

V I C I A I



PROCEEDINGS

EDITED BY
JOHN GRIMES AND
GRAY LORIG



SIGGRAPH '92



ACM SIGGRAPH '92

July 26-31, 1992

Chicago, Illinois

Sponsored by the Association for Computing Machinery's Special Interest Group on Computer Graphics in cooperation with the IEEE Computer Society's Technical Committee on Computer Graphics

The Association for Computing Machinery
1515 Broadway
New York, NY 10036

Copyright ©1992 by the Association for Computing Machinery, Inc. Copying without fee is permitted provided that copies are not made or distributed for direct commercial advantage and credit to the source is given. Abstracting with credit is permitted. For permission to republish, write: Director of Publications, Association for Computing Machinery. To copy otherwise, or republish, requires a fee and/or specific permission.

All product names printed in this publication are trademarks or registered trade names of their respective companies.

Additional copies may be ordered prepaid from:

ACM Order Department
PO Box 64145
Baltimore, MD 21264

(800) 342-6626
(301) 528-8596 fax
(301) 528-4261 Outside U.S., MD, and AK
email inquiries to: acmpubs@acmvm.bitnet

ACM Order Number: 428922

ACM Soft Cover ISBN: 0-89791-423-7

ACM Series Hard Cover ISBN: 0-89791-499-6

Edited by John Grimes and Gray Lorig

Design by Vicki Putz Design

Front cover image (top) produced by Videosystem

Front cover image (bottom) by Ryoichiro Debuchi

Back cover image by William Latham



PROCEEDINGS

The Art and Science of Computer Graphics

Art Show 2 | Reality Versus Imagination 42 | Aspects of the Aesthetics of Telecommunications 47 | Artistic Frontiers in Virtual Reality 58 | Art Show Committee and Jury 64

Electronic Theater 66 | Electronic Theater Committee and Jury 98 | Computer Graphics Screening Room 99 | Art Show Animation 108 | Art Show Contact Information 110

INTRODUCTION

The idea of creating a Visual Proceedings originated early in the planning of SIGGRAPH '92. The traditional *Conference Proceedings* documents the current state of technical and algorithmic knowledge. It has a life beyond the conference and has an enormous influence on the software and hardware features that will become generally available to the users of computer graphics. We believe that SIGGRAPH also needs a permanent record of the most creative applications of hardware and algorithms. For 1992 our answer is a second volume, the *Visual Proceedings*, which combines the art show and electronic theater catalogs into a single publication that will be available beyond the time horizon of SIGGRAPH '92.

The art show and the electronic theater present some of the most visually interesting applications of computing. Unlike the technology on which they are based, these works do not, if they have any lasting claim on our attention, get better. Technology improves; art changes. Past work does not become obsolete. Newer and more powerful methods may change the vocabulary and the range of issues that the contributors to the art show and the electronic theater address, but in these areas the need for a permanent record is arguably more important than in areas where the most recent work is the best work.

The combination of venues in this volume also acknowledges the blurring of distinctions between media that is a consequence of changes in the intellectual discourse concerning the nature of author/audience relationships and the concomitant extension of technological capabilities. Virtual reality, real-time interaction, computer-assisted performance, multimedia, collaborative work, and structured graphic telecommunication do not neatly or naturally sort themselves into the overlapping and ill-defined categories of artwork and animation. Also this year, the electronic theater and the art show share a projection and performance space which presents the art show reel, the screening room material, and live performance.

THE ELECTRONIC THEATER serves several functions. First and foremost it provides a forum for the recognition of the year's most exciting new work in computer graphics. Entries for the show are judged on technical as well as aesthetic merit, with particular attention paid to new and innovative applications. We realize

that computer graphics has never meant just animation and that the field is quickly expanding to include applications and specialties unheard of only a few years ago. In response, the electronic theater has taken on the role of stimulating interest and educating the audience in the range of time-bound computer graphics in all of its emerging forms. Lastly, the electronic theater must entertain. Its role as showcase and educator would go unheeded if it were not for the sheer pleasure of attending the show. For many of the approximately 13,000 show-goers, the electronic theater represents the high point of the conference. The show audience is thoroughly diverse. It is only through maintaining these varied elements that the electronic theater has and will continue to offer something of interest to everyone.

THE ART SHOW has a broad charter. It presents any and all applications of computer graphics and interactive techniques in which the visual or experiential product utilizes the unique qualities of computing technology to embody the content of the work. The number of distinct areas of inquiry is so great that each year only a few of them can be sampled. This year, in addition to two- and three-dimensional work of significant interest, telecommunications is represented by three large-scale experiments. Performance and virtuality are also represented. The *Visual Proceedings* is, of necessity, visually dominated by static images. The essays included here point to the experiential and transactional modalities that are most in evidence in the "performances" of the art show and the electronic theater during their one week lives.

The *Visual Proceedings*, like its predecessors, is a printed volume. Hardcopy, it is said, is the last refuge of fools. Witness fax versus modem. While the printed form is adequate for the reproduction of static works and probably the best for linear text, it has never been adequate for the electronic theater. Videotape has served as an admirable palliative. CD ROM seems to promise a path to a more complete visual record in the future, but that path will inevitably be littered with the rubble of obsolescent standards, copyright disputes, and lost data—unrecoverable and invaluable.

For now, welcome to our book.

JOHN GRIMES AND GRAY LORIG, EDITORS



SCOTT PARK
Awake | 1992
Photographic print
8 x 16 inches

A R T

S H O W

TODD WALKER

Eighteen | 1992

Artist's book, collotype

2-3/8 x 3-7/16 x 5/16 inches

DAVID S. GOODSSELL

Intimacies | 1992

Laser print

8 x 8 inches

KARIN SCHMINKE

Self-Portrait | 1992

Ink-jet printout

6.2 x 6.7 inches





RYOICHIRO DEBUCHI
The Reindeer With Twisted Horns | 1991
Ink-jet printout
70 x 100 centimeters



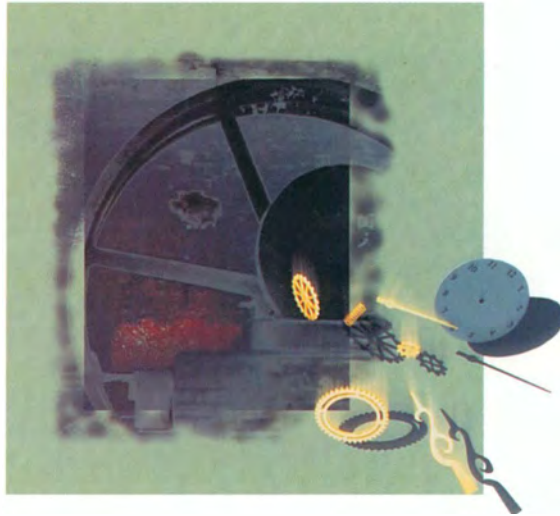
DAVID HAXTON
Synthetic Gallery No. 1 | 1992
Three views in ink-jet prints; view #2
16 x 20 inches each

