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Teaching Holography in an Art School Environment: The Program at the School of the Art Institute of Chicago

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Abstract

The philosophy of the holography department, The School of the Art Institute of Chicago (SAIC), is discussed, along with a fine arts curriculum designed to take into account the learning styles of art school students. A description of the facilities follow, ending with a survey of artwork by the best students.

Introduction

Holography is almost unheard of in the art world; when it is mentioned it is apt to be used as a metaphor for the ultimate in tastelessness.[1] Occasionally, a 'recognized' artist will dabble in holography, using the facilities of a commercial lab, translating his concept into a hologram[2]. The results usually raise objections from the clique of hands-on holographic artists[3],[4], who feel that they are, on the other hand, are being discriminated against by the art world because they practice in a technical medium. As a way of improving the situation, art school students must be better educated in the fine arts aspect of holography, laboratory techniques and how to set up their own studios. For it will be only through the efforts of the "hands-on" workers will the medium fully realize its creative potential.

This, then, is the major goal of this teacher: to help the students realize their full potential creating artful holograms with inexpensive equipment. Not only is it necessary that the holographic artist learn to work within the constraints of equipment at hand, but also realize the discipline and dedication required to complete a project. No self-respecting painter borrows or rents another's paints and brushes or explains to a technician where he wants the brush strokes.

Although the SAIC has acquired a pair of Newport tables, demonstrations prove them nonessential in the making of good holograms. A 1/2-inch thick steel slab, 4 by 7 feet, is used for the Beginning Class, and slides of sandbox systems and "Big Beams" are shown. But what impresses the students the most is making a single beam reflection hologram on the floor. The laser and spatial filter are mounted on a stand on one side of the room, while the object and plate are on a

similar stand on the opposite side of the room. The resultant hologram looks identical to one made on a Newport table. And to be even more dramatic, a single beam transmission deep scene hologram of the actual floor was made concurrently with sounds of someone throwing refuse into the trash can outside. The set-up still worked.

With the shop facilities at the SAIC, the student is able to make just about everything needed to equip a home lab. In the wood shop the student can make film and plate holders, frames for large front surface mirrors, display stands, etc.; in the foundry, gravity bases for working on concrete tables or floors; with the lathe and mill in the electronics department, mounting rods and posts and even spatial filters. Broken laser tubes could conceivably be repaired in the neon shop, but with all the helium-neon lasers available on the surplus market nowadays, there is really no point to doing that. Setting up an artist's home holography studio need not be any more expensive than setting up a home photography studio.

But before moving on to their own studios, Students at SAIC have the opportunity which is unique amongst art schools to familiarize themselves with the technique on research grade equipment. Every holography student is entitled to eight hours a week of actual lab experience, with or without a partner. Permanent lab times are assigned at the beginning of the semester. Shifts not assigned are available on a first-come, first-served basis, and sometimes the lab is used solely by the students twenty-four hours a day, seven days a week (except during class instructional time). Time slots can be exchanged or bartered.

The Curriculum

1. Holography I

The first five weeks of the Holography I course are devoted to acclimating the students to the laboratory procedures by working with everybody's favorite easy-to-make hologram, the basic single beam reflection. Successful exposures are assured by showing how to use simple kinematic object holders. Three demonstration plates are shot by the instructor, each with the same four test exposure quadrants of the same object but processed differently to show the color variations possible. Students can refer to these tests since the set-up remains essentially the same, thus minimizing waste of their own plates to make tedious tests. This simple technique affords exploration in the realms of pseudoscopic imagery, multiple exposures, juxtaposition of two different objects in the same holographic space, self-portraits by holographing plaster casts of their faces, etc. Making an image plane hologram using the real image of a previously made Denisyuk hologram is an optional project. The more ambitious students try to make duo-color holograms using triethanolamining techniques.

The students move onto four weeks of single beam transmission hologram techniques, making deep scene holograms, division of amplitude

holograms, open-aperture or pseudo-achromat copies of the latter, or cylindrical holograms[5]. They witness the effect of looking at these holograms without the proper replay conditions, i.e., white light instead of laser, real instead of virtual image, to see how these transformations can create some interesting new effects that can go beyond anything ever seen before. Simple diffreaction gratings are explored; favorite tricks are to use them to project rainbows onto the wall or to use a televison as one of the replay beams.

The end of the first semester introduces the one-step rainbow shadowgram[6], also known as "holographic silk-screening." The instructor generates a color palette calibration hologram as a guideline for the students, who use 2-D high contrast and photographic imagery or 3-D objects to make some very interesting statements.

2. Holography II

The curriculum for the Holography II class is more subject to change as it must fit the needs of students at a variety of levels inasmuch as there are some who have repeated this class several semesters. The topics covered are rainbow hologram masters and transfers, with means of controlling the color taking up one of the semesters per year and reflection holograms made from transmission hologram masters, the other. The Holography II students also have access to the SAIC holographic stereogram printer.

