INCLUSION OF MOVING SUBJECTS, IN A CYLINDRICAL FORMAT, TO BE VIEWED WITH WHITE-LIGHT. THE HOLOGRAM IS MADE FROM STANDARD 16MM MOTION PICTURE FOOTAGE TAKEN PANNING AROUND THE SUBJECT.

LION

N.I.K.F.I. SCIENTISTS

REFLECTION HOLOGRAM: 1977

FACILITY: CINEMA AND PHOTOGRAPHIC RESEARCH INSTITUTE (N.I.K.F.I.); MOSCOW, U.S.S.R.

A PRIME EXAMPLE OF THE WHITE-LIGHT REFLECTION TYPE HOLOGRAM FIRST DEVELOPED BY Y.N. DENISYUK (OF THE U.S.S.R.). NOTABLE FOR THE SUPERB RESOLUTION, BRIGHTNESS, AND DEPTH OF SOVIET HOLOGRAPHIC FILM, AND THE USE OF A PROJECTED "PSEUDOSCOPIC" IMAGE IN FRONT OF THE FILM.

(15)

RUSSIAN JEWELRY

N.I.K.F.I. SCIENTISTS

REFLECTION HOLOGRAM: 1976

FACILITY: CINEMA AND PHOTOGRAPHIC RESEARCH INSTITUTE

COLLECTION: DR. TUNG H. JEONG

HOLOGRAPHIC MOVIE FRAMES

N.I.K.F.I. SCIENTISTS

TRANSMISSION MOVIE FRAMES: 1977

FACILITY: CINEMA AND PHOTOGRAPHIC RESEARCH INSTITUTE

COLLECTION: DR. TUNG H. JEONG

3 FRAMES FROM A CONTINUOUS HOLOGRAPHIC MOVIE. THESE FRAMES, RECORDED AND PROJECTED WITH A PULSE LASER, ARE THE IMAGE PORTION OF A COMPLEX OPTICAL SYSTEM TO PROJECT THE TRUE THREE DIMENSIONAL MOTION PICTURE INTO THE REAL SPACE OF A MASS AUDIENCE.

ENGINE # 9

WILL WALTER AND
DR. STEPHEN A. BENTON

REFLECTION HOLOGRAM: 1976

FACILITY: POLAROID RESEARCH LABS, CAMBRIDGE, MASS.

COLLECTION: DR. STEPHEN A. BENTON

AN EXAMPLE OF THE RESOLUTION, BRIGHTNESS, AND DEPTH
(IN FRONT OF AND BEHIND THE PLATE) POSSIBLE WITH THE
WHITE-LIGHT REFLECTION TYPE HOLOGRAM.

HOLOGRAPHY

DR. STEPHEN A. BENTON

WHITE-LIGHT TRANSMISSION HOLOGRAM: 1975

FACILITY: POLAROID RESEARCH LABS, CAMBRIDGE, MASS.

COLLECTION: DR. STEPHEN A. BENTON

ONE OF THE FIRST AND BEST ILLUSTRATIONS OF THE "RAINBOW"
HOLOGRAM FROM THE LAB WHERE IS WAS DEVELOPED IN 1968.

PORTRAIT OF PUM III

WILL WALTER

ACHROMATIC WHITE-LIGHT TRANSMISSION HOLOGRAM: 1976

FACILITY: POLAROID RESEARCH LABS, CAMBRIDGE, MASS.

COLLECTION: WILL WALTER

AN ATTEMPT TO CREATE AN "ACHROMATIC" (BLACK AND WHITE) IMAGE RECONSTRUCTED WITH WHITE LIGHT. AN EXCELLENT EXAMPLE OF HOLOGRAPHY AS ARCHIVAL DOCUMENTATION OF THREE DIMENSIONAL SUBJECTS.

LITTLE WATCHES AND WATCH PARTS

RICK RALLISON

DICHROMATE REFLECTION HOLOGRAM: 1976

FACILITY: ELECTRIC UMBRELLA, INC., SALT LAKE CITY, UTAH

COLLECTION: MUSEUM OF HOLOGRAPHY, NEW YORK, NEW YORK

ANOTHER FILM EMULSION TO PRODUCE HIGH RESOLUTION, BRIGHT REFLECTION HOLOGRAMS WHICH CAN BE VIEWED BY ALMOST ANY LIGHT.