ERIC W. FLAHERTY

Cycles #1 | 1991

Ink-jet printout

16 x 16 inches



RYSZARD HOROWITZ, R/GA PRINT

AT&T Steeplechase | 1991

Photographic print

18 x 38 inches

PERRY A. HOBERMAN

Exhaust & Heat Haze | 1992

Sculpture with stereo viewers

60 x 24 x 30 inches

Detour (Traveling Light) | 1992

Sculpture with stereo viewers

60 x 24 x 30 inches



61



MARSHA J. McDEVITT
Coup 1 1991
Backlighted transparency
20 x 24 inches



BILL DAVISON
Circus 1 1992
Screen print
30 x 42 inches



CHARLES R. HOFFMAN

Height Field of Slow But Happy I 1992

Photographic print

11 x 14 inches

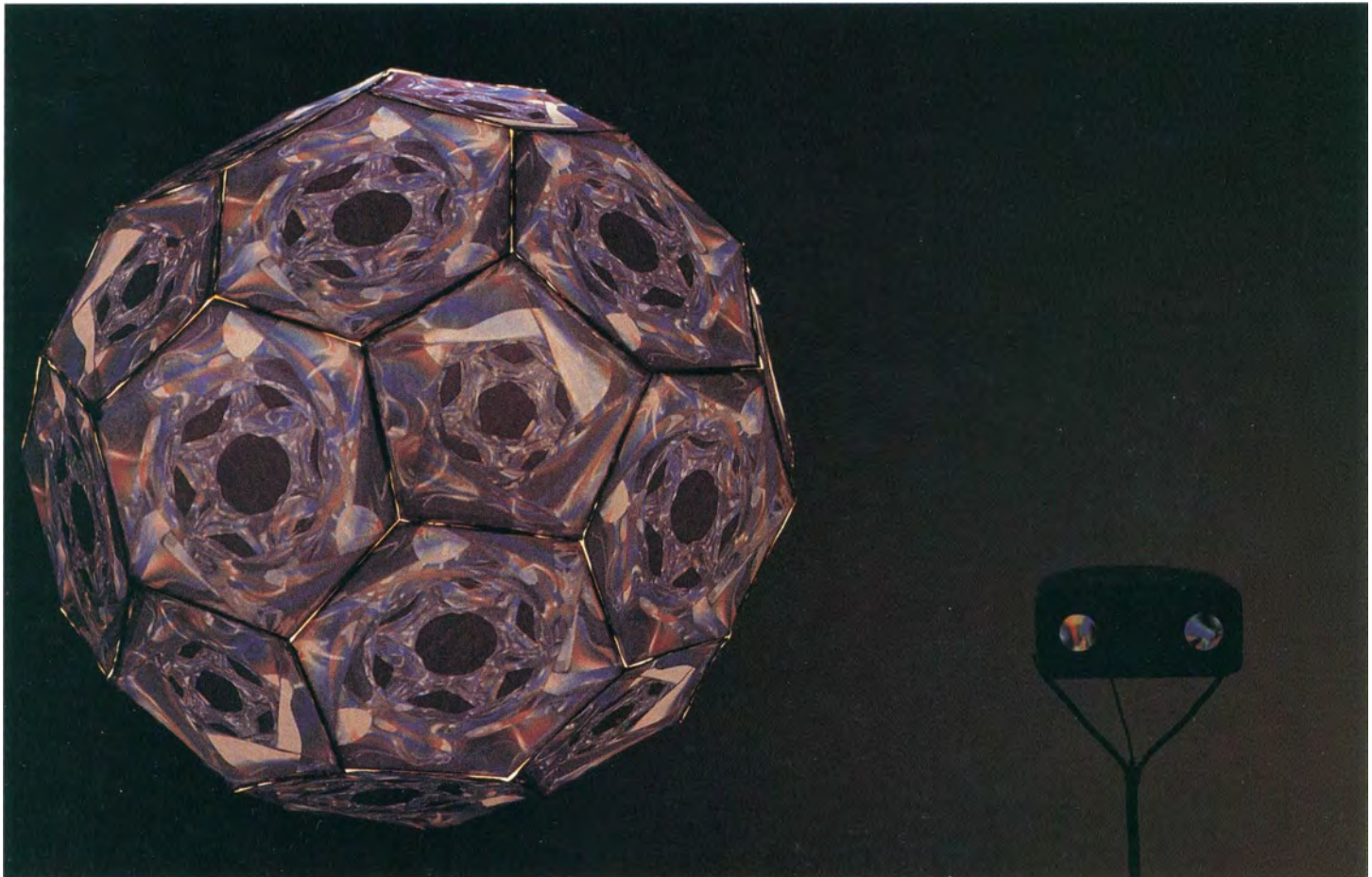
CLAUDIA CUMBIE-JONES

LANCE FORD JONES

Praxis 2 I 1992

Sculpture with Duratrans

24 x 24 x 24 inches





PATRIC OLD

Feel | 1991

Photographic print (Chroma)
20 x 30 inches

ROBERT MURRAY

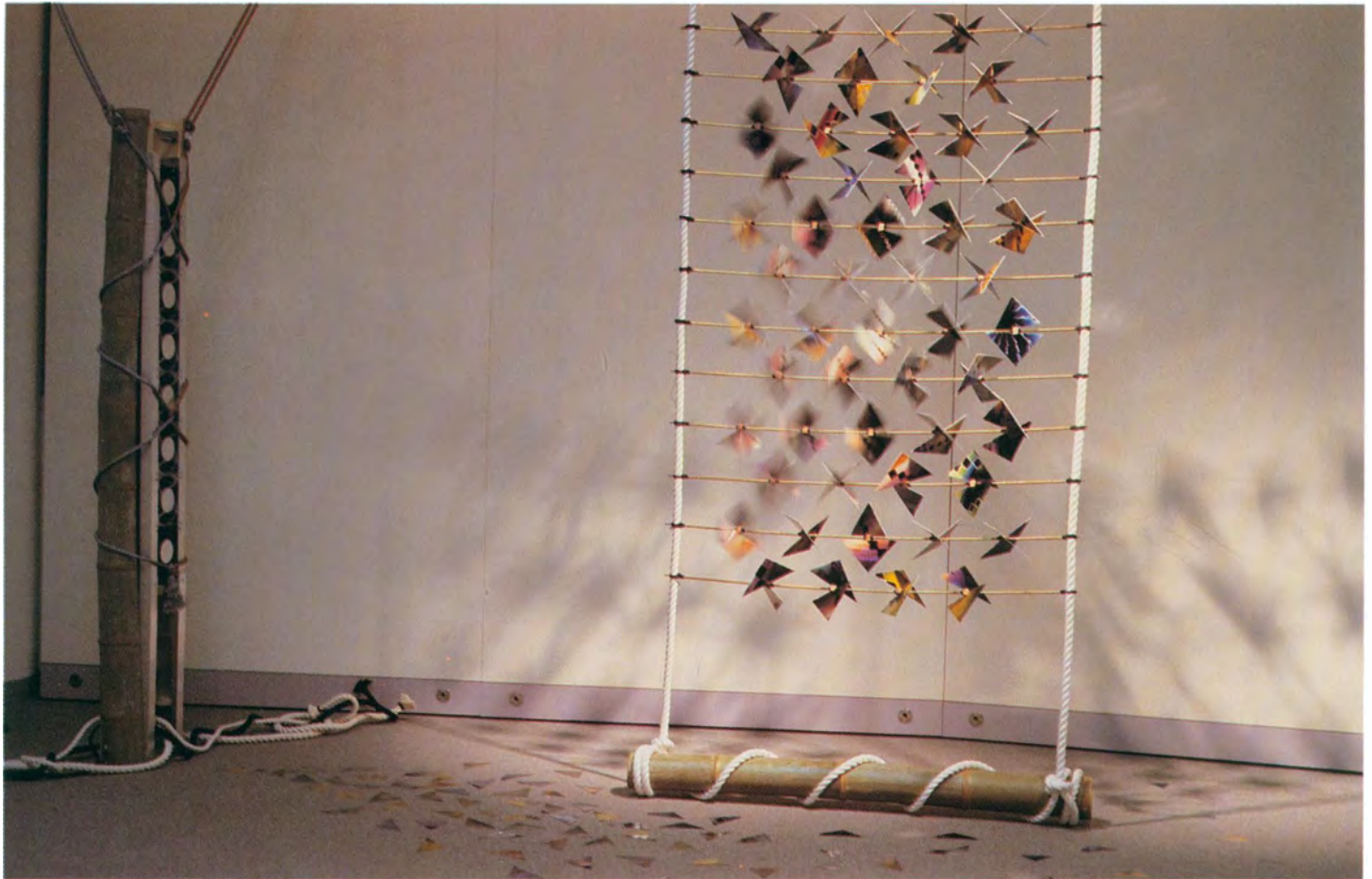
Book of Ontology | 1992

Bronze sculpture
5 x 27.5 x 13 inches

ROMAN VEROSTKO

Folia 700.
N. Diamond Lake Apocalypse | 1992

Plotter print
22 x 24 inches



110

KAY
 (MICHIKO SHIOBARA AND
 RYOICHIRO DEBUCHI)
Kazoguruma
 (Pinwheels of Schrodinger) | 1992
 Sculpture/ Installation with fans
 200 x 100 x 22 centimeters



JAY RISKIND
Loony Toms #7 | 1991
 Photographic print
 19 x 23 inches

KEES VAN PROOIJEN
function Allegro Misterioso I nd
Photographic print
30 x 40 inches



VUTIKHAI BURANASINLAPIN
Sleeping Beauty I 1992
Photographic print
20 x 30 inches



THOMAS A. DEBIASSO
Show of Hands 1992

Installation: Photographs on painted wall
8 x 8 feet





CAROL FLAX
Smoke Scream | 1990
 Ink-jet printout, billboard print
 10 x 22 feet

CRAIG A. JOHNSON
Spirits Rising | 1991
 Photographic print
 42 x 34 inches

Gypsy Tricks | 1991
 Photographic print
 42 x 34 inches



FACING PAGE

VIBEKE SORENSEN

*Experiment in
Depth Perception #2* | 1991

Photographic print and viewer
30 x 40 inches

KENT ROLLINS

Entern | 1992

Photographic print
10 x 8 inches





16

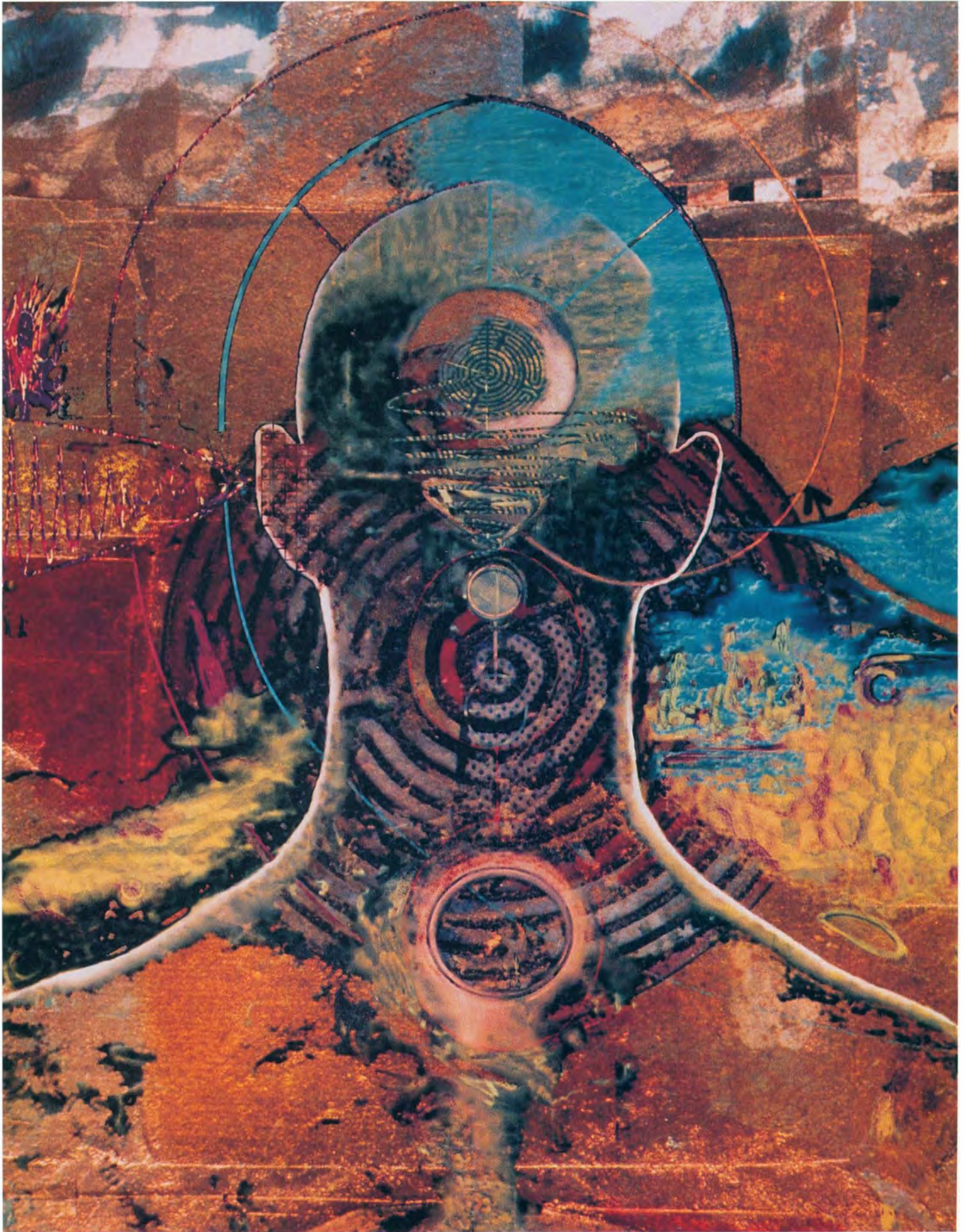


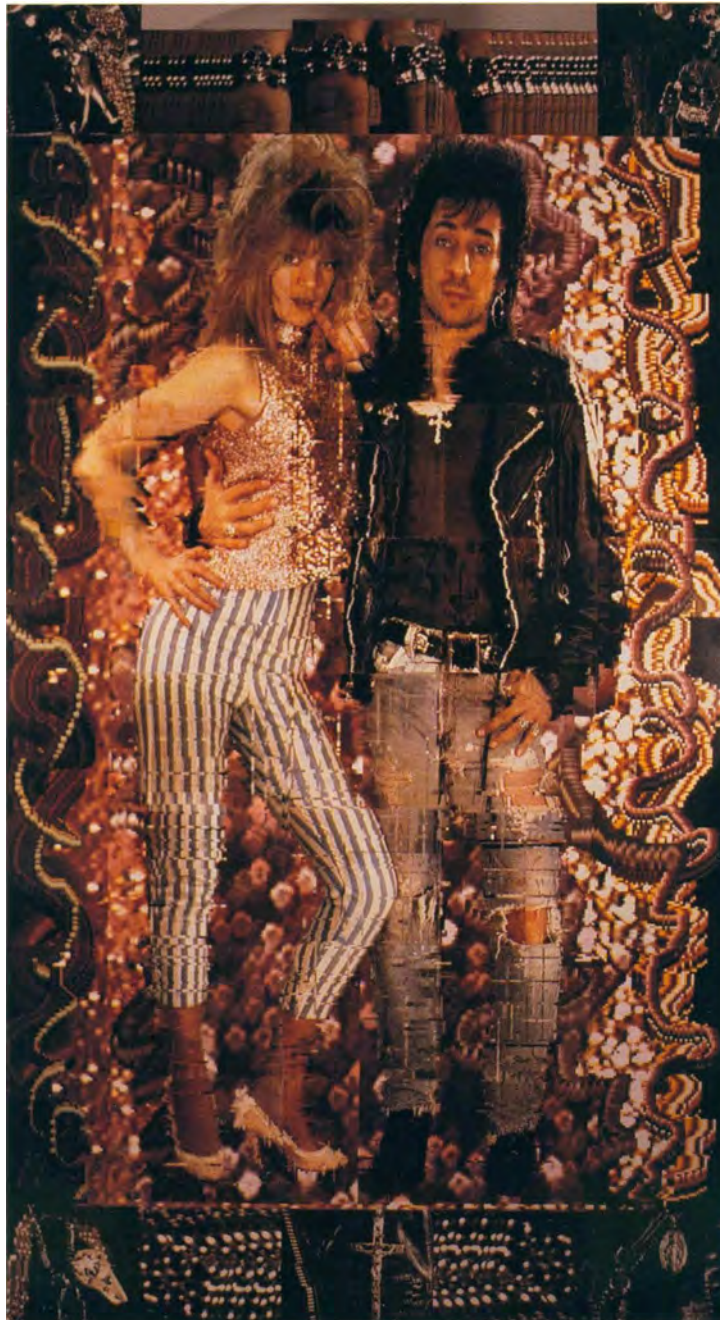
JEAN-PIERRE HEBERT
Querelle De C'eau Et De La Terre | 1991
Pen plotter drawing
40 x 29 inches

PHILLIP GEORGE
Headlands Mnemonic Notations | 1992
Installation view

FACING PAGE

Headlands Mnemonic Notations | 1992
Ink-jet printouts (detail)
7.5 x 5.2 feet



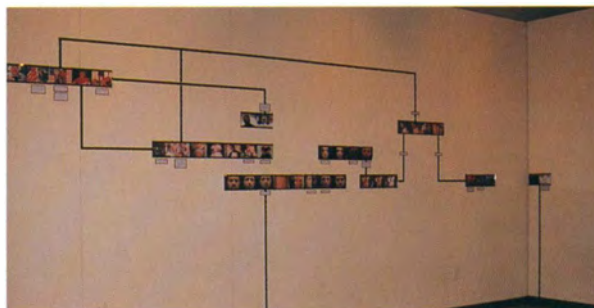


| 18

GREGORY P. GARVEY

Ted & Liza 1991

Thermal printout
6 x 3 feet



BILL CURTIS JR.
ROBERT HAMILTON JR.

