

Appraisal of Holograms for Estate of Marian B. Javits

April 27, 2017

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HOLOGRAM RESEARCH

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Patricia K. Perlman
Executor
Estate of Marian B. Javits
175 West Shore Drive
Putnam Valley, NY 10579

April 27, 2017

Dear Ms. Perlman,

Please find enclosed my appraisal of the twelve laser viewable transmission holograms and two related items, belonging to the estate of Marian Javits, conducted on March 31, 2017 at 322 East 57th Street, New York City.

The total valuation of the twelve holograms is \$134,000.00.

Additionally, I have enclosed my CV per your request.

I include here some additional comments which may be used to augment previous excellent commentary on these pieces by Jonathan Ross and Arthur Dion.

All these holograms are horizontal, when viewed in laser light, and all have a reconstruction (playback) angle of illumination from the left rear side except #6, Card Players (11x14 inches) which is from behind and above. All the holograms appear to be in excellent physical condition except #8 and #12 which are master holograms each broken in two pieces. All of the holograms have various stickers indicative of content, viewing orientation, and various inventory schemes.

These pieces are historical in nature, and related to technology developments of the mid twentieth century in general, and more specifically, to the fields of optics, lasers, and in particular, holography. They represent the peak of achievement in holography, at the time they were created, in terms of quality, size, and subject matter.

The pieces came to be in the estate of Marian Javits by inheritance from Gino Robert Schinella. It's known that they were made at McDonnell Douglas

Electronics (MCD) in St. Louis MO, and Conductron in Ann Arbor, MI, between 1969 and 1972, and that Schinella was a representative of MCD. Unusually for such important historical holograms, almost nothing is currently known about the individuals responsible for designing the recording systems, the optical setup designs themselves, who made the physical recording of the holograms, the chemical processing systems, or who did the darkroom processing of the holograms.

There are several non-technical articles describing why the pieces came to be and, in the case of the Card Players holograms, we know that Larry Siebert was the holographer who both designed the setup and did the recording in 1969 at Conductron in Ann Arbor, MI. We know that the Cartier Hand, aka Hand & Jewels, was designed by Robert Schinella for Cartier, and there is some limited non-technical documentation about the recording and final display at Cartier, but no technical information about the “who and how”. We know that the Devil and Witch hologram was designed for Ripley’s Believe or Not exhibit but, again, no technical information regarding “who and how”. I have been unable to locate any information about how the, very little known, but remarkable hologram, Divers, came to be.

I mention this because it is unusual for holograms, recorded by highly skilled optical physicists, in ‘state of the art’ laser holography labs of that era, not to be accompanied by well documented lab notes.

I know that Schinella kept journals and diaries about his work and that he was involved primarily in the sales of holography for MCD for some undetermined period 1969-1972, and occasionally, in the designs for finished holograms. Several years ago, Mrs. Javits briefly showed me one of Schinella’s diaries, so I know that they exist. While doing the appraisal, I came across a journal labeled #3. Unfortunately for the appraisal, Schinella’s journal #3 started just after these pieces were produced and contains no information about any of them. It is my hope that the other diaries can be located since they may add significantly to the historical record and later value of these appraised pieces as well as other pieces already donated by Mrs. Javits to the MIT Museum.

It is in this light, that I add these following observations about the appraised pieces, since, in a sense, this appraisal forms part of the historical record.

The holograms were all recorded using Agfa 8E75 plates, designed by Agfa Gaevert specifically for recording holograms in red laser light, whether by pulsed ruby laser at 694.3nm or helium neon laser at 632.8nm. The 11x14 inch and 18x24 inch plates are both 5mm thick as indicated by the two remaining Agfa 18x24 inch plate boxes and by my measurements. The 2x3 foot plates (actual size=25.5x37.875 inches) are 6mm thick as indicated by the two remaining Agfa 2x3 ft boxes. While it is unclear from the existing holograms themselves, it appears from the Agfa box labeling that some or all of the plates may have originally incorporated an "anti halo" backing (anti halation backing) that would have been washed out of the emulsion during darkroom processing.

I suggest that the Agfa plate boxes, and various cardboard packing materials associated with them as plate separators in the original packing, be kept and considered as historically collectible. While they may seem quite minor at the moment, consider that packaging for early photography materials, and even toys, significantly enhance the value of the items originally contained by that packaging if the original packaging remains with the items. Additionally, some of the handwritten notes on the boxes may have been written by Schinella, or others involved in the creation process, further enhancing their value.