⁶
DRAKULA

LEE LACY

MULTIPLEX HOLOGRAM: 1977

FACILITY: MULTIPLEX CORP., SAN FRANCISCO, CALIFORNIA

COLLECTION: LEE LACY

MIKE ROYKO

LEE LACY

MULTIPLEX HOLOGRAM: 1977

FACILITY: MULTIPLEX CORP., SAN FRANCISCO, CALIFORNIA

COLLECTION: GALLERY 1134

NOTES ON HOLOGRAPHY AS A WAY TO ART

"HALF OR MORE OF THE BEST NEW WORK IN THE LAST FEW YEARS HAS BEEN NEITHER PAINTING OR SCULPTURE."

DONALD JUDD

THIS PROVOCATIVE COMMENT BY ONE OF AMERICA'S MOST NOTED SCULPTORS AND CRITICS HAS TWO IMPORTANT IMPLICATIONS TO HOLOGRAPHY AS LEGITIMATE ART ACTIVITY. FIRST, IT ACKNOWLEDGES THE SHIFT IN INTEREST TO THE USE OF MEDIA OTHER THAN THE TWO MOST ACCEPTED TRADITIONS. BUT PERHAPS MORE IMPORTANTLY IT SUGGESTS THAT THE IDEAS OF ART HAVE BECOME AS OR MORE SIGNIFICANT THAN FORMAL CONCERNS. THIS IS NOT TO SAY THAT HOLOGRAPHY HAS ARISEN AS THE CUTTING EDGE OF SIGNIFICANT NEW CONCEPT-ORIENTED INVESTIGATIONS (OR THAT IT SHOULD EXCLUSIVELY.) HOWEVER, HOLOGRAPHY NOT ONLY BEARS FUNCTIONAL SIMILARITIES TO EXISTING MEDIA, BUT CARRIES THE POTENTIAL FOR NOVEL CONTRIBUTIONS TO THE FUNCTIONS OF THE VISUAL ARTS.

MANY INTERESTING PARALLELS EXIST BETWEEN THE HISTORIC DEVELOPMENTS OF PHOTOGRAPHY AND HOLOGRAPHY. AT THE PURELY TECHNICAL LEVEL, THE PROBLEM OF DEVELOPING A FILM ADEQUATE TO RESOLVE AN ILLUMINATED SCENE IS IN COMMON. THE ALL-DAY EXPOSURE OF NICÉPHORE NIÉPCE'S COURTYARD IS ONE MOST HOLOGRAPHERS CAN IDENTIFY WITH. THE HIGH RESOLUTION SILVER HALIDE FILMS IN WIDEST USE FOR HOLOGRAPHY WERE ORIGINALLY DESIGNED FOR OTHER SCIENTIFIC APPLICATIONS, AND HAVE AN ASA OF .02 !

A FURTHER SIMILARITY IN UTILIZING THESE MEDIA IN AN ART CONTEXT IS THE SELECTION OF SUBJECT MATTER. PIONEERS OF BOTH PROCESSES HAVE INITIALLY SELECTED SUBJECTS BECAUSE THEY CAN BE ADEQUATELY ILLUMINATED. BUT IT HAS ALSO BEEN IMPORTANT TO SELECT IMAGERY WHICH COULD BE ACCEPTED AS PART OF AN EXISTING PICTORIAL TRADITION. MARGARET BENYON, ONE OF THE FIRST ARTISTS TO PURSUE HOLOGRAPHY, RECOGNIZED THIS PROBLEM. "MY INTENTION IN THE STILL-LIFES WAS TO PROVIDE THE VIEWER WITH IMAGES OF FAMILIAR OBJECTS, IN ORDER TO PRESENT THE 3D PROPERTIES OF HOLOGRAMS IN A COMMONLY KNOWN ART GENRE, WITHOUT THE ENCUMBRANCE OF NEW IDEAS."

OTHER ARTISTS HAVE MADE MORE SUCCESSFUL REFERENCE TO THIS PROBLEM. MICHAEL SOWDON HAS MADE ONE SUCH ATTEMPT IN HIS "BREAKFAST OF CHAMPIONS"; A STANDARD SIZED COLLECTION OF CUTLERY AND COMMON TABLE IMPLEMENTS ARE PRESENTED WITH AN OVERSIZED OSTRICH EGG. HERE, THE INTENSE REALISM OF A BANAL COLLECTION OF OBJECTS (IN ALL THEIR 3D SPLENDOR) IS JUXTAPOSED WITH A DISTURBING SCALE REFERENCE.