Skin State 1991

Installation of ink-jet printouts
5 x 25 feet

DAVID PERLMAN

Alice | 1991

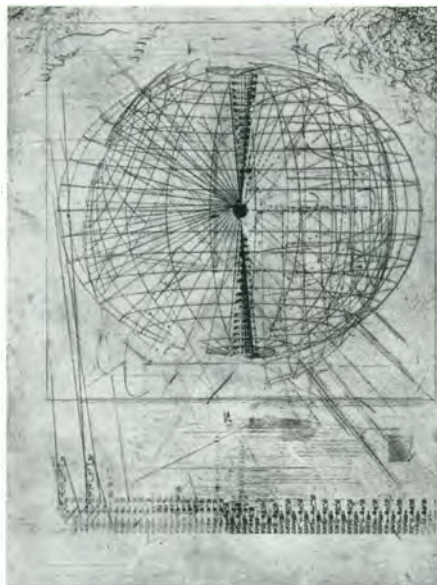
Laser printouts with photograph
39-1/2 x 23 inches



STEVEN M. HERRNSTADT

Nova Scotia Rainfall | 1990-1991

Intaglio
30 x 22 inches





LEAH SIEGEL
Map.d | 1991

Photographic print from a laser print
50 x 40 inches



STEVE BRADLEY
We Save You More Money | 1991

Prismocolor thermal printout
11 x 30.75 inches

Taking Stock | 1991

Prismocolor thermal printout
11 x 30.75 inches

ANNE MORGAN

*1,2,3...n,n+1..., Rate X Time = Distance,
Time Stops and The Moment Expands Outward* |
all 1992

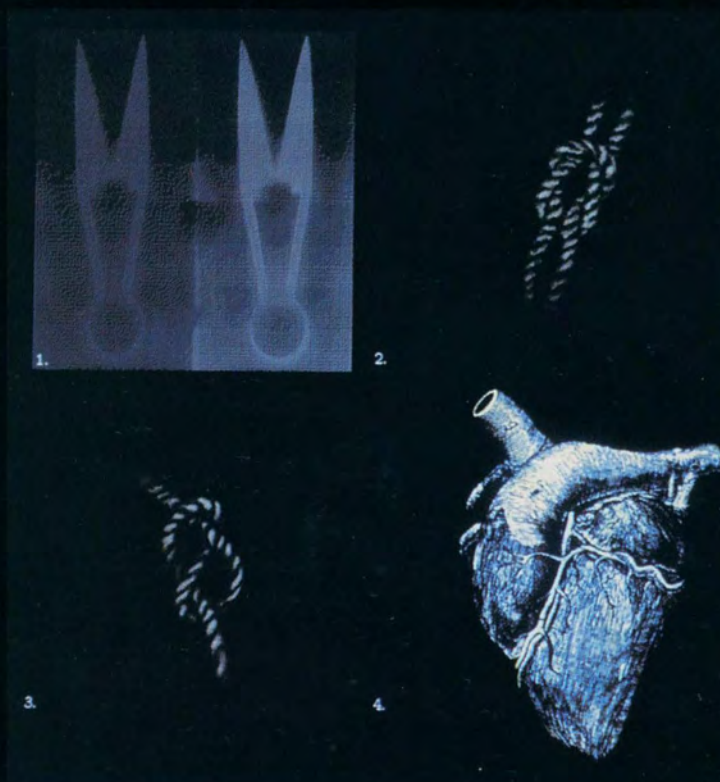
Laser printouts
20 x 17 inches (total)



KAREN HILLIER

Cardinal Points | 1992

Backlighted black-and-white transparencies (detail)
21 x 29 inches





FACING PAGE

(ART) LABORATORY

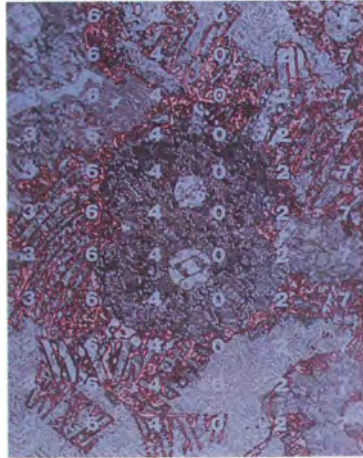
Castañuellas, Comunicación, Energía I
1992

PHSColograms (barrier-strip
autostereograms)
30.5 x 30.5 inches each

KATHRYN FOOT

Figures of Eight I 1992

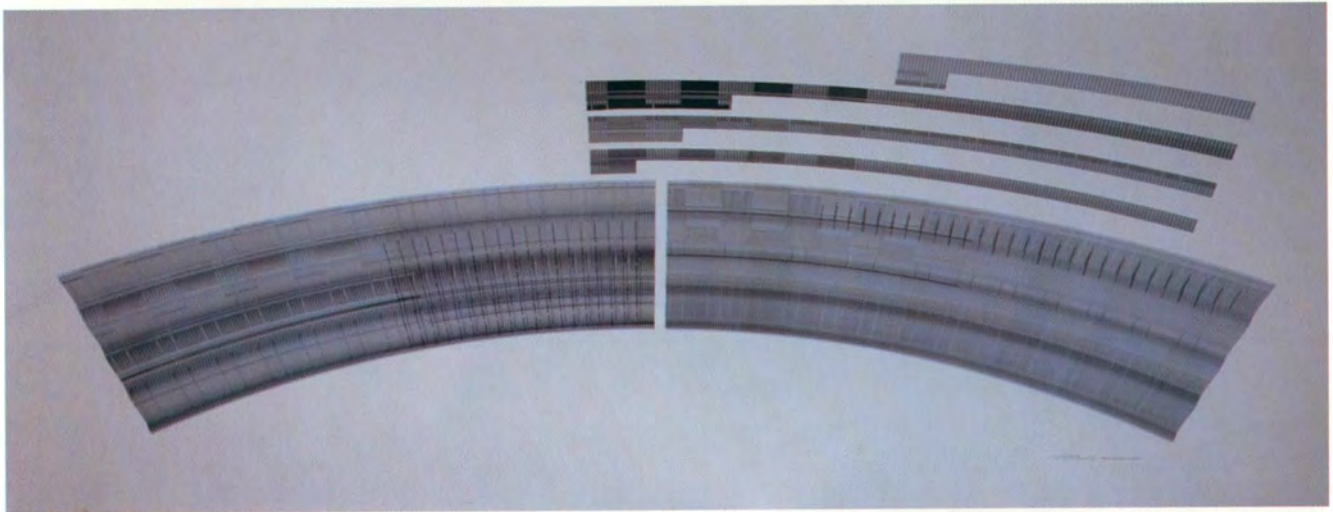
Photo etching
12.5 x 10 inches



MARK WILSON

18690 I 1990

Platter drawing
36 x 96 inches







CHAR DAVIES
Stream I 1991

Backlighting transparency
4 x 6 feet

FACING PAGE

MARKUS RIEBE
Ratte-1 I 1992

Aerosonic print (computer airbrush)
190 x 190 centimeters



JOHN F. SHERMAN

Signing | 1991

Linotronic print on wood
4 x 6 feet

FACING PAGE

BLAISE PORTE

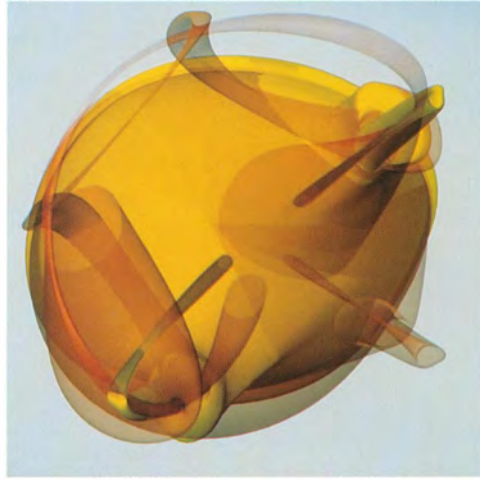
Thanks To Viewers Like You | 1991

Mixed media
36 x 36 x 10 inches



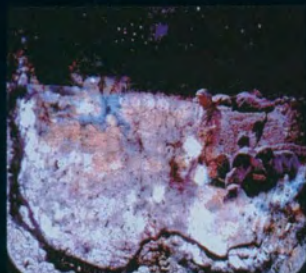
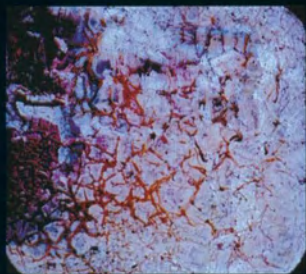
PATRICK GARRET
Calligraphy I nd
Intergraphy (Stereogram)
41 x 30 x 5 centimeters

SUI MORITA
Onyx On Torus I 1991
Ink-jet printout
32 x 40 inches



28





ERAN STEINBERG
X-Mas Story | 1991
Backlighted transparencies (3 pieces)
11 x 11 inches each

LESLIE WILSON
Gathering, Production, Progress | 1991
Mixed media

DEBORAH P. KLOTZ

Winged Yam I 1992

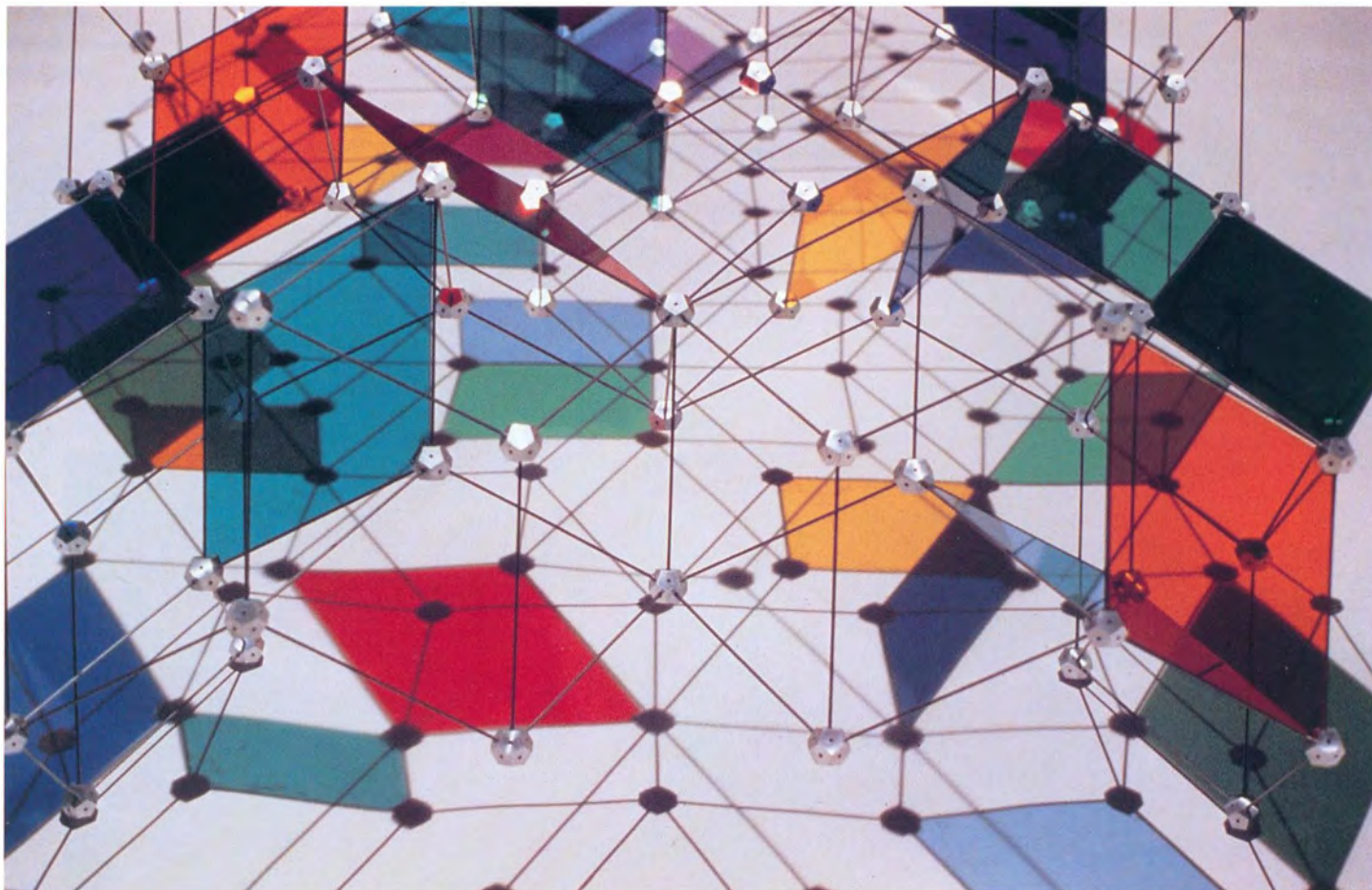
Ink-jet print transferred to wood with
gold leaf, varnish, wood dye
78 x 60 x 6 inches