The protective cover plates on appraised items #1 through #7 and #13, all appear to be the same type of glass and exact physical dimensions and appearance as the recorded holograms themselves. I believe that these plates may have been "reject" exposed and processed holograms that were bleached to remove the emulsions in order to be used as protective cover plates or, less likely, they may have been uncoated plates provided by Agfa for the purpose. In the early 1970s, holographers began to use various processes, with varying degrees of success, to archivally protect and seal the holograms from the damaging effects of air and moisture to the silver halide gelatin emulsion in which the holograms are recorded. Usually, these processes involve a permanent laminate of an optical cement, adhesive, or epoxy. In the case of pieces #1 through #7, the holograms have been protected by an unlaminated piece of glass placed over the emulsion and held together by tape around the edges. In each case, black 3M Scotch Type

235 Photographers tape has been used except for appraised item #2. #2 uses an unidentified orange tape. It is important to the longevity of these pieces that the protective glass cover plates not be removed unless absolutely necessary. While the plates are not protected from air or moisture by these cover plates, they are protected from casual damage to the all important hologram emulsion. Additionally, the cover plates were most likely taped by Schinella which, again, would enhance their value.

While possibly obvious to the informed observer, it may bear repeating that the process for exposing and processing these types of holograms is essentially identical to that used for exposing and processing black and white glass plate photographs, except that laser light is used for exposure and the darkroom chemistry is adjusted for the ultrafine grain black and white emulsion.

Appraisal items #1 through #4 were most likely recorded and exposed using a Spectra Physics 125 helium neon laser at MCD since a pulsed laser would have been difficult to use for this type of hologram transfer and would not have been necessary. These are second step transfer holograms, most likely made using the appraised master holograms #8 through #11. Without closer examination in laser light, which I have not had the opportunity to perform, it is difficult to speculate further about the exposure systems or methods.

Appraisal items #5 through #12 were all most likely made using a pulsed ruby laser in a single exposure.

Based on the coloration and excellent cleanliness of the hologram emulsions, they were all bleached, a darkroom process used to make holograms brighter. The color, clarity, and lack of discoloration of the emulsions, lead me to believe that the process may have been reversal bleach and that the plates were subsequently thoroughly washed in a long waterbath to wash out residual chemicals. The process sequence, after laser exposure, most likely would have been a fine grain high contrast developer such as Kodak D-19, diluted acetic acid stop bath, water wash bath, a sulfuric acid/potassium dichromate reversal bleach bath, long water bath, possibly followed by a diluted wetting agent such as Kodak PhotoFlo and then placement leaning vertically in a drying cabinet.

Each of the holograms has a very slightly visible, and unique, pattern of a “wood grain” noticeable to the experienced eye (minimized by excellent exposure and darkroom processing) when tilted so that fluorescent light grazes off the surface. This pattern, if documented by specialized scanning, can be used to authenticate each hologram since this pattern cannot be duplicated. This artifact pattern, created and recorded by the laser light bouncing between the two glass surfaces of the plate, represents the unique surface irregularity of the float glass used as the substrate for the hologram emulsion.

While not necessary for this appraisal, it would be interesting to more closely view each of the appraised holograms in laser light.

Finally, I caution any who handle these holograms to be aware that they are quite heavy and unwieldy and fragile glass plates. Holograms #1 through #7 can be thought of as glass plate sandwiches, almost a half inch thick, and up to 2x3 feet in size. Even the smallest hologram, #6, is quite heavy for its size. Additionally, master plates #8 through #12 have completely unprotected emulsions. It would be wise to have two people handle the larger plates.

Best regards,



Joseph Burns
Hologram Research
P.O. Box 377
Locust Valley, NY 11560

Appraisal of Holograms from Marian Javits Estate

1- Cartier Hand, Hand & Jewel, #29,

Size: 18x24x3/8 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

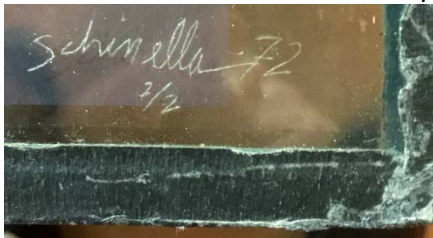
Illumination orientation: reference beam from rear left side

Physical condition: glass good

Emulsion surface protection: protective cover glass, 3/8" inset black tape around edges

Quality comment: bright

Labeling: "Schinella 72" 2/2, lower right, hand etched into glass; upper left front surface two overlaid white handwritten paper stickers "Ref. Cart Hand/ 29 Hand & Jewel".