THE INCLUSION OF HUMAN SUBJECTS HAS POSED MAJOR TECHNICAL PROBLEMS FOR THE HOLOGRAPHER, SINCE EVEN THE MOST MINUTE MICRO-MOLECULAR MOVEMENT OF ANY SUBJECT DESTROYS THE IMAGE. THE PULSE LASER, COMPARABLE TO A STROBOSCOPIC FLASH, ALLOWS THE USE OF LIVE MODELS BUT IS AN EXPENSIVE AND COMPLEX PIECE OF EQUIPMENT. THE DESIRE TO INTEGRATE MOTION INTO HOLOGRAMS PROVIDED ONE SOLUTION. THE INTEGRAM AND MULTIPLEX HOLOGRAM ALLOWS STANDARD MOTION PICTURE FOOTAGE MADE BY PANNING AROUND A SUBJECT TO BE PROCESSED INTO A CONTINUOUS STRIP OF HOLOGRAMS, EMPLOYING THE PRINCIPLE OF EARLY PERSISTENCE OF VISION MACHINES (PRIMARILY THE ZOETROPE) AND STEREO OPTICS. WITH THIS TECHNIQUE, NOT ONLY CAN ALL STANDARD CINEMATOGRAPHIC EFFECTS (ZOOMS, DISSOLVES, MASKS, ETC.) BE ACCOMODATED, BUT A NEW RANGE OF SUBJECTS CAN BE INCLUDED: LIVE MODELS, OUTDOOR SCENES, AND, IN SHORT, ANYTHING THAT CAN BE FILMED AROUND ITS CIRCUMFERENCE. THE IMAGE THEN APPEARS INSIDE A TRANSPARENT CYLINDER OF FILM. A SIMPLE BUT SENSITIVE REFERENCE TO THIS CONTAINED APPEARANCE IS MADE BY ARTIST ANAÏT STEPHENS WHO WRITES "WHIPPED CREAM" WITH WHIPPED CREAM ON A TRANSPARENT CYLINDER, IN WHICH SHE WAS FILMED, IN HER PIECE "SPACE GRAFFITI I." INTERESTINGLY, ANAÏT REFERS TO THESE MULTIPLEX HOLOGRAMS AS "HOLODEONS", RECOGNIZING THEIR LIKENESS TO EARLY ZOETROPE NICKELODEONS. ALSO NOTEWORTHY ARE THE MULTIPLEXES MADE FROM FILMS OF COMPUTER GENERATED DRAWINGS, CREATING MOVING 3D IMAGES OF SUBJECTS WHICH DO NOT EXIST. IT IS PERHAPS INTERESTING THAT THE EARLIEST EXPERIMENTS IN STEREO OPTICS (C 1600) WERE DONE WITH DRAWINGS WELL IN ADVANCE OF THE INVENTION OF PHOTOGRAPHY.

THESE TECHNIQUES FUSING MOTION PICTURES INTO A HOLOGRAPHIC FORMAT STILL RETAIN THE ESSENTIAL QUALITIES OF A HOLOGRAM, GIVING A SENSE OF "PERSONALNESS"; THIS DUE LARGELY TO THE LIMITED SCALE AND VIEWING ANGLE WHICH PERMITS ONLY A FEW VIEWERS AT A TIME. THE ESSENTIAL "PUBLICNESS" OF CINEMA IS AS YET ONLY REALIZED IN CURRENT DEVELOPMENTS BY NIKFI RESEARCH SCIENTISTS IN THE U.S.S.R. THIS METHOD OF PROJECTING FULL-SCALE IMAGES OF ANY MODEST SIZE STUDIO SCENE INTO THE VIEWERS REAL SPACE IS INCREDIBLY EXCITING IN ITS PROMISE. THE TECHNOLOGY OF THIS SYSTEM IS GROSS, HOWEVER;

HIGH-POWERED PULSE LASERS, A COMPLEX OPTICAL SYSTEM FOR RECORDING AND PROJECTION, AND A SPECIAL SCREEN (ESSENTIALLY A LARGE HOLOGRAM OF ANOTHER COMPLEX OF LENSES) ARE REQUIRED. HOWEVER, THIS TECHNIQUE, PERHAPS SIGNIFICANTLY DEVELOPED BY THE SOVIETS, SUGGESTS THE ADVENT OF A HOLOGRAPHY MADE PUBLIC, REACHING A VAST AUDIENCE SIMULTANEOUSLY.