PAMELA HOBBS
Smart | 1991
Iris Print
30 x 20 inches

ROGER DADE
The Call of the Piper I | 1991
Etching
27 x 43 inches



32



TONY ROBBIN
Quasicrystal Sphere | 1991
Aluminum, stainless, and plexiglas
7 x 7 feet

ERIC EGAS
Pe One | 1991
Pen plotter drawing
6 x 32 inches



ANDREW C. DECK

Do String Heads I 1991

Laser printout

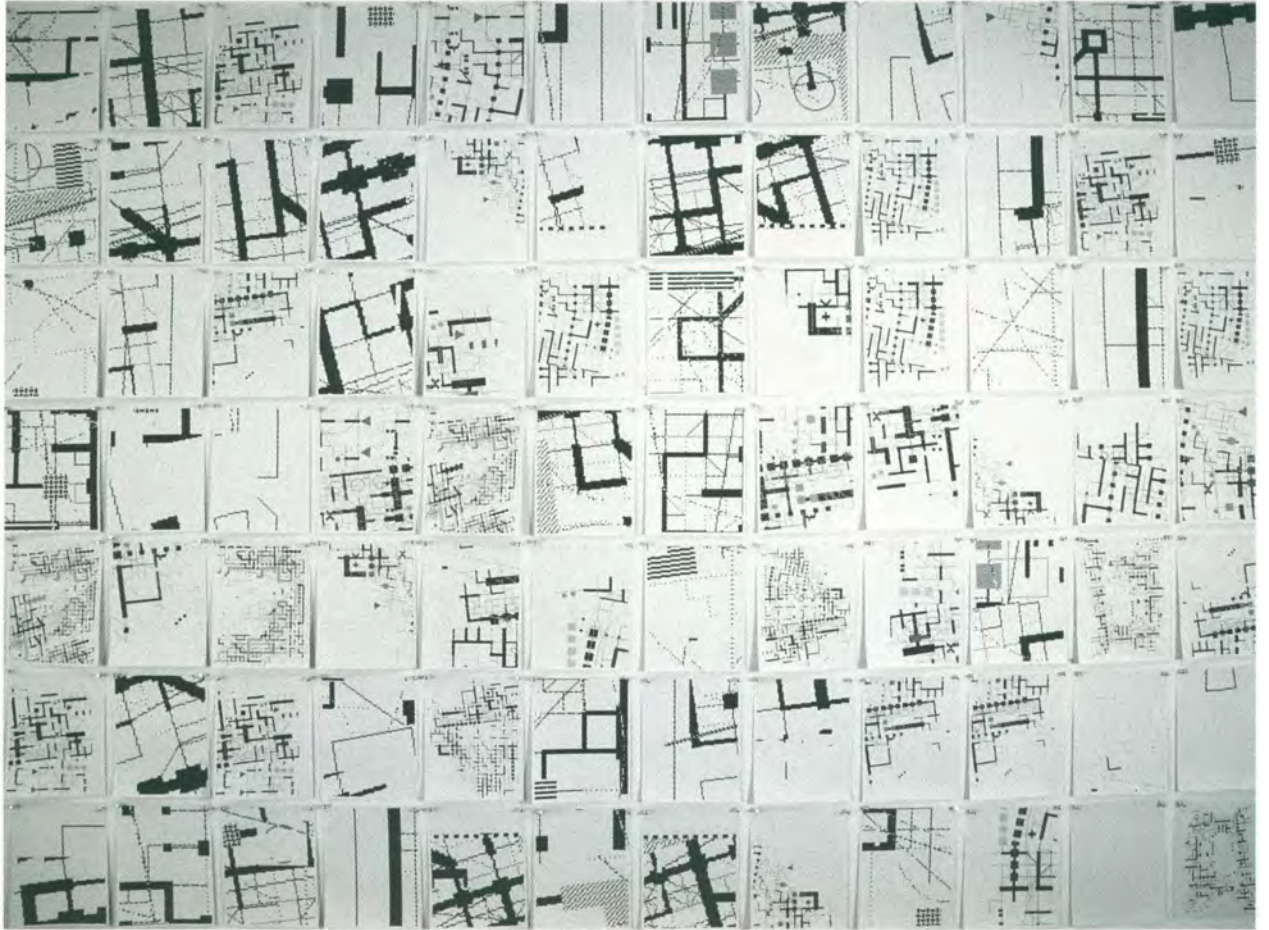
8 x 8 inches

BRUCE AND SUSAN HAMILTON

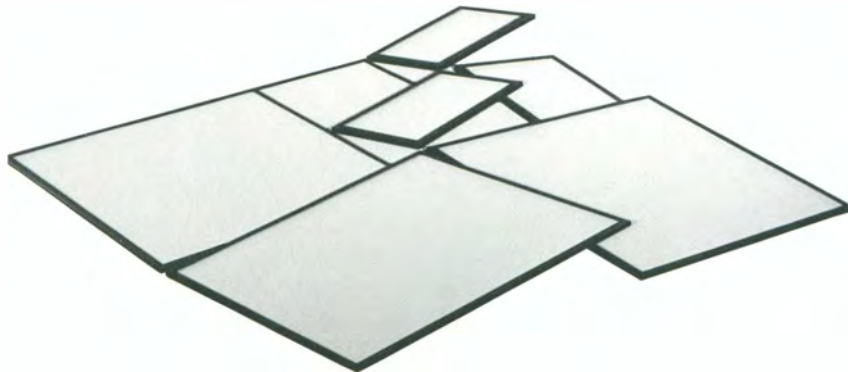
Venus of The Planes I 1992

Canvas sculpture

48 x 19 x 7 1/2 inches



| 34



MADGE GLEESON

Blind Man's Bluff | 1991

Installation of laser printouts
84 x 108 inches

STEPHEN KELTNER

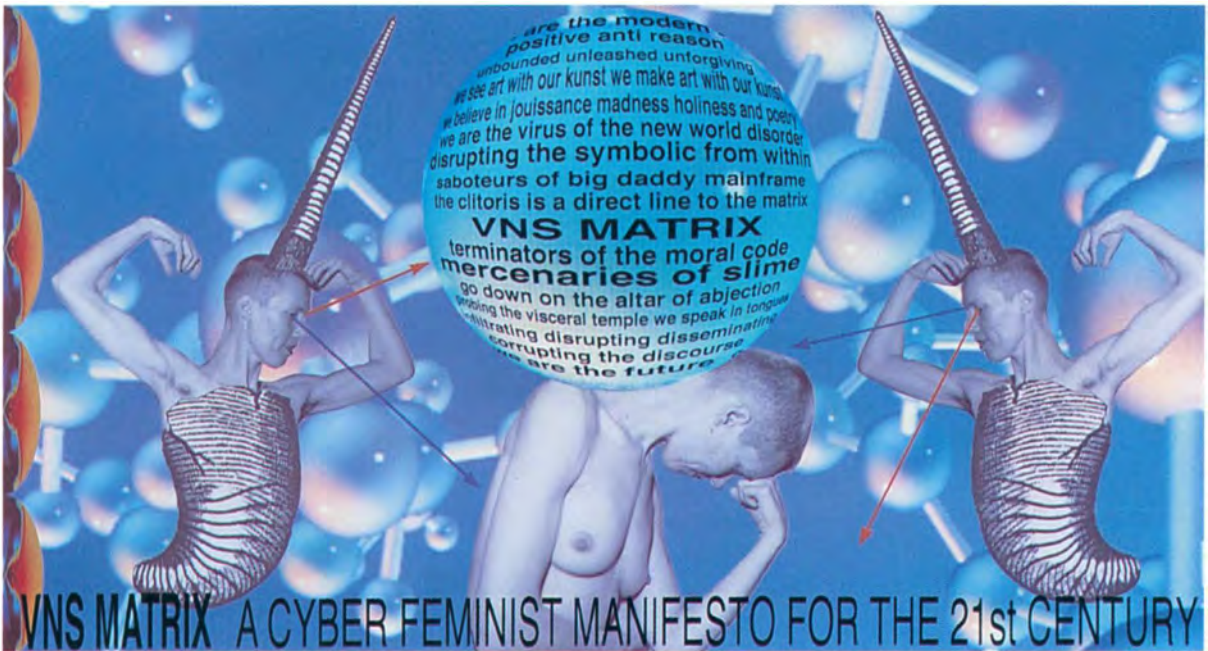
D-3 untitled Angle | nd.