Lower left



Upper right

Valuation: \$20,000

COMMENT: This is the most valuable of the four Cartier Hand (Hand & Jewels #29), pieces, because it was hand signed and numbered, by etching into the glass and/or emulsion, by the creator, Robert Schinella. It is etched, "2/2", which implies that there is another similarly signed piece. That piece may be in the MIT Museum collection. This is a very well known early piece. Although it was designed for a commercial client, it is aesthetically pleasing and an early iconic piece in holographic history. It is also one of two pieces that can be definitively said to have been designed by Schinella.



Photo for Cartier Hand appraisal #s 1, 2, 3, 4, 8, 9, 10, 11

2- **Cartier Hand, Hand & Jewel, #28,**

Size: 18x24x3/8 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

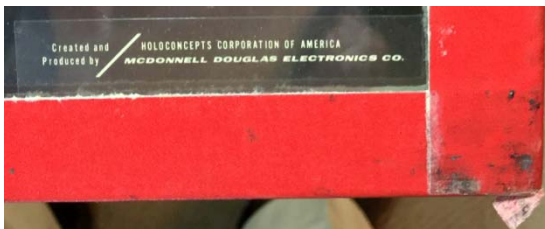
Illumination orientation: reference beam from rear left side

Physical condition: glass good

Emulsion surface protection: protective cover glass, 7/8" inset orange tape around edges

Quality comment: dimmer than #29

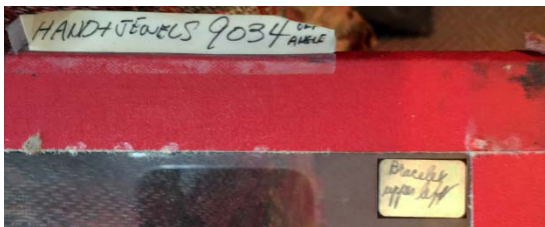
Labeling: lower right transparent sticker "Created and Produced by/ HoloConcepts Corporation of America McDonnell Douglas Electronics Co."; upper left front surface two overlaid white handwritten paper stickers "Top Ref. Cart/ 28 Hand & Jewel"; upper right front surface white handwritten paper sticker "Bracelet Upper Left"; upper right taped to top edge "Hand+Jewels 9034 off Angle"; lower left rear surface white handwritten paper sticker "V9034".



Lower right



Upper Left



Upper right



Lower left back side

Valuation: \$9,000

COMMENT: All of the four Cartier Hand pieces are desirable and valuable. This is the least valuable of the four Cartier Hand holograms (#28) because it is probably the dimmest. It would be useful to view the three pieces, #26, #27, & #28, together in laser light and to record fixed light meter readings to ascertain their true quality with respect to one another.

3- **Cartier Hand, Hand & Jewel, #27,**

Size: 18x24x3/8 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

Illumination orientation: reference beam from rear left side

Physical condition: glass good,

Emulsion surface protection: protective cover glass, 5/16" inset black tape around edges

Quality comment: brighter than #28, (white handwritten paper sticker upper left says "Less Brilliant")

Labeling: lower right transparent sticker "Produced by McDonnell Douglas Electronics Company"; upper left front surface two overlaid white handwritten paper stickers "Ref Top/ 27 Hand & Jewel Less Brilliant".



Lower right



Upper left

Valuation: \$9,000

COMMENT: See Comment for #2 above.

4- **Cartier Hand, Hand and Jewel, #26,**

Size: 18x24x3/8 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

Illumination orientation: reference beam from rear left side

Physical condition: glass good

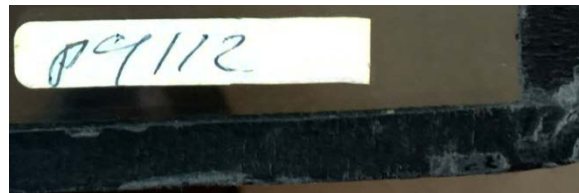
Emulsion surface protection: protective cover glass, 3/8" inset black tape around edges

Quality comment: brightest

Labeling: upper left front surface two overlaid white handwritten paper stickers "Ref Top Cartier Hand/26 Hand & Jewel"; lower right plain white handwritten paper sticker "P9112".



Upper left



Lower right

Valuation: \$11,000

Comment: See Comment for #2 above.