The optical layout of this device was assembled by graduate students Dean Randazzo and Eduardo Kac. Over the Summer of 1989, on a budget of less than $100 for a flea market 16 mm projector and an electric typewriter chassis to move the slit (the laser and hardware were already in the lab), they made a system rivalling those at commercial holographic labs in quality to produce their own imagery taken from life or computer generated. The prototype electronic controller was built by the SAIC's very capable electronic technician, Ed Bennett, from bits and pieces of recyclable material that had accumulated at the School over the years. It resembled the guts of a pinball machine, having plenty of 'clunk and thunk' with its washing machine-like circuitry; but, just like the washers at the laundromat, this thing worked day-in/day-out for over a year without malfunction. An improved, slicker controller with thumbwheel controllers for the TTL logic and LED readouts was built by another graduate student, Matt Deschner, under Mr. Bennett's tutelage.

The original format size was an 8 by 10 inch master with slits for 48 motion picture frames to be transferred to an 8 by 10 inch copy film. Expansion to 30 by 40 centimeter-sized masters and copy are scheduled for Spring 1991. Rainbow and achromatic white light transmission copies and reflection copies have been made from the stereogram masters, with the equipment for making them spread out over two unconnected Newport tables that were not floating. The laser and beamsplitter are on one table; the master and copy plate holders are on the other one. This

set-up is used because of the lack of collimating optics in the lab and the need to 'flatten out' the wavefronts with long throws. Microscope objectives of 5X power with 50-micron pinholes are used to provide a slowly expanding beam that is thrifty with the light. The success rate of this set-up is nearly 100%, barring film movement problems.

CROSS-SECTION OF STUDENTS

The academic profile of the current beginning holography class breaks down to eleven women and seven men, with grade levels ranging from seven freshmen up to two graduate students. Their majors vary, with a couple of painters representing the traditional art aspect but the majority involved in mechanical image-making. Four students are from the Art and Technology curriculum whose main interest lies in Computer Graphics, especially three-dimensional; three from Graphic Design/Illustration; and the rest involved with Film, Video, Photography or Kinetic Sculpture. Usually three or four students per beginning class continue with the advanced class.

Most of the Holography II students are either concurrently enrolled or have taken courses in Photography, Filmmaking, and Computer Graphics. These students are very technically literate and facile in imaging technologies; once they catch on to the basic holographic principles, they add that to their abilities in multi-media manipulations. Video is popular also amongst the holographers, but cathode ray tube displays don't holograph so well. One student made the precursor of the present stereogram machine, using a $40 liquid crystal television set as a spatial light modulator. Since the School didn't have a frame grabber, he had to stay up all night advancing the VCR frame-by-frame, using the edit button. Even if the holograms didn't turn out so well, the experience gained in assembling such a contraption was a worthy educational experience.

Although art school students are not noted for being abstract learners, they do catch on quickly to the basic concepts of wavefront recording through watching demonstrations and practical experience. This is the only way to internalize the practice of the art. Theory must, of course, be discussed, but since learning is by doing, about a third to a half of the class is devoted to demonstrations of the holograms under discussion. Hopefully, the mistakes will be made in front of them to demonstrate what they will need to watch out for or can be frustrated by, but can master. More subtle is to demonstrate the techniques of how to solve optical problems, so that they might acquire skills that could pay off for them in the job market. The skill of the holographic artist must be high, as an art piece is scrutinized very carefully; that is its sole purpose in being: to provide a medium for visual communication. A graduate of this program would make a very good applicant for a technical position, knowing the technicalities of how to make the set-ups work plus being a perfectionist.

Sometimes students think they can solve some of their financial woes by using their lab times to undertake commercial jobs. What they usually learn is that it takes much more time than they ever imagined.

The students have full access to all the equipment and resources in the holography labs (except Holography I students are limited to the smaller table for one semester). It is made clear to them that they have the responsibility to keep the area clean and leave the set-up in some semblance of working order for the next user. Communication with the succeeding student is encouraged. Teaching discipline like this can be frustrating but a necessary task, but the reward is less aggravation in the lab.

Grades

The grades for the School of the Art Institute of Chicago are Pass, Fail, and Honors. The student can assume that they will receive a 'Pass' grade if all the holographic experiments are attempted over the course of the semester, but a 'Fail' if he/she

(a) attends less than half the classes;
(b) only attempted one type of hologram;
(c) fails to show up for the Final Critique.

The student who receives 'Honors' will have attended every class and lab period and has a collected body of work showings exceptional development over the course of the semester.

Critiques

The Midterm Critique is purely a technical one; all attempts, failed or perfect, are shown. The Final Critique encompasses not only the technical aspect of the medium, but the completion of a finished project that combines a hologram and frame or display that is show-ready and which exhibits a deliberate attempt at an aesthetic statement. Notebooks, which the students are encouraged to keep for their inspirations as well as their class and lab notes, may also be examined. Graduate students are also reviewed every semester by a panel consisting of faculty members.