Sculpture
27 x 64 inches

MICHAEL D. COTE
High-tech Flower 1991
Cibachrome photographic print
15 x 20 inches



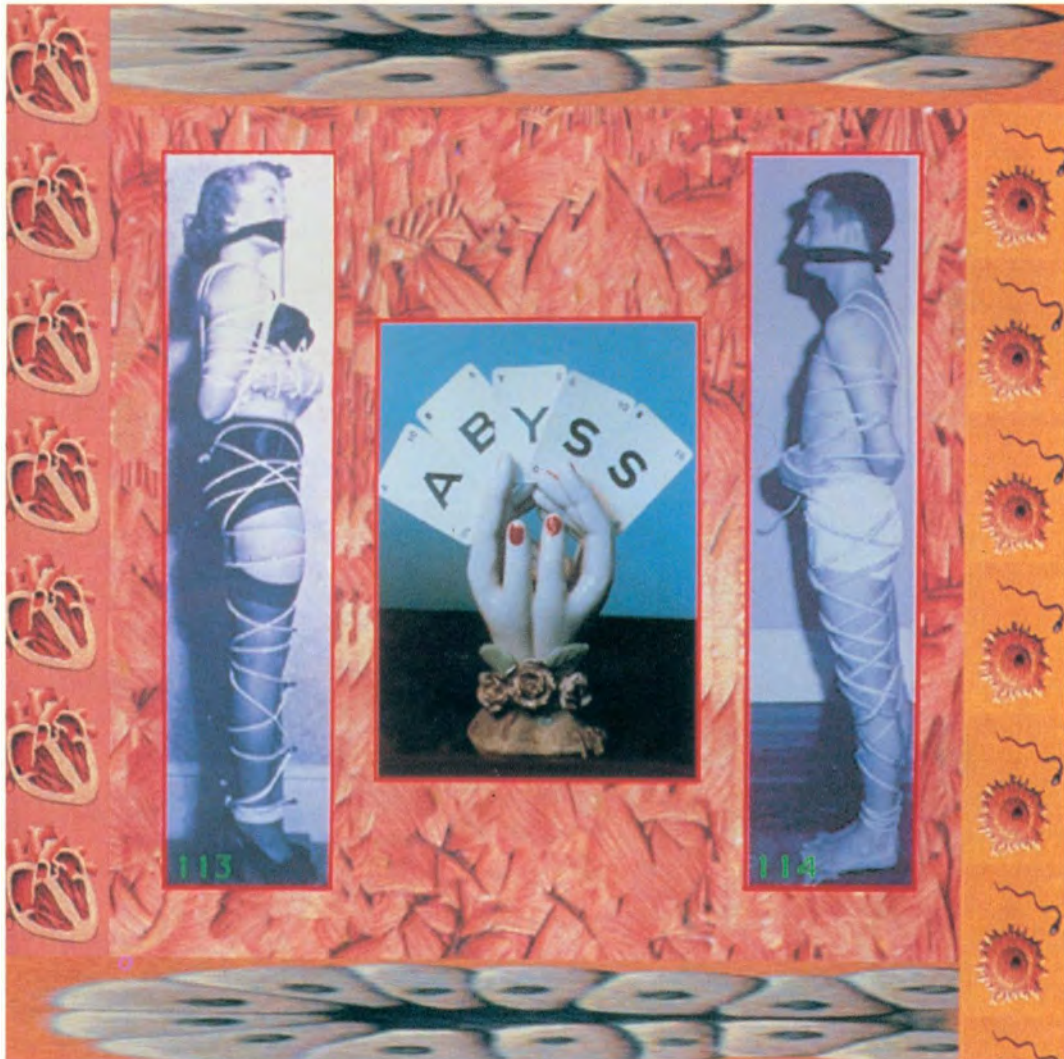
VNS MATRIX
(ARTISTS' COLLECTIVE)
VNS Matrix 1992
Photographic print
1 x 2 meters



STEVE DAVIS
Close Inspection | nd
Photographic print
11 x 44 inches

STEWART MCSHERRY
trans bowl 2A (revisited) | 1991
Ink-jet printout
30 x 36 inches





JOSEPHINE STARRS
Abyss I 1992
Photographic print
39 x 39 inches



WILLIAM LATHAM
Mutation X | 1991
Photographic print
5 x 5 feet



KEN GOLDBERG
CLAUDIA VERA
Inter Caetera Divina

This installation explores the relationship between maps and technology. Maps are a product of civilization; their changing boundaries trace the lines of history and of the future. What is the role of information technology in bringing us closer together while defending and extending these conceptual lines?

To emphasize the ethereal nature of the lines drawn and redrawn through history, we use an instrument of modern technology—the industrial robot arm—drawing on a translucent paper. The combination of computer technology with traditional media creates a contrast of structural elements. In the background of this time-processed theater, computer-manipulated images of birds and everyday objects are projected to represent the futility of lines drawn over nature. Robot courtesy of ABB Robotics.



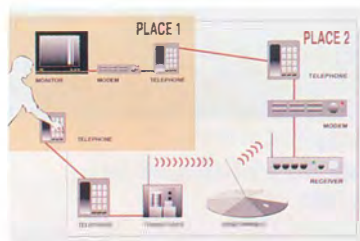
BARBARA NESSIM
Random Access Memories 400

The participant is invited to produce a customized book of Barbara Nessim's drawings by choosing one of eighteen national flags on a Macintosh screen. Software then randomly orders a selection of fourteen drawings from a potential pool of 400 and produces a document which is laser printed and assembled by the viewer. Through random selection, each book is potentially unique. This means of self publishing is only a part of the piece. A more important aspect is the use of the computer as a repository for an extended, years long body of work which will continue to grow. *Random Access Memories 200* was exhibited at SIGGRAPH '91.



CRAIG HICKMAN
Dry Reading

An artist's book exploring personal history, technical notation, and evaluation displayed in framed panels as well as in printed form.



EDUARDO KAC
Omitorrinco

Omitorrinco (platypus in Portuguese) is a telepresence artwork. It provides the conditions for a participant to experience presence in a remote and decidedly odd space. This is accomplished by allowing a person to see through the eye of a telerobot and to control its motion. By employing regular telephone lines, this project launches the concept of personal telepresence. It generates an experiential context which the participant explores. Two main features of the project are 1) the creative solutions the participant improvises in configuring a "strategy of vision" and 2) the organization of the remote space, which takes a number of forms (installation, maze, mirrored environment, etc.). Special thanks to Steven Waldeck and Joan Truckenbrod of the School of the Art Institute of Chicago and to Geof Goldbogen, Academic Computing Department, Columbia College, Chicago.



MYRON W. KRUEGER
Somewhere Elsewhere

Since conventional reality is already in abundant supply, there is no point in merely duplicating it with computers. Instead, we can explore new kinds of reality in which the laws of cause and effect are composed from moment to moment. In this piece, reality itself will be one of the performers. Two dancers, each in a VIDEOPLACE environment, dance together in a three-dimensional scene projected before the audience. At the same time, one of them is also dancing with a third dancer in a second VIDEOPLACE world projected onto a second screen. Thus, her performance occurs in two distinct contexts simultaneously. Every action has a different consequence and a different significance in each world. At times, the worlds themselves are created in real time by yet another participant sitting at the VIDEODESK.

This performance is enabled by the loan of two VGX440s from Silicon Graphics Computer Systems and the loan of four high-resolution video projectors from Esprit Projection Systems. Katrin Hinrichsen provided engineering support for the project.



BEVERLY REISER

HANS REISER

Life on a Slice: Temple of the Goddesses

An interactive video/computer installation that explores choice making. It provides an environmental metaphor for decision-making based on information slices.

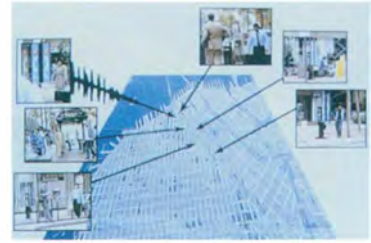
Music by Bill Fleming. Hans Reiser's participation courtesy of The IBM Research Center at Almaden.



DANIEL SPIKOL

Digital Diorama: an Evolving Documentary

An installation is based on the concept of an electronic town meeting. The viewer can witness and participate in a community discussion on the issues of waste disposal and pollution. The ongoing discussion is stored in the computer as a multimedia document including digital video. The viewer watches a base documentary of interviews with civic leaders. The viewer is in control of the viewing process and may stop the "meeting" and respond by video-recording him or herself into the piece. Since this is an interactive environment, the video clip is not inserted into a linear path, but into the category chosen by the viewer/participant.



STEPHEN WILSON

Is Anyone There?

For one week a computer telemarketing device made hourly calls to selected pay telephones, engaging whoever answered in conversations about life in the city. This information has been digitally stored. The installation allows viewers to interactively explore the city via a database of these recorded calls and digital, Quicktime movies of life near the phones. It appropriates the often intrusive computer-based telemarketing technology, using it in a new way. The installation challenges the safety of passive art viewership by shifting occasionally into real-time mode and automatically placing live calls to the pay phones, linking the viewer with a real person on the street at the location on the screen.



JILL SCOTT

Paradise Tossed

An interactive survey of technological terrain, architecture, transport, and design from a woman's point of view. Using domestic technology as a metaphor for human interface, it explores scientific and industrial technology from four time periods: 1900, 1930, 1960, and 1990.



STELARC

Performance for Amplified Body with Third Arm and Robot

Through the use of biosensors Stelarc is able to extend the boundaries of the body with technology. In this performance he integrates an industrial robot as well as his virtual, third arm into his cybernetically amplified person. Thanks to the Advanced Computer Graphics Laboratory, Royal Melbourne Institute of Technology.



VINCENT JOHN VINCENT

FRANCIS MACDOUGALL

SUE WYSHYNSKI

Freefall Cyberball

A virtual ballet in zero gravity, *Freefall Cyberball* is a melding of virtual sports, dance, acrobatics, and video games in a single-user, audience-impact experience. This form of Mandala World analyzes three-dimensional space information through two cameras. It also features 3D, rendered computer graphics.

CARRIE HEETER

PERICLES GOMES

MICHAEL MILLER

3-D SpaceTime

An interactive installation combining ENTER 3-D stereoscopic, video laserdisc, and codec technology with Mandala second person virtual reality on an Amiga computer. The live chromakeyed participant becomes part of a 3-D, stereoscopic, motion video environment. The participant experiences a curious and compelling transformation upon entering the photorealistic, interactive, virtual space seen on a life-sized screen. Initial research by Michigan State University shows that participants feel as if they are entering a different world. People report a strong desire to interact.

Kit Galloway

Sherrie Rabinowitz

The Electronic Cafe International

The Electronic Cafe International (ECI) of Santa Monica, California is in operation at SIGGRAPH '92, providing a forum for tele-interactive art. Through ISDN networks, voice lines, and videophone, SIGGRAPH '92 is connected to mobile ECI at Dokumenta 9 in Kassel, Germany and *La Cite's* (Paris') Man and Communication exhibit. Both of these events are simultaneous with SIGGRAPH '92. They are geared toward mass audiences and feature compressed video transmissions of performances taking place at the two sites, remote control of environmental conditions, collaborative painting, and other uses of the network.

Additional connections exist to Japan and the rest of eastern and western Europe, including Bulgaria. During performances in France and Germany, those sites act as hubs linking participants to the SIGGRAPH site. Chicago acts as a hub for still imagery from the US, and participants in Chicago are connected to all other sites around the US and the world.

IMAGES ON-LINE

During the week of SIGGRAPH '92 individuals and groups from around the world may submit images for exhibition in the art show by means of e-mail or file transfer protocol from any location having network access to Internet. Through the high-speed network connection (T3) to the SIGGRAPH conference site, resolution (file size) is not an issue. These images may be in almost any file format. They will be juried as they are received and all serious submissions will be printed on site using a high-resolution, full-color printer (up to 3K by 4K at 24 bits) and displayed on a large wall. When the wall fills, the next image will be displayed over the least recently received. During the week this changing wall of images presents the flow of visual information and the range of computer imaging around the world.

JUDITH MAYER, PRODUCER

Rosetta Stone

Artists in Chicago and at remote sites interact through ISDN technology in a number of cooperative experiments in real time, in the interactive telecommunication space represented on a video wall at the conference site.

The *Rosetta Stone* is an interactive telecommunications "white board" which enables artists from different locations to draw and create together as if they were in the same room working on the same canvas. Artists can send and receive text, graphics, drawings, video, and voice. This interactive space/image is alive, a medium of constantly evolving communication and collaboration. By breaking through the usual boundaries of language and geography, artists can share their histories, their art, and their personalities.

Artists and programs from San Jose State University CADRE Institute (Computers in Art, Design, Research, and Education): Dr. Kathleen Cohen, Pat Coleman, Brian A. Kromrey, Hassan Ebrahimi Nuyken, Joel Slayton.

Technical assistance, software, and hardware from Adobe Systems, Compression Labs Incorporated, Fractal Design, IIS Technologies (a division of Bell Canada), Macromedia, Network Express Incorporated, Nippon Telegraph and Telephone Corporation, Pacific Bell Market Application Development Group, Pioneer, RasterOps, RGB Spectrum, Anthony Templer, Wacom Technology Corporation, *Leonardo*, the Journal of the International Society for the Arts, Sciences, and Technology.

THE S.L.A.D.E. CORPORATION

International Pointing Interactive

Artists at remote sites around the world work cooperatively by telecommunication on interactive paintings existing in cyberspace and visible on a video wall at SIGGRAPH '92.