- 5- **Card Players**, no number,
Size: 18x24x3/8 inches (5mm)
Orientation: horizontal
Hologram type: transmission laser viewable
Illumination orientation: reference beam from rear left side
Physical condition: glass good
Emulsion surface protection: protective cover glass, 5/16" inset black tape around edges
Quality comment: needs to be viewed in laser light to judge
Labeling: lower right transparent sticker "Produced by McDonnell Douglas Electronics Company"; upper left front surface two overlaid white handwritten paper stickers "Ref #9/ 2 Card Players".



Lower right



Upper left

Valuation: \$25,000

COMMENT: This is an iconic and very desirable early hologram. I consider it one of the most interesting. It was designed to show off the potential depth and volume possible in a laser viewable, pulsed laser, transmission hologram. It has been variously ascribed to different creators. In fact, it was created by Larry Siebert at Conductron in Ann Arbor MI in 1969. It is one of the very few holograms that viewers come back to and find endlessly interesting to see again and again. Larry Siebert built the laser that made this hologram and was the first person to make a pulsed hologram of a live subject and the first person to make a pulsed laser portrait of a human being. The laser that made this hologram was also used to make all of the holograms for the artist, Bruce Nauman, in 1968 and 1969, as well as the later holograms at McDonnell Douglas Electronics in St. Louis MO in 1971/2 for Salvador Dali and the portrait of Denis Gabor, inventor of holography.



Photo for Card Players appraisal #s 5 and 6, detail

6- **Card Players,**

Size: 11x14x3/8 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

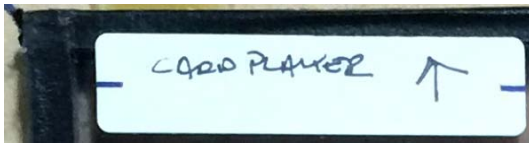
Illumination orientation: reference beam from rear top

Physical condition: glass good

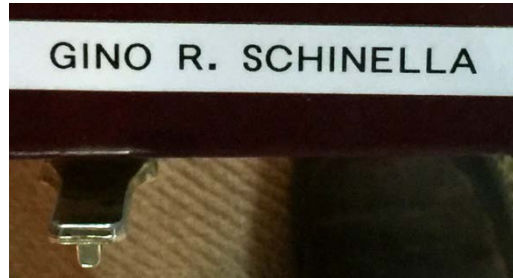
Emulsion surface protection: protective cover glass, 5/16" inset black tape around edges

Quality comment: needs to be viewed in laser light to be judged

Labeling: upper right white handwritten paper sticker "Card Player"; in briefcase labeled "Gino R. Schinella" with dual combination locks both "001".



Upper left



Schinella briefcase label

Valuation: \$25,000

COMMENT: See Comment for #5 above. I have valued this piece at the same valuation as #5 above even though #5 is a physically larger piece. Without having viewed this in laser light, I assume that this piece is the same large deep scene simply viewed through a smaller "window". While larger pieces can be more spectacular, the smaller version is more accessible to exhibit for a collector or museum. Although it should have the same reference beam distance requirement, it requires a substantially less powerful laser for viewing. In fact, it can be exhibited with a tiny and very inexpensive laser diode.

7- **Diver,**

Size: 37 3/8 x 25.5 x 7/16 inches (6mm)

Orientation: horizontal

Hologram type: transmission laser viewable

Illumination orientation: reference beam from rear left

Physical condition: glass good

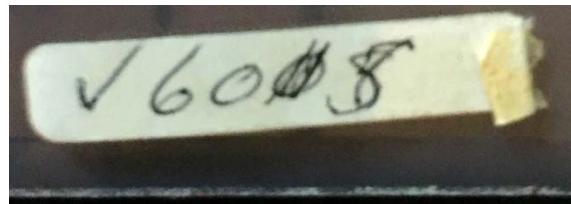
Emulsion surface protection: protective cover glass, black tape around edges (tape insets 3/4", 1 3/8", 3/4")

Quality comment: needs to be viewed in laser light to be judged

Labeling: upper right front surface white handwritten paper sticker "Diver Weeds Chaff"; lower right front surface handwritten paper sticker "V6018" (unclear – could be V6008 or last digit could be 5).



Upper right



Lower right

Valuation: \$10,000+

COMMENT: Without viewing this piece in laser light, it is impossible to give it a proper valuation. Therefore, I have given it a value that is at the low end. Its value could be significantly greater. The finished piece is known to be a deep life-size underwater scene with at least one human diver and other underwater effluvia.