A MAJOR CONTRIBUTION OF PHOTOGRAPHY WAS ITS ABILITY TO CAPTURE A MOMENT IN A VISUAL CONTINUUM. EADWEARD MUYBRIDGE'S SEQUENTIAL INSTANTANEOUS PHOTOGRAPHS OF ANIMALS IN MOTION PROVIDED A WEALTH OF VISUAL INFORMATION THROUGH A "NEW WAY OF SEEING." SIMILARLY, ONE OF HOLOGRAPHY'S SPECIAL PROPERTIES IS WORTH RECOGNITION. SINCE MICRO-MOLECULAR MOVEMENT OF ANY PART OF A SUBJECT OF A HOLOGRAM RECORDS AS A VOID OR DARK "FRINGE", THESE MINUTE MOVEMENTS CAN BE RECORDED, THROUGH THE TECHNIQUE OF HOLOGRAPHIC INTERFEROMETRY (OR "HOLOMETRY") A DOUBLE EXPOSURE OF A SUBJECT IS MADE; ONE BEFORE AND ONE AFTER SOME PHYSICAL STRESS IS APPLIED. THIS HAS BECOME HOLOGRAPHY'S PRIMARY PRAGMATIC APPLICATION THROUGH NON-DESTRUCTIVE TESTING OF MATERIALS. HOWEVER, MARGARET BENYON NOTED THIS PROPERTY AND EMPLOYED IT IN MAKING TWO HOLOGRAMS OF ONE LOAF OF BREAD: ONE WHILE IT WAS FRESH (AND MOVING AS ITS MOISTURE EVAPORATED) AND ONE AFTER IT HAD DRIED. THUS SHE PRESENTS THE VIEWER WITH NEW VISUAL INFORMATION ABOUT A COMMON OBJECT. IN THIS WAY A CONFRONTATION IS ENGENDERED WITH A "NEW WAY OF SEEING" A PREVIOUSLY ACCEPTED VISUAL SITUATION.

pragmatic

HOLOGRAPHY'S MOST HERALDED QUALITY IS ITS THREE DIMENSIONAL PROPERTY. THIS IS IRONIC, AS IT WAS AN UNFORESEEN CONSEQUENCE OF DR. DENNIS GABOR'S EARLY EXPERIMENTS WITH COHERENT LIGHT CONDUCTED IN THE LATE '40S WHICH WERE FEASIBILITY TESTS OF A THEORY HE DEVELOPED AS A METHOD OF IMPROVING THE RESOLUTION OF ELECTRON MICROSCOPY. GABOR ABANDONED THESE EXPERIMENTS FOR LACK OF AN ADEQUATE LIGHT SOURCE (THE LASER) AND BECAUSE HE CONSIDERED THE 3D PROPERTIES TO BE OF LITTLE CONSEQUENCE.

THIS PROPERTY (THREE DIMENSIONALITY) WILL TAKE A SECONDARY ROLE IN HOLOGRAPHY AS A WAY TO ART TO A MORE SIGNIFICANT IDEA -- ITS ISOLATION OF THE PURELY VISUAL ASPECT OF A COMPLEX PHYSICAL SITUATION. THE HOLOGRAMS OF ARTIST HARRIET CASDIN-SILVER ARE OF GREAT IMPORTANCE IN THIS RESPECT. HERE THE UNIQUE QUALITIES OF REFLECTED/DIFFRACTED LASER LIGHT ARE RECORDED IN SPACE WITHOUT THE SUPPORT OF ANY VISIBLE MATERIAL PRESENCE,

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A SUCCINCT EXPRESSION OF THIS IDEA IS MADE IN A PROJECT BY ARCHITECT FRIEDRICH ST. FLORIAN: "THE IMAGINARY MONUMENT."
"DESIGNED AS A CORPORATE HEADQUARTERS, FUNCTIONAL AND SYMBOLIC CONCERNS ARE DISCONNECTED AND GIVEN DIFFERENT REALITIES. THE STRUCTURE ITSELF, WITH ITS PROGRAM REQUIREMENTS, IS SUNKEN INTO THE GROUND AND IS INVISIBLE FROM ITS SURROUNDINGS. THE "CORPORATE IMAGE," THE FORM-ANALOG TO THE MANHATTAN SKYSCRAPER, IS PRODUCED BY MEANS OF A HOLOGRAM THAT FLOATS WEIGHTLESSLY IN THE AIR."