Executive Producers/artists: Stephanie Slade, John Peterson. Artist coordinator: Victoria Vesna. Video Wall: Mary Duda, producer; Sean Kilcoyne, director; Miroslaw Rogala, guest director. R&D Technology: John Peterson, David Cook, and Bill Romanowski

Participating Artists: Thomas Anshutz (Berlin, Germany), Stephen Axelrad (Long Beach, CA), Leah Berkowitz (Jerusalem, Israel), Jose Bertrand (Barcelona, Spain), Michael Bielicky (Prague, Czechoslovakia), William Crutchfield (Long Beach, CA), Linda Dement (Sydney, Australia), Herbert Distel (Bern, Switzerland), Anne Farrell (Santa Fe, NM), Mathias Fuchs (Vienna, Austria), Lawrence Gartel (New York, NY), Phillip George (Sydney, Australia), Jim Gibson (Aberdeen, SD), Lynne Roberts Goodwin (Sydney, Australia), Alexander Hahn (Zurich, Switzerland), Mayumi Handa (Tokyo, Japan), Nai-Wai Hsu (Taipei, Taiwan), Eti Jacobi (Tel Aviv, Israel), Bogdan Korczowski (Paris, France), Nancy Macko (Upland, CA), Milovan Markovic (Berlin, Germany), Maureen Nappi (New York, NY), Rossen Petkov (Sophia, Bulgaria), Thomas Porett (Ardmore, PA), William Rabinovitch (New York, NY), Anet Margot Ris (Long Beach, CA), Micha Riss (New York, NY), Joan Salinger (Irvine, CA), Misha Savich (Belgrade, Yugoslavia), Susan Scholten (San Jose, CA), Laura Semple (Montreal, Quebec), Wendy Schmidt (Berwyn, IL), Csaba Szamosy (Sydney, Australia), Shin Young (New York, NY).

Paint Software: Digital Arts and Time Arts

Workstations: Silicon Graphics Computer Systems

Pressure sensitive tablets: Wacom Technology Corporation

Network Paint Software: S.L.A.D.E. Cookware

A personal view of art and virtuality in the context of technology

Fifteen years ago I exhibited some work that explored unusual perturbations in otherwise consistent color interpolation. The gallery was a part of University College, London and several scientists saw the show. One, a Polish mathematician and physicist called Andre Lissowski, chased me up. He was interested in the work I had done and wondered if it bore any relationship to other contemporary research into what are now called non-linear phenomena—part of the field fashionably dubbed Chaos. Chaos studies were still an underground activity at that time and Andre took me along to small back rooms at the Royal Institution and ancient London Colleges where mostly young scientists along with the occasional Nobel laureate discussed the fantastic new ideas that were emerging worldwide.

There were regular visitors from overseas bringing updates that the journals were still reluctant to acknowledge and publish. Most of it went way over my head although Andre did his best to explain. His main interest was Grand Unified Theories of everything (GUT's)—a single set of laws that could describe all observable phenomena both electromagnetic and gravitational. He suggested that the universe could be like a close packed geometric ether. Chaotic perturbations in this ether would cause transient instabilities. These instabilities would manifest themselves in time as wave-like phenomena or in time-independent "snapshots" as quarks and other sub atomic particles. The elapsed time between the chaotic breakdown and subsequent reestablishment of the geometry would be equivalent to the particles' lifetime.

I asked Andre what stuff this close packed ether might be composed of. He looked at me and replied, ". Well, it may be imagination." I was pretty shocked to hear a member of what I then believed to be a rational, pragmatic discipline using such a word. Imagination, I thought, was the preserve of artists and other dreamers.

Now, some fifteen years later, we have been fortunate to witness a radical revision of cultural values and the erosion of stereotypes. Artists are now more regularly becoming involved with the mysteries of science and technology. Scientists are acknowledging the inadequacies of the rational method. It would appear that concepts like "reality" and "illusion" become less and less meaningful as their common boundary dissolves.

Nevertheless many prejudices remain and these are particularly dominant in the art world. They are, in my opinion, detrimental to the future development of the field. Art is entering an evolutionary cul-desac and seems unable to realign itself to post-industrial culture. It is in danger of becoming an outmoded decoration which, like Christmas tinsel, will be dispatched in the New Year's trash.

I believe the current problems of art assessment and marginalization, partially evidenced by the criticism of arts funding organizations, are one aspect of this crisis. Although I certainly do not agree with the detractors of the National Endowment of the Arts, it is nevertheless my opinion that the art mainstream has only itself to blame for becoming so isolated from the intellectual movements of our time that it is an easy target for cynical fundamentalist demagogues and former anti-communists in search of a new enemy. It would be unfortunate to see the current attacks on the arts as a validation of the work and working methods attacked. The vulnerability of the arts to attack by mental midgets and to cuts in governmental funding is the result of a larger crisis of confidence in the value of art which is a consequence of the diminishing accountability of the art establishment and its inability to respond to change during the past half century. Many

still labor under outmoded notions of art as subversion, material production, utopianism, and functional decoration. The art world must re-evaluate its mission. In particular, educational institutions should revise their arts curricula in order to encourage new avenues of enquiry that can revitalize the subject.

Art as Subversion

The scientific paradigm of the mechanical universe owes its origins to Isaac Newton. Other thinkers of his period, like Kircher before and Goethe after him, retained an interest in the tradition of alchemy and in holistic theologies, ideas whose roots extend back through Islam to the Greek, Egyptian and Babylonian cultures. Newton established rational enquiry and reductionism as the dominant scientific method. A polarity evolved when, in reaction, the arts adopted Romanticism as the preeminent ideology. The artist was concerned with imagination and emotion, the scientist with reality and logic. Increasingly the artist became an outsider, a commentator and critic rather than a contributor and participant.

Blake's engraving of Newton illustrates the polarity. In it Newton is bent over and perusing a rudimentary geometric diagram scrawled in the sand. Above his head the full glory of the heavens are manifest - and are ignored. Blake, an early critic of the rational method, went on in his poem *Eternity* to proclaim:

He who binds to himself a joy
Does the winged life destroy
But he who kisses the joy as it flies
Lives in eternities sun rise

With the invention of photography the immediate utility of art as visual documentation was severed. Artists like Proudhon (who is believed to be the originator of the term "property is theft") promoted the role of art as a subversive activity. In the Twentieth Century a number of art movements, particularly Dada, evolved this premise into a full aesthetic. A definition of subversion depends on the position of the observer. Nonetheless most readers, who subscribe to democracy, support the work of artists in Europe in the Thirties and Forties who attempted to ridicule and under-

mine the forces of totalitarian fascism. Whether or not the critics of the NEA would care to agree, *Art as Subversion* is a valuable contribution to a healthy society. Whether or not such activity can be effective if it results from the patronage of the very State it seeks to question is another, and equally pertinent, question that I don't intend here to address.

The leaders of the post World War II art establishment, and their students who have now risen to positions of influence, hold dear the concepts of a free and often radical art. We shouldn't be surprised therefore to find that the art mainstream and in particular the art education sector maintain this ideology as their dominant paradigm. It is my opinion that this position has now become as ossified as that which it seeks to question and that a revitalization is overdue.

Art is entering an evolutionary cul-de-sac and seems unable to realign itself to post-industrial culture. It is in danger of becoming an outmoded decoration which, like Christmas tinsel, will be dispatched in the New Year's trash.

Art as Materialism

Also in consequence to the development of photography, a number of artists, notably Post-Impressionists like Cezanne and Seurat, began to question the intrinsic nature of the work of art. Here evolves the second major theme of Twentieth Century art history. Whereas the School of Subversion is concerned with the value of the meaning, context, or consequence of the art work, the followers of Cezanne and Seurat eventually rejected all reference to the "outside" world and developed abstraction - art as itself.

With the migration of the art markets from fascist Europe to the USA in the Thirties, art for its own sake took off in a big way. It flourished in a free market economy. By the Mid-sixties the New York artist Andy Warhol was able to give a succinct answer to the post-impressionists' questions about the value of art. According to Warhol the work of art is worth just as much as you can convince somebody to pay for it.

About the same time artists like On Kawara and Sol Lewitt suggest another answer. Rejecting the self referentiality of the artifact inherent in most abstraction, Lewitt phoned instructions to assistants who actually produced the work. The loss of the artifact is of no consequence. Anybody who has access to the instructions is in possession of a "genuine" Lewitt. On Kawara gave a Japanese minimalist solution. The statement "I Am" was signed "On Kawara." A series exploring alternative parsing of the same four word sequence followed. Another series contains nothing more than the time and/or date the pieces were created. The pieces were often in the form of postcards sent to friends. Both artists rejected the intrinsicity of the work in favor of its value as a pointer to a set of ideas that it initiates.

In the work of these and other artists associated with movements like Art Language and Conceptual and Performance Art during the Sixties, art went through a transition from intrinsic, self-referential artifact to an extrinsic virtual form. It is conceivable that future historians will perceive this shift as the most important since the establishment of the perspectival (human centered) viewpoint during the early renaissance.

Evolving from material monetarist roots virtual art poses many interesting questions. Since it is by nature intangible, how can it be communicated, classified, preserved and marketed? The art mainstream has been singularly unsuccessful in coming to terms with these important issues.

Art as Utopia

The third important theme that has woven its way through the Twentieth Century has been art in the service of the establishment. Evaluation of this contribution often hinges on political rather than aesthetic ideology. I suspect that the architect of the Pentagon is, if still alive, a respected member of society. Albert Speer, architect of the buildings of the Third Reich, was imprisoned for life after the war and denied access to any kind of drawing

material—even prevented from producing formal gardens. Although most of us would, I hope, agree that Speer was working for the wrong side many might also share my feeling that his punishment—denying an artist his tools—was unnecessarily harsh. In general the heady idealism of artists who believed they were working for the betterment of society has suffered considerably in recent times. The tower blocks of the Internationalist Style remain as one of the most visible and most maligned of the contributions of Modernism.

The ideals of the Modernists have been identified with the eugenic “purist” ideologies of the European totalitarian dictatorships. This conflicts with the evidence that many of the Modernists (members of the Constructivists, de Stijl, Bauhaus, etc.) also contributed to Dadaism and the more “subversive” art forums.

What we find is that the one major art movement of the Twentieth Century dedicated to the direct service of humanity via support of the establishment infrastructures has been discredited by the art mainstream. This was achieved by both historical marginalization and by association with political ideologies that most find unacceptable. To resort to a cliché: the baby got thrown out with the bath water.

In doing this, the art world reemphasized its own “outsider,” Romantic, marginal status at precisely the time it could have recognized new and vital opportunities. In consequence its credibility with the establishment has suffered considerably and its sources of funding have become increasingly threatened, if they have not already been reduced or withdrawn

Applying Art to Life

In the Fifties, the Royal College of Art in London established what is claimed to have been the first specialist course (university degree program) in Graphic Design in the world. In these mid years of the century major changes were taking place in art education. The dispersal of the Bauhaus faculty had distributed awareness of its radical new curricula. The training of the artist had originally been

general and it was left to the student to decide whether to practice either “fine” or “applied” arts. Now specialization was introduced and it was possible to train exclusively in design and ignore the fine arts and vice versa.

In retrospect we can consider this move toward specialization, at a time when society was on the brink of a shift to more generalization, to have been a poor strategy. In particular it created marginalization. Now, as funding for arts education is being reduced, the design areas are publicly defaming the fine arts hoping to take the major share of the reduced income. In fact this sibling rivalry serves only to weaken the credibility of both areas. We should also consider that this high degree of specialization coupled with academic marginalization has weakened the ability of art or design to respond to the challenge of interdisciplinary initiatives like Scientific Visualization.

Nevertheless the founders of the School of Graphic Design at the Royal College of Art had a social ideology. Several were survivors of the fascist rape of Europe and hoped that design could be used to prevent its reoccurrence. In their vision Graphic Design would become a vehicle for the packaging of information in order to enhance its communicative potential and so enable people to better identify the issues that affected them.

In fact, over the following thirty years, Graphic Design as a discipline devolved into a decorating service for advertising and marketing. Professor John Lansdown, head of the UK’s Center for Advanced Studies in Computer Aided Art and Design, in a recent letter to me, aptly described practitioners as “the slaves of the yuppie culture.”