Photo for Diver appraisal #7

8- **Master 3, Broken Hand & Jewel Plate, #33,**

Size: 18x24x3/16 (inches (5mm))

Orientation: horizontal

Hologram type: transmission laser viewable

Illumination orientation: reference beam from rear left side

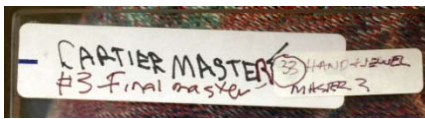
Physical condition: broken in two pieces

Emulsion surface protection: unprotected glass plate emulsion, broken in two pieces, larger piece still potentially useful

Quality comment: needs to be viewed in laser light to be judged

Labeling: Larger Piece 8A: upper left two overlaid white handwritten paper stickers "Cartier Master #3 Final Master" and "33 Hand & Jewel Master 3";

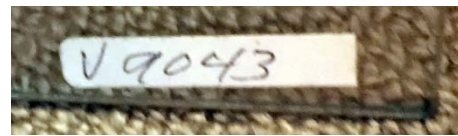
Smaller Piece 8B: upper right large white paper sticker handwritten "3"; lower right white handwritten paper sticker "V9043".



Upper left, 8A



Upper right, 8A



Lower right, 8B

Valuation: \$2,500

COMMENT: There are four Hand & Jewel (Cartier Hand) master plates. Although broken, this piece still has value. The larger piece can be used to make additional copies of the Cartier Hand hologram although with less parallax than an unbroken master. It can also be optically cemented back together by an expert optics technician. Master holograms may be thought of as similar to negatives for photographs, in that, additional "prints" can be made from the masters that, darkroom processing being equal, can be indistinguishable from the original "prints". However, it is unlikely that the original exposure techniques or darkroom processing could be easily replicated.



Larger broken piece, # 8A



Smaller broken piece, # 8B

9- **Master 2, Hand & Jewel, #32,**

Size: 18x24x3/16 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

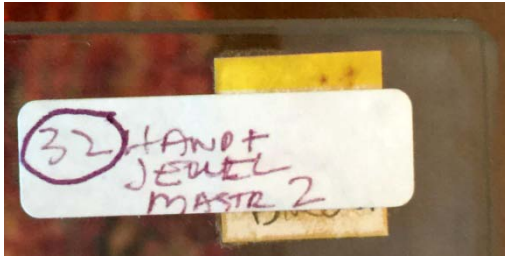
Illumination orientation: reference beam from rear left side

Physical condition: glass good

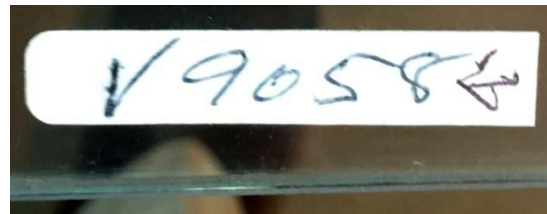
Emulsion surface protection: unprotected glass plate emulsion

Quality comment: needs to be viewed in laser light to be judged

Labeling: upper right white handwritten paper sticker overlaid over older sticker "32 Hand + Jewel Master 2"; lower right white handwritten paper sticker "V9058".



Upper right

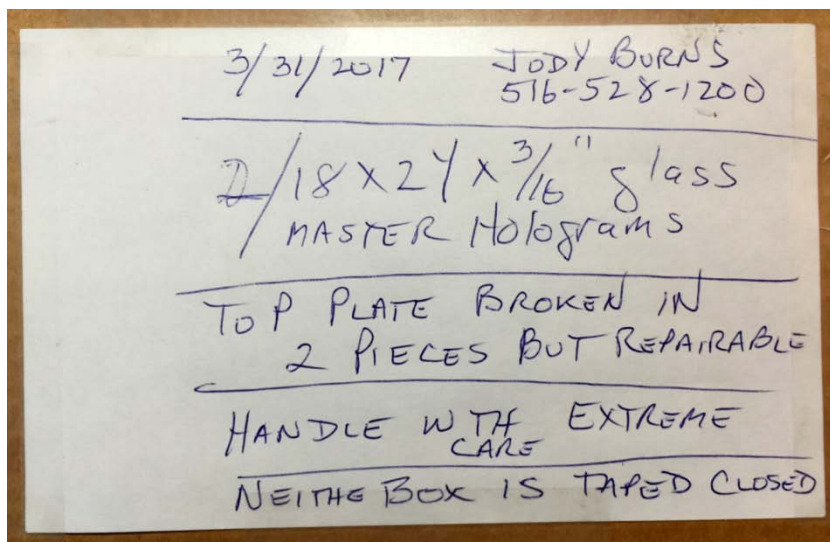


Lower right

Valuation: \$5,000+

Comment: See Comment for #8 above. Although I have valued the masters at less than the value of the finished "prints" (or second step holograms, also known as H2s to those skilled in the art), it is my contention that the masters are as valuable as the "prints" because they can be used to generate both new "prints" as well as be used in the future to create entirely new and interesting "prints" using other holographic techniques.