HOLOGRAPHY'S GREATEST POTENTIAL WITHIN THE VISUAL ARTS LIES IN ITS CAPABILITY TO ISOLATE THE PURE VISUAL ASPECTS -- THE PERCEPTUAL PHENOMENON OF LIGHT DETACHED FROM A MATERIAL SUBSTANCE.

UNTITLED

ANTHONY R. ANDALORO

3 TRANSMISSION HOLOGRAMS AND...: 1977

FACILITY: LAKE FOREST COLLEGE, LAKE FOREST, ILLINOIS

COLLECTION: THE ARTIST

"MILKSHAKE"

RUDIE BERKHOUT

TRANSMISSION HOLOGRAMS: 1976

FACILITY: PHYSICS DEPARTMENT, BROWN UNIVERSITY,
PROVIDENCE, RHODE ISLAND

COLLECTION: THE ARTIST

"ALMOST WHITE-LIGHT"

RUDIE BERKHOUT

WHITE-LIGHT TRANSMISSION HOLOGRAMS: 1977

COLLECTION: THE ARTIST

"INTO ONE"

LORAN BILLINGS

LASER LIGHT ENVIRONMENT: 1977

INSTALLATION: GALLERY 1134

"TOMORROW"

HANS BJELKHAGEN AND ÅKE SANDSTRÖM

WHITE-LIGHT TRANSMISSION HOLOGRAM: 1975

FACILITY: HOLOVISION AB, STOCKHOLM, SWEDEN

COLLECTION: HOLOVISION AB, STOCKHOLM, SWEDEN

"SIOLENCE"

HANS BJELKHAGEN
POEM: HANS WEIL

TRANSMISSION HOLOGRAM: 1976

FACILITY: HOLOVISION AB, STOCKHOLM, SWEDEN

COLLECTION: HOLOVISION AB, STOCKHOLM, SWEDEN

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"2 INVESTIGATIONS "

JOHN A. BOESCHE

WORDS, PHOTOGRAPHS, TRANSMISSION HOLOGRAMS: 1977

FACILITY: THE SCHOOL OF THE ART INSTITUTE OF CHICAGO,
CHICAGO, ILLINOIS

COLLECTION: THE ARTIST

"APROPOSFORTHESHOW"

COSMOS CAMPOLI AND TOM CVETKOVICH

REFLECTION HOLOGRAM, SCULPTURE: 1977

FACILITY: NORTHEASTERN ILLINOIS UNIVERSITY,
CHICAGO, ILLINOIS

COLLECTION: THE ARTIST

"BEE THEATRE"

COSMOS CAMPOLI AND TOM CVETKOVICH

TRANSMISSION HOLOGRAM: 1977

FACILITY: NORTHEASTERN ILLINOIS UNIVERSITY,
CHICAGO, ILLINOIS

COLLECTION: THE ARTIST

"DR. EINSTEIN'S CHESSBOARD"

PETER CLAUDIUS

MULTIPLEX HOLOGRAM: 1975

FACILITY: THE MULTIPLEX CORP., SAN FRANCISCO,
CALIFORNIA

COLLECTION: MUSEUM OF HOLOGRAPHY, NEW YORK, NEW YORK

"THEATRE ALIF"

TOM CVETKOVICH

DIFFRACTION GRATINGS, SCULPTURE: 1977

FACILITY: NORTHEASTERN ILLINOIS UNIVERSITY, CHICAGO,
ILLINOIS

"HOLO DALI: CRYSTALIZED"

MARK DIAMOND

TRANSMISSION HOLOGRAM: 1976

FACILITY: HOLOGRAPHICS

COLLECTION: THE ARTIST

"THOUGHTS"

KENNETH DUNKLEY

TRANSMISSION HOLOGRAM: 1973

FACILITY: NEW YORK UNIVERSITY, NEW YORK, NEW YORK

COLLECTION: THE ARTIST

"THE WORLD'S FIRST HOLOGRAPHIC SCULPTIMATION"

BOB GARDINER

MULTIPLY HOLOGRAM: 1975

FACILITY: THE MULTIPLY CORPORATION, SAN FRANCISCO,
CALIFORNIA

COLLECTION: THE ARTIST

"COUNT 'EM AGAIN..."