Expenses

The students can expect to spend about $100 on holographic plates and film over the course of the semester. The holography department supplies the necessary chemicals. Other expenses would involve expendable materials, like hot glue sticks and objects for the holograms and framing, or display items, like halogen bulbs.

All the holograms made in the School are shot on silver halide materials: Agfa 8E75HD plates or film. Since students have very little money and film is one-fifth the price of plates, they have devised ingenious methods of holding the film still during reflection hologram

exposures. Mineral spirits, silkscreen ink, Karo corn syrup, xylene and tape have been been used to stick the film to glass, all successfully but none always 100% so. Processing chemicals are chosen to yield results as bright as possible with as low a health hazard as possible. Developers used are CWC2[7] or Pyrochrome[8] and the bleach is either Jeff Blythe's copper sulfate[9] for non-shrinking playback or Pyrochrome silver solvent bleach for wavelength shifted playback.

Bibliography

These books have proven helpful:

The Holography Handbook, Fred Unterseher et al., Ross Books, 1982

Practical Holography, Graham Saxby, Academic Press, 1988

Seeing the Light, Falk, Brill and Stork, Harper & Row, 1986.

Books are optional, as the most useful ones are either expensive or out of print, so homemade handouts tailored to the School are used. Figures 1 and 2 are examples of the typical handout, taking liberties with equipment manufacturers' catalogs in that ransom note collage style that was popular about ten years ago.

As the students trickle in before class or during breaks, an assortment of the latest trade magazines, catalogs, scholarly journals and junk mail is available for their perusal.

The Fruits of the Labor

The most ambitious and certainly one of the best, if not the best, piece ever to come out of the SAIC lab was an alphabet by Alicia Magarinos. There is a 3 by 4 inch cell for each letter containing two holograms, one of them a one-step rainbow shadowgram of the letter in a variety of scripts floating in space on the viewer's side; the other, an open aperture achromat image plane holograms of objects that begin with that letter. Since these holograms use the real image of a master hologram, there are actually three holograms for each letter. This piece represents about a thousand hours of lab time, usually in 72-hour stints, and about another hundred or two hours finding the objects and mounting the final piece. This instructor was so impressed by this piece that he called it to the attention of the Dean, who then got the curator of the Junior Museum of the Art Institute to view it; consequently, the piece was included in the One Hundred Fifty Years of Photography Exhibit.

Kinetic sculptural displays are the interdisciplinary forte of Mark Bains, whose "HOLO-ZOETROPE" (holograms mounted on a spinning disc which were reconstructed by a synchronized strobe light to achieve animation) was so good that the instructor had to remove himself to the outdoors for a breath of fresh air to relieve his vertigo. Another one of Bains' kinetic pieces, made entirely out of stuff found while "dumpster

diving," takes the effort out of wavefront reconstruction by moving the holograms back and forth instead of the viewer dancing around.

The "Holo-Poetry" of Eduardo Kac, a graduate student from Brazil, has blossomed using the equipment at the School. His concept is to use words and letters in a visual context which straddles the fence between the left and right hemispheres of the brain. The word is not just a symbol, but a compositional element of the artwork. It is the space age descendant of the poems written by the Ancient Greeks about pottery, in the shape of pottery, except that now the piece can incorporate not only the x- and y-axes of the printed page but the z-axis plus the t-axis. His first piece in Chicago, "Phoenix," features the laser-replayed real image of a letter 'w' floating in a gas flame.

A piece combining holography, neon, and rubble is Hans Wolfe's "Tribute to the Granada Theatre." Holograms of photographs of the classic old theatre and its contemporary replacement are surrounded by neon, on a stand made from pieces of concrete culled from the demolition site.

Even the simple Denisyuk holograms can be a real treat for the eyes with the proper display. Eric Spruth made a mat for his hologram of a 1950's vintage Kodak with a collage of period advertisements. A hologram of a Roaring 'Twenties hip flask is matted with grapes; navigational instruments are matted with a map.

Dean Randazzo uses his family's archives going back a generation or so to create a genetic holographic memory field. Photographic transparencies and home movie footage are holographically layered between two plates mounted on a free-standing base, and these white light transmission holograms are lit from both sides so that the viewer can walk around the sculpture and see a variety of images.

Conclusion

The School of the Art Institute of Chicago, although founded in the Nineteenth Century, is a training ground for the artist of the Twenty-First Century. Holography is just one category in the larger field of high-tech art, including laser sculpture, kinetics, robotics, and computer graphics which are also taught here, and all of them can be brought together in mixed-up media art pieces. SAIC is unique amongst art schools in its holographic facilities, and it is hoped that the alumni of this program will develop more programs like this one throughout the world, not unlike the spread of photographic education in the 'Sixties and 'Seventies.

Students at the SAIC are among the most intelligent and capable that I've seen on the several campuses on which I've worked. It is the fervent wish of this instructor that his students will succeed in excelling their instructional level at the SAIC and thus push the frontiers of the medium farther out into the universe.

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