In Agfa 8E75 Box #23: was empty - now storing #s 8 & 9, Hand & Jewel Masters 3 & 2.



N.B.: New cautionary note on Agfa Box #23

In Agfa 8E75 Box #22:, storing #s 10 & 11, Hand & Jewel Masters 1 & 4.

10- Master 1, Hand & Jewel, #31,

Size: 18x12x3/16 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

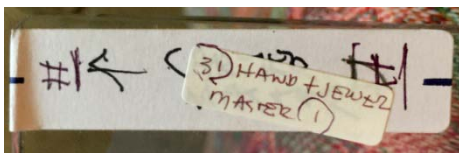
Illumination orientation: reference beam from rear left side

Physical condition: glass good

Emulsion surface protection: unprotected glass plate emulsion

Quality comment: needs to be viewed in laser light to be judged

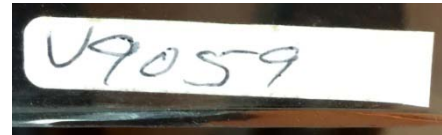
Labeling: upper left two overlaid white handwritten paper stickers “#1 31 Hand + Jewel Master 1”; upper right white handwritten paper sticker “1”; lower right white handwritten paper sticker “V9059”.



Upper left



Upper right



Lower left

Valuation: \$5,000+

COMMENT: See Comment for #9 above.

11- Master 4, Hand & Jewel, #34,

Size: 18x24x3/16 inches (5mm)

Orientation: horizontal

Hologram type: transmission laser viewable

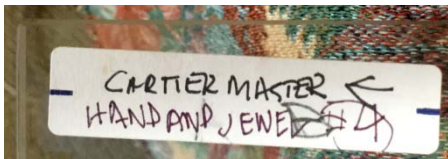
Illumination orientation: reference beam from rear left side

Physical condition: glass good

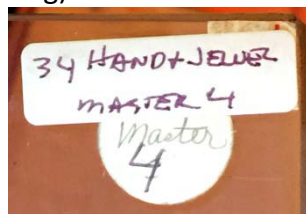
Emulsion surface protection: unprotected glass plate emulsion

Quality comment: needs to be viewed in laser light to be judged

Labeling: upper left white handwritten paper sticker “Cartier Master Hand & Jewel #4”; upper right white handwritten paper sticker “34 Hand & Jewel Master 4” & round white paper handwritten sticker “Master 4”; right edge middle has plain white irregular sticker paper wrapped around edge (no writing).



Upper left



Upper right



Middle right edge

Valuation: \$5,000+

COMMENT: See Comment for #9 above.

12- Master, Broken Devil Plate,

Size: 37 7/8 x 25.5 x 3/16-7/32 inches, (actual thickness 6mm= ~1/4")

Orientation: horizontal

Hologram type: transmission laser viewable

Illumination orientation: reference beam from rear left side

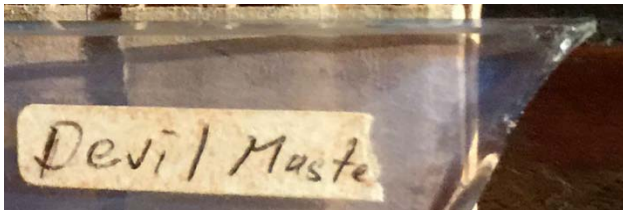
Physical condition:

Emulsion surface protection: unprotected glass plate emulsion, broken in two pieces, larger piece still potentially useful

Quality comment: needs to be viewed in laser light to be judged

Labeling: Larger Piece 12A: upper right front surface white handwritten paper sticker "Devil Maste";

Smaller piece 12B: along broken glass edge some residual black tape.