Bill Cleveland, a statistician and researcher at Bell Labs, has spent over fifteen years investigating better methods for graphing data. In a recent conversation with me he acknowledged that during this period he had not found any significant input from the Graphic Design discipline and that in fact he believed that designers often destroyed the value of numerical data by using poor and ineffective graphing models.

Cleveland is at the forefront of the area now known as Scientific Visualization. It is an area that has a long history in art and design as Scientific, Technical, and Medical Illustration. If Cleveland is right it would appear that the marginalization and specialization now typical of art education has significantly weakened the area’s ability to contribute to these important developing areas. The USA’s National Science Foundation (not an arts funding institution) is currently offering grants to develop Scientific Visualization courseware. Meanwhile the NEA is receiving criticism for funding “subversive” activity. At grass-roots level the art and design input to scientific visualization often consists of little more than “tarting up” some data—an activity, as Cleveland suggests, that more often obscures than reveals its meaning. Here, yet again, we find that the art establishment has carefully and precisely shot itself in the foot.

Postmodernism and Chaos

At the same time that groups of artists in the Sixties were breaking ties with traditional value structures and evolving new paradigms for the art experience, groups of scientists were investigating new, analytical models made possible by access to high-speed calculation. As computers became more available their use began to reveal weird behaviors in what had been considered simple, deterministic systems. The field now known as Chaos evolved and, during the past thirty years, has established itself as the dominant scientific paradigm.

During the same period the arts slipped into yet another period of romantic self indulgence call Postmodernism. The paradigm shift that should have followed the pioneering work by Sixties artists never occurred. The art establishment rejected change and ignored the flow and evolution of a knowledge base that was changing science and would eventually change our society.

At the grass roots many artists defied their conditioning and forsook professional recognition in order to explore these new areas. Many adopted the emerging tools of digital technology. The establishment

dumped them, refusing to acknowledge, exhibit, or publish their work. The artists responded by developing a number of alternative venues, like the annual SIGGRAPH Art Show, which is still considered by the mainstream to be a marginal event.

What is interesting to consider is that science, because of its rational methodology, has to acknowledge these new developments. The art establishment, which bases its evaluation on subjective judgment, could and did choose to ignore them, Art, probably not for the first time in its history, proved the more reactionary and pigheaded of C. P. Snow's "two cultures."

Towards a New Model

At SIGGRAPH some years ago one speaker commented that "even military shoppers like their hardware to look good." The success of design over the past thirty years has been a consequence of its ability to add value to consumer items and services. The success of a design is measured by market preferences, the number of people who buy or subscribe in some way to the commodity. Preference measurement, typified by market research methodology, has become the accepted yardstick for design development and appraisal. Clearly this supports the model of designers contributing to a market economy.

Many now believe that the current international recession is symptomatic of the saturation of this economic model and look for alternatives. One of the most often suggested is the information based economy, a heterarchical model that can better account for human and ecological issues. As several researchers have discovered, the measurement of design by preference testing is inadequate when the commodity in question is information.

Preference measurement relates to the concept of the artwork or designed artifact as totally self-referential, a concept that I suggest above became outmoded in the Sixties. In contrast more designers are now investigating the measurement of design by its performance, a more pragmatic approach.

Also performance measurement relates to the concept of the artwork/designed artifact as a signifier whose success is propor-

tional to its ability to communicate extrinsic content—the signified. This interpretation reinforces the model of art and design as a virtual process whose essence is information exchange. I believe that it is here, when considering the utility of a designed artifact in an information transaction, that we may find an emergent solution to the art mainstream's problems with acknowledging "intangible" artforms. In order to come to terms with its current problems the art education sector could well prioritize this area for investigation.

A Case Study: The Australia Telecom Bill Redesign

One possible model for a new paradigm comes from the field of Information Design. David Sless is one of the pioneers of new design methodologies and is the co-founder and co-director of the Commu-

The artists responded by developing a number of alternative venues, like the annual SIGGRAPH Art Show, which is still considered by the mainstream to be a marginal event.

nication Research Institute of Australia. CRIA is attracting international attention for its leading edge research and Sless' books have recently been accepted as set texts in several American universities. At a recent seminar: "Designing Information for People" (Canberra, October 1991), he compared preference and performance measurement techniques for information design.

He suggested that the accepted barometers of current design and market research—the measurement of market preferences and attitudes as well as the use of focus groups (think tanks) and usability labs—are inadequate. He quoted a contemporary report on work to redesign the bills for the US's Mid Western Bell. Preference measurement was used to validate design changes but, when the performance of the revised bill was measured, there was no improvement.

His model was CRIA's revamp of the Telecom bill. The aims were to: improve the

bill; reduce dissatisfaction; reduce confusion; improve the format and understanding; take advantage of modern laser printing technology; and, reduce the volume of paper. Sless pointed out that no two bills are the same and that the problem is not designing a document but rather designing a set of rules that describe the document.

After a rigorous analysis of background information including an evaluation of fifteen bills and past research, CRIA's prototype was iterated through a process of refinement and diagnostic testing which was intended to measure how adequately people could use the bill to extract the information they needed or wanted.

Sless measured their success by the evidence. Customer satisfaction with the Telecom bill has improved from 64 to 84 percent. Even more important is the reduction in the level of complaints from 47 percent to just 4 percent. This represents a phenomenal improvement particularly when considering that Australia Telecom issues over twenty million bills each year. Here, design has been used effectively in an information economy.

Client relations have improved, communication has been enhanced, significant economic savings (the cost of printing and distributing the bills and supporting complaint services) have been made, and the significant savings in paper has produced ecological benefits.

The current need to package products in order to communicate important messages like their environmental qualities—"our matches come from sustainable forests"—is one example of the transition that is taking place in both consumer and producer attitudes. Legislation concerned with the labeling of medicines and foodstuffs is another. Public demand for more efficient computer human interfaces is yet another.

A lesson for the Fine Arts?

Although these examples relate to applied art—to design—I believe that there is an important lesson here for the fine arts as well. In accepting performance measure-

ment the design community is beginning to wean itself from the concept of the designed artifact as a thing in itself and, equally important, escaping the myth of the omnipotence of its designer. The role of the commodity as a quantifiable signifier that gains meaning via interaction within an information transaction community is beginning to gain acceptance.

This is precisely the kind of development that we might have expected in the fine arts after Conceptual Art, Art Language, and the introduction of electronic communication media in the visual arts. Instead we often find that artists now use computer systems to produce artifacts that are put in frames and hung on walls, an absurdity that almost defies comprehension. What we are witnessing is a common psychological phenomenon, the denial, repression, and suppression of the new and the return to the comfortable, self-indulgent, self-referential, nostalgic, and eclectic concept of artfor-arts-sake now called Postmodernism.

It is important to emphasize here that I am not suggesting that art should necessarily be involved in immediate utility (although I believe that it is an essential part of a healthy society) or a return to Modernism. Although I would certainly agree with Peter Frank who, when commenting on the utopian nature of Modernism in his neo-Modernist Manifesto, comments that the "neo-Modernists turn to historical Modernism because they see embodied in the Modernist ethos the assertion, if not of human perfectibility, then of human improvability."

My main concern is somewhat simpler. Artists have been offered the opportunity to free themselves from the limitation of the artifact and have, under pressure from the education system and the art establishment, turned that opportunity down. In doing so I believe they have essentially rejected the future and created an historical backwater where art will atrophy.

As I hope I have illustrated above, scientists and applied artists have done somewhat better in adapting to new and often strange paradigms. At least some of them

have been prepared to give up long held beliefs and egocentricities as well as to recognize the erosion of cultural boundaries. I believe that the art historian of the future may look back at this period and see that the major aesthetic inputs have come from science and not from art.

Maybe science is evolving into a new science called art, a polymath subject once again. Maybe art itself, at least as we have known it over this past quarter century, has ceased to have any social usefulness. Maybe art, at least in the sense that the Postmodernists use the word, is dead.

The Convergence of Reality and Illusion

The polarity of art and science has its origins in the polarity of human awareness. Newton formalized this polarity and forced the evolution of Romanticism effectively splitting life into two parts. Science pursued the objective world and the rational method. Art investigated the subjective world.

Now science has had to recognize the limits of rational enquiry. It has also, with the development of computational technology, provided a new model for the universe. We now acknowledge the possibility of the universe itself as a computational simulation or the evolution of self aware, conscious, computational entities - artificial life. It is no longer possible to distinguish between "reality" and "illusion." The two are coming together in a holistic model that concerns the relationship of the observer and the observed, the signifier and signified. The term "virtual reality" may well be a pointless oxymoron, but nevertheless, the concept of virtuality is one of the most pertinent of our time.

...we often find that

artists now use

computer systems to

produce artifacts

that are put in

frames and hung on

walls, an absurdity

that almost defies

comprehension.

INTRODUCTION

For the past fifteen years, increasing numbers of artists around the world have been working in a collaborative mode using telecommunications. In their "works," which we shall refer to as "events," images and graphics are not created as the ultimate goal or the final product, as is common in the fine arts. Employing computers, video, modems, and other devices, these artists use visuals in a much larger, interactive, bi-directional communication context. Images and graphics are created not simply to be transmitted by an artist from one point to another, but to spark a multidirectional visual dialogue with other artists and participants in remote locations. This visual dialogue assumes that images will be changed and transformed throughout the process in the same way that speech gets changed—interrupted, complemented, altered and reconfigured—in a spontaneous face-to-face conversation. Once an event is over, images and graphics stand not as the "result," but as documentation of the process of visual dialogue promoted by the participants.

This unique ongoing experimentation with images and graphics develops and expands the notion of visual thinking by relying primarily on the exchange and manipulation of visual materials as a means of communication. The art events created by telematic or telecommunication artists take place as a movement that animates and unbalances networks structured with relatively accessible interactive media such as telephone, facsimile (fax), personal computers, e-mail, and slowscan television (SSTV). More rarely, radio, live television, videophones, satellites, and other less accessible means of communication come into play. But to identify the media employed in these "events" is not enough. Instead, one must do away with prejudices that cast off these media from the realm of "legitimate" artistic media and investigate these events as equally legitimate artistic enterprises.

This essay partially surveys the history of the field and discusses art events that were either motivated by or conceived specially for telecommunications media. The essay attempts to show the transition, from the early stages, when radio provided writers and artists with a new spatiotemporal paradigm, to a second stage, in which telecommunications media, including computer networks, have become more accessible to individuals and through which artists start to create events, sometimes of global proportions, in which the communication itself becomes the work.

Telecommunications art on the whole is, perhaps, a culmination of the process of dematerialization of the art object epitomized by Duchamp and pursued by artists associated with the conceptual art movement, such as Joseph Kosuth. If now the object is totally eliminated and the artists are absent as well, the aesthetic debate finds itself beyond action as form, beyond idea as art. It finds itself in the relationships and interactions between members of a network.

Art and Telecommunication

One must try to understand the cultural dimensions of new forms of communication as they emerge in innovative art works which will not be experienced or enjoyed as unidirectional messages. The complexity of the contemporary social scene permeated by electronic media, where the flux of information becomes the very fabric of reality, calls for a reevaluation of traditional aesthetics and opens the field for new developments. In other words, to address the aesthetics of telecommunications is to see how it affected and affects more traditional arts. It is also to investigate to what extent the context for a new art is created by the merger of computers and telecommunications. The new material with which artists will be dealing more and more must be identified and then traced, through the intersection between the new electronic processes of visual and linguistic virtualization brought irreversibly by telecommunications and the personal computer (word-processing, graphic programs, animation programs, fax/modems, satellites, teleconferencing, etc.) and the residual forms that resulted from the process of dematerialization of the art object, from Duchamp to conceptual art (language, video, electronic displays, printing techniques, happenings, mail art, etc.) to the present. This new art is collaborative and interactive and abolishes the state of unidirectionality traditionally characteristic of literature and art. Its elements are text, sound, image, and, eventually, virtual touch based on force-feedback devices. These elements are out of balance; they are signs which are already shifting as gestures, as eye contact, as transfigurations of perpetually unfulfilled meaning. What is commuted is changed, re-changed, exchanged. One must explore this new art in

its own terms, i.e., understanding its proper context (the information society at the dawn of the twenty-first century) and the emerging theories (poststructuralism, chaos theory, culture, studies) that inform its questioning of notions largely taken for granted such as subject, object, space, time, culture and human communication. The forum where this new art operates is not the materially stable pictorial space of painting nor the Euclidean space of sculptural form; it is the electronic virtual space of telematics where signs are afloat, where interactivity destroys the contemplative notion of beholder or *connoisseur* to replace it by the experiential notion of user or participant. The aesthetic of telecommunications demonstrates the necessary move from pictorial representation to communicative experience.