DR. TUNG H. JEONG AND DAVID WENDER

TRANSMISSION HOLOGRAM: 1971

FACILITY: LAKE FOREST COLLEGE, LAKE FOREST, ILLINOIS

COLLECTION: DR. TUNG H. JEONG

"THE TRANSITIONS OF LIGHT/LIFE: and the void is not empty"

DEBORAH GAVENTA

LASER AND SUNLIGHT INSTALLATION: 1977

INSTALLATION: GALLERY 1134

"IN THE TRANSITIONS THE REALITY HAS BEEN CONSUMED BY ILLUSIONS, ALLOWING THE VIEWER A CHOICE IN PARTICIPATION WITH THE AMBIGUOUS EDGES. THE VOID CONTAINED BY THE ARTIST'S SOLUTION TO EDGE IS FILLED WITH A REALITY OF ENERGY. EMPTY OF OBJECTS, WITH THE EXCEPTION OF THOSE WHICH MANDATE TRANSITION, THE SPACE HAS BECOME A REPRESENTATION OF OUR UNIVERSE; TO ATTEMPT A COLLABORATION OF THE MOST COHERENT FORM OF LIGHT WITH OUR PRIMARY SOURCE OF WARMTH AND ILLUMINATION. THUS ART REACHES ITS LEVEL OF A MAJOR COMMUNICATION. A CREATION OF RITUAL(S), ON WHICH OUR SOCIETY DEPENDS FOR AN EXPLANATION TO THE CONFUSION."

DEBORAH GAVENTA

"PROPOSAL DRAWING FOR THE INSTALLATION"

DEBORAH GAVENTA

OIL PASTELS ON PAPER: 1977

COLLECTION: THE ARTIST

"CREME DE MOTION # 3"

SCOTT E. NEMTZOW

REFLECTION HOLOGRAM: 1976

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FACILITY: PHYSICS DEPARTMENT, BROWN UNIVERSITY,
PROVIDENCE, RHODE ISLAND

COLLECTION: THE ARTIST

"RED SUN"

RUBEN NÚÑEZ

REFLECTION HOLOGRAM: 1976

COLLECTION: THE ARTIST

"TITLE F"

RUBEN NÚÑEZ

REFLECTION HOLOGRAM: 1976

COLLECTION: THE ARTIST

"EXCAVATION MIRROR"

RUBEN NÚÑEZ

REFLECTION HOLOGRAM: 1976

COLLECTION: THE ARTIST

"CELESTIAL MIRROR"

RUBEN NÚÑEZ

REFLECTION HOLOGRAM: 1976

COLLECTION: THE ARTIST

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"SPACE MAN"

JERRY PETHICK

WHITE-LIGHT TRANSMISSION HOLOGRAM: 1974

FACILITY: SCHOOL OF HOLOGRAPHY, SAN FRANCISCO,
CALIFORNIA

COLLECTION: JACKSON GRAPHICS, NEW YORK, NEW YORK

"GYROSCOPE"

RICK SILBERMAN

REFLECTION HOLOGRAM: 1975

FACILITY: POLAROID RESEARCH LABS, CAMBRIDGE, MASS.

COLLECTION: THE ARTIST

"SPHERE AND COLLAGE"

ANAIT STEPHENS

REFLECTION HOLOGRAM, COLLAGE: 1975

FACILITY: THE ARTIST'S STUDIO, LOS ANGELES, CALIFORNIA

"SPACE GRAFFITI I" (HOLODEON SERIES)

ANAÏT STEPHENS

MULTIPLEX HOLOGRAMS: 1974

FACILITY: THE MULTIPLEX CORP., SAN FRANCISCO,
CALIFORNIA

COLLECTION: MUSEUM OF HOLOGRAPHY, NEW YORK, NEW YORK

"THE FIRST 360° CELL ANIMATION"

BRITTON ZABKA

MULTIPLEX HOLOGRAM: 1976

FACILITY: THE MULTIPLEX CORP., SAN FRANCISCO,
CALIFORNIA

COLLECTION: THE ARTIST

"THE KNIGHT SHOT"

BRITTON ZABKA

MULTIPLEX HOLOGRAM: 1976

FACILITY: THE MULTIPLEX CORP., SAN FRANCISCO,
CALIFORNIA

COLLECTION: THE ARTIST