Upper right larger piece 12A



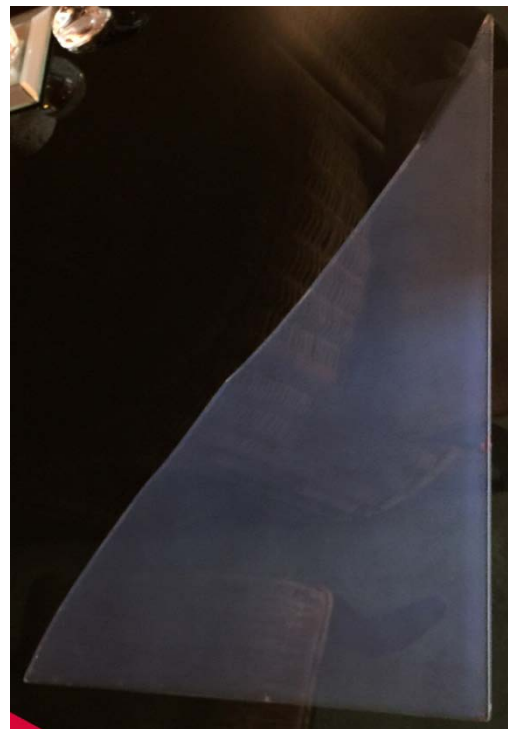
Tape on smaller piece 12B

Valuation: \$7,500+

COMMENT: See comment for #8 above.



Larger broken piece 12A



Smaller broken piece 12B

13- Plain glass cover plate for #33 broken Cartier Hand master plate #3,

Size: 18x24x3/16 inches (5mm)

Valuation: \$200.

COMMENT: This plate has value as a cover plate for any one of the unprotected masters and as a laminate plate for the broken master, #8.



Plain glass cover plate 18x24

14- Spectral Helium Neon laser, model RMM505,

Size: 43.25x2.125x2.125 inches

Valuation: \$0.00 to \$250

COMMENT: This is a "multimode" red laser, wavelength 632.8nm. While useful for viewing laser viewable holograms, it is not useful for making holograms. If new, it can lase at 50-60mw, which is at the high end for a helium neon laser. The power supply is missing. Without a power supply, it is useless. The appropriate power supply from Spectral in Italy would be their model SPS200US.

Link to Spectral for laser: http://spectral.it/hene_laser.html

Link to Spectral for power supply: <http://spectral.it/power.html>



Laser model # and serial #

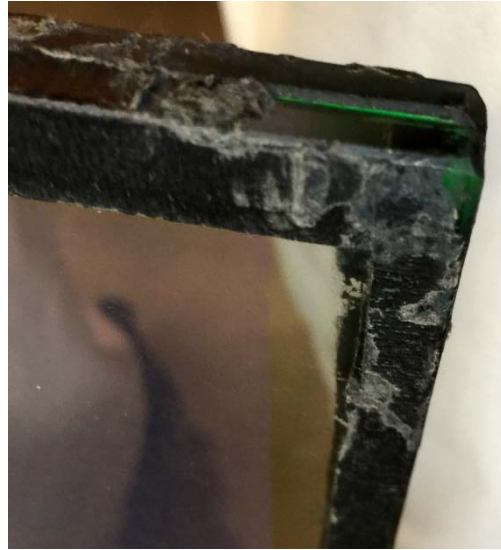


Spectral Helium Neon laser head

Additional photos:



Photo of Devil & Witch, detail from final piece made using master #12



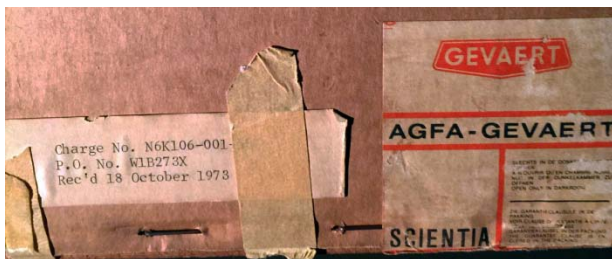
Cartier Hand, appraisal #4, corner detail



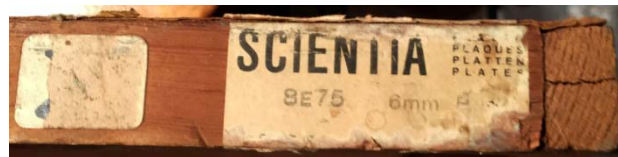
Agfa 18x24 in. plate box labels



Agfa 18x24 in. plate box technical data label



Agfa 2x3 ft. plate box labels



Agfa 2x3 ft. plate box technical data label

HOLOGRAPHY EDUCATION

- 1966-1970 **US Navy**, Photographic Interpreter.
- 1972 **Dr. Tung Jeong**, Lake Forest, inventor cylindrical hologram;
Basic workshop: transmission, reflection, and cylindrical holography.
- 1973 **Lloyd Cross**, San Francisco, inventor one-step, white light,
integral, cylindrical hologram;
Workshop: rainbow and integral holography.
- 1973-1974 **Hart Perry**, New York, Oscar winning cinema-photographer;
Personal instruction: 35 mm Arriflex, 16mm very high speed, for
Integral Holography
- 1974 **Don White**, Bell Labs, New York/New Jersey, senior scientist;
Advanced Workshop: dichromate and wide angle work .
- 1976-1979 **Bob Bartolini, Burton Clay, Nathan Feldstein, Mike Lurie, Bud
Morris and John Russell** (all RCA Sarnoff Labs - team which
originally patented embossed holography);
Personal instruction: photoresist, electroless nickel, electroforming,
etching, embossing.
- 1976-1979 **Steve Benton**, Polaroid and MIT, inventor rainbow holography;
Three special workshops: reflection and rainbow, with
emphasis on mathematical representation and pre-visualization.

EXPERIENCE

- 2014-Present **Hologram Research**
Oversaw replication and documentary photography of Bruce Nauman
laser transmission holograms for Kramlich Trust.
Created and produced limited edition of Charlotte Moorman white light
transmission holograms entitled, "Charlotte in Spiritu".
Built new holography studio for production of integral stereograms.
- 2009- 2014 **IT Consultant,**
Head of IT for a small investment bank with offices on Long Island,
NYC, and London. Oversaw setup of network and server
infrastructure and oversaw day to day IT services.
- 1989-1996 **Hologram Research**
Directed digital holography research with microdisplays at State
University of NY (Stonybrook) LI High Tech Incubator.
- 1983-1987 **Owner, Holoplate, Inc.**
Produced all types of photoresist and silver halide white
light transmission holograms. Sold business in 1987 to Secure Image
Technologies, a credit card manufacturer.

Joseph R. Burns
Holography CV

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- 1977-1983 **President, New York Art Alliance Inc.**
Commercial and Art Holography Laboratory. Sold to
Holoplate, Inc. in 1983.
- 1973-1977 **Founder and Director, New York School of Holography (NYSOH),
Museum of Holography (MOH).**
Organization included 4 small holography laboratories. Founded NYSOH
in 1973 and MOH in 1974. Resigned as trustee in 1978. MOH became
part of MIT Museum of Fine Art in 1993. Sold NYSOH in 1977.
- 1970-1973 Columbia University, liberal arts studies
- 1966-1970 **US Navy**

SELECTED MASS PRODUCTION ACTIVITIES

- 1986 Completed development of **New York Telephone** all-holographic credit
card.
- 1982-1983 Completed development of large-format (up to 12" x 12") photoresist
recording and electroforming facility.
- 1980-1982 Completed computer program for the production of multicolor
rainbow hologram setups that allowed multiple colors and
objects to be recorded in proper registration in a single
laser viewable master plate.
- 1980 Evaluated 52 holography patents for **CitiCorp.**
- 1977-1979 Chief holographer for two-year research project with
General Mills Creative Products Group, which demonstrated
feasibility of manufacturing holograms by injection molding.

SELECTED ART HOLOGRAPHY ACTIVITIES

- 2014-Present see above under **Experience**
- 1991 Curated, and exhibited in, comprehensive 90 piece holography
exhibition, Nabisco Corporate Headquarters in NJ.
- 1973-1987 Produced holograms for, and consulted with, and collaborated with
numerous artists including, Yaacov Agam, Ruben Nunez, Dieter Jung,
Nam June Paik, Charlotte Moorman, Salvador Dali, etc.
- 1976-1987 Exhibited in numerous group and one-man museum exhibitions in the
US and Europe.
- 1977 Curated, and exhibited in, first exhibition of holography at MoMA,
NYC, "Picture This".

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- 1976 Exhibited 360 degree moving hologram of Charlotte Moorman performing Kosugi Bag Piece while Charlotte performed the piece at MoMA, NYC.
- 1976 Co-curated, and exhibited in, first major European holography exhibition at Kulturhuset, Stockholm, Sweden, "Holografi: Det 3-Dimesionella Mediet".
- 1975 Curated, and exhibited in, first major holography exhibition in NYC at International Center of Photography (ICP), "Holography: The First Decade".
- INTERESTS** Squash, skiing, tennis, wilderness canoeing, scuba.