Two of the most interesting new forms of communication that seem to do away with the old addresser-addressee model proposed by Shannon and Weaver [1] and reinforced by Jakobson [2] are electronic mail (e-mail) and conference calling. In e-mail a user can post a message and set it adrift in electronic space, without necessarily sending it to a specific addressee. Then another user, or several other users at the same time, can access this message and answer it, or change it, or add a comment, or incorporate this message into a larger and new context in a process that has no end. The closed message, embodying as it must the identity of the subject (sender), is potentially dissolved and lost in the signifying vortex of the network. If real-time is not crucial for e-mail, the same cannot be said about conference calling, where three or more people engage in exchanges that don't have to be limited to voice.[3] If the linear model goes as far as allowing for addresser to become addressee when the poles are reverted, this new multidirectional and interconnected model melts the boundaries that used to separate sender and receiver. It configures a space with no linear poles in which discussion replaces alternate monologues, a space with nodes that point in several directions where everybody is simultaneously (and not alternately) both addresser and addressee. This is not a pictorial or volumetric space, but an aoretic space of

information in flux, a disseminated hyperspace that does away with the topological rigidity of the linear model. It shares the properties of non-linear systems, such as are found in hypermedia or in the statistical self-similarity of fractals, as opposed to the embellished linear surfaces of post modern painting. It is here, possibly, that artists can intervene critically and suggest a redefinition of the framework and the role of telematics, demonstrating that antagonistic forces mutually constitute each other. What we used to call true and real is and has always been reciprocally and dynamically, in its play of differences, constituted by what we used to call false and unreal. Cultural values are also questioned, since the structures that privileged one culture over others are conceptually challenged, bringing cultural differences to the forefront. Artists can also show, by working with the

The forum where this new art operates is not the materially stable pictorial space of painting nor the Euclidean space of sculptural form; it is the electronic virtual space of telematics where signs are afloat...

new media, what role the new media play in forming or preserving stable structures that form the self, that model communication, and, ultimately, that create social relations (including relations of authority and power).

In like manner, artist and audience are also constructed in this play of differences. If the mass-produced printed book has generated both the notions of author and of audience as we know them today, associating control over the distribution of printed information to power, the disseminated play of meaning in telematic networks potentially dissolves both without fully establishing the integrated, harmonized, aural global village dreamed of by McLuhan. If telecommunication is that which brings people closer, it also is that which keeps them apart. If telematics is that which makes information accessible to everyone at any moment regardless of geographic frontiers,

it also is that which makes certain kinds of data generated by particular groups in certain formats accessible to people involved with specific institutions. That which brings people closer is also what keeps them away; that which asks is also that which affirms certain values implicit in the framing of the question. If there is no end to this play, to this motion, there must be awareness of its context. But then again, awareness is not removed from this motion through which it is also configured.

To the linear model of communication, which privileges the artist as the codifier of messages (paintings, sculptures, texts, photographs), telematics opposes a multidirectional model of communication, one where the artist is creator of contexts, facilitator of interactions. In the first case, messages have physical and semiological integrity and are open only to the extent

they allow for different interpretations. In the second case, it is not mere semantic ambivalence that characterizes the signification openness. The openness of the second case neutralizes closed systems of meaning and provides the former viewer (now transformed into user, participant, or network member) with

the same manipulation tools and codes at the artist's disposal so that the meaning can be negotiated between them. This is not a simple inversion of poles, as proposed by Enzensberger [4], but an attempt to acknowledge and operate within a signification process that is dynamic, destabilized, and multi-vocal, within a signification process not based on the opposition artist/audience but on the differences and identities they share. Messages are not "works" but a part of larger communicative contexts, and can be changed, altered, and manipulated virtually by anybody.

One of the problematic issues here is that the dissolution of the distinction between artist and user takes away from artists their privileged position as senders or addressers, because there is no more message or work of art as such. It is clear that most artists are neither prepared nor willing to abandon this hierarchy because it undermines the practice of art as a prof-

itable activity and the social distinction associated with notions such as skill, craft, individuality, artistic genius, inspiration, and personality. The artist, after all, is someone who sees him or herself as somebody who should be heard, as somebody who has something important to say, to transmit to society [5]. On the other hand, one can ask to what extent artists who create telecommunication events may restore the same hierarchy they seem to negate by presenting themselves as the organizers or directors of the events they promote—in other words, as the central figure from which meaning irradiates. As it seems, while a television director works in collaborative fashion with tens or hundreds of people without ever giving up the responsibility for the outcome of the work, the artist (context creator) that produces telecommunication events sets a network without fully controlling the flux of signs through it. The artist working with telecommunication media gives up his or her responsibility for the “work,” to present the event as something which restores or tries to restore the responsibility (in Baudrillard’s sense) of the media. [6]

I must observe that certain traces of apparently uncritical enthusiasm for this change in the processes and issues of art are identifiable not only in the present essay and in other texts of mine on the subject [7], but also in the writings of other artists that address the aesthetics of communications at large, and of telecommunications or telematics in particular, including Bruce Breland [8], Roy Ascott [9], Karen O’Rourke [10], Eric Gidney [11] and Fred Forest [12]. Artists are now endowed with new instruments with which they reflect on contemporary issues, such as cultural relativism, scientific indeterminacy, the political economy of the information age, literary deconstruction, and decentralization of knowledge. Artists are now able to respond to these issues with the same material (hardware) and immaterial (software) means that other social spheres employ in their activities, in their communion and isolation. If actual walls are falling (Berlin, the Iron Curtain), and so are metaphorical walls (telematic space, virtual reality, telepresence), one cannot simply overlook or overestimate these historical

1 Claude E. Shannon and Warren Weaver, *The Mathematical Theory of Communication* (Urbana: The University of Illinois Press, 1949).

2 Roman Jakobson, “Linguistics and Poetics,” *Style in Language* (New York: MIT Press, 1960), Thomas Sebeok, ed., pp. 353-356.

3 Two examples based on personal experience: a) In 1989, Carlos Fodon and I (Chicago), Bruce Breland and Matt Wrabic (Pittsburgh) and Dono Moser (Boston) collaborated in “Three Cities,” a slow-scan exchange operated through three-way calling; b) In 1990, Fodon and I suggested to Bruce Breland the creation of an international telecommunication event to be called “Impromptu,” in which artists would try to engage in conversations with telemedia (fax, SSTV, etc) the same improvised way they do when talking face-to-face. “Earth Day” was going to be celebrated soon, and Bruce suggested we expand the idea to encompass the ecological context and make it “Earth Day Impromptu.” Fodon and I agreed, and we started to work with Bruce and the Dax group, and Irene Foigenboim, in organizing it. Later, Bruce’s experience with large networks proved crucial: working with other Dax members, he made possible a very large SSTV conference call with several artists in different countries, which was, together with the fax and videophone network, part of the “Earth Day Impromptu.”

4 Hans Magnus Enzensberger, “Constituents of a Theory of the Media,” *Video Culture* (New York: Visual Studies Workshop Press, 1986), John Hanhardt, ed., p. 104.

5 In *Artists’ use of interactive telephone-based communication systems from 1977-1984* (unpublished master thesis submitted to City Art Institute, Sidney College of Advanced Education), 1986, p. 18, Eric Gidney gives an account of pioneer artist Bill Bartlett’s telecommunication events and also of his disappointment with other artists’ responses: “Bartlett was dismayed at the incapacity of many North American artists, who were willing to collaborate only insofar as it furthered their own careers. He found that some artists would simply refuse to correspond after a project was completed. He felt let down, exploited and ‘burned out.’ Assaulted by serious doubts, he decided to withdraw from any involvement in telecommunications work.” Gidney also summarizes the telecommunication work of pioneer artist Liza Bear, and quotes her (p. 21): “A hierarchical structure is not conceptually well-suited and does not create the best ambience for communication by artists. This [medium] is only successful in regions where artists and video people already have a good track record of working together, sharing ideas, and preparing material.”

6 Jean Baudrillard, “Requiem for the Media,” *Video Culture* (New York: Visual Studies Workshop Press, 1986), John Hanhardt, ed., p. 129. Baudrillard formulates the problem of lack of response (or *irresponsibility*) of the media with clarity: “The totality of the existing architecture of the media founds itself on this latter definition: *they are what always prevents response*, making all processes of exchange impossible (except in the various forms of response *simulation*, themselves integrated in the transmission process, thus leaving the unilateral nature of the communication intact). This is the real abstraction of the media. And the system of social control and power is rooted in it.” In order to restore the possibility of response (or *responsibility*) in the current configuration of the telecommunications media it would be necessary to provoke the destruction of the existing structure of the media. And this seems to be, as Baudrillard rushes to point out, the only possible strategy, at least on a theoretical level, because to take power over media or to replace its content with another content is to preserve the monopoly of speech.

7 See: Koc, E., “Arte pelo telefone,” *O Globo*, September 15, 1987, Rio de Janeiro; “O arco-iris de Paik,” *O Globo*, July 10, 1988, Rio de Janeiro; “Parallels between telematics and holography as art forms,” in *Navigating in the Telematic Sea*, Bruce Breland, ed., New Observations, 76, New York, May-June 1990, p. 7; Koc, E., “Ornitarrinco: Exploring Telepresence and Remote Sensing,” in *Connectivity: Art and Interactive Telecommunications*, Roy Ascott and Carl Eugene Loeffler, eds., Leonardo, Vol. 24, N.2, 1991, p. 233; Koc, E., “On the notion of art as a visual dialogue,” in *Art Reseaux*, Karen O’Rourke, ed., Université de Paris I, Panthéon-Sorbonne, Paris, 1992, pp. 20-23.

8 Art Com (on online magazine forum), Tim Anderson and Wendy Plesniak, eds., Number 40, Vol. 10, August 1990, issue dedicated to the Dax Group.

9 Ascott, R., “Art and Telematics,” in *Art Telecommunications*, Heidi Grundmann, ed., The Western Front, Vancouver, Canada (Shakespeare Company, Vienna, Austria), 1984, pp. 25-58.

10 O’Rourke, K., “Notes on Fax-Art,” in *Navigating in the Telematic Sea*, Bruce Breland, ed., New Observations, 76, New York, May/June 1990, pp. 24-25.

11 Gidney, E., “The Artist’s use of telecommunications: a review,” *Leonardo*, Vol. 16, N. 4, 1983, pp. 311-315.

12 Forest, F., “Communication Esthetics, Interactive Participation and Artistic Systems of Communication and Expression,” in *Designing the Immaterial Society*, Design Issues special issue, Marco Diani, ed., Vol. IV, Ns. 1 & 2, University of Illinois, Chicago, pp. 97-115.

and technical achievements. It is not only with sheer enthusiasm for new tools that the artist will work with communication technologies, but also with a critical, skeptical approach concerning the logic of mediation they entail. This means not ignoring that utopias of ubiquitous, electronically mediated communication necessarily exclude those cultures and countries that, usually for political and economic reasons, don't have the same or compatible technologies and therefore cannot participate in any global exchange.[13]

Let's suppose that in a not so distant future Jaron Lanier's dream of "post-symbolic" communication [14] becomes possible and that the cost per minute in a cyberspace matrix is comparable to the normal cost of a phone call. This hypothetical situation could be a viable approach to the problem of linguistic barriers (including language impairment), but it would be no different from other cases of economic segregation, given that even basic telephone technology is full of serious problems in most developing countries.

Perhaps exactly because of these problems, and not despite them, artists are using today's techniques to discuss today's issues. If telecommunications art will not simply ignore the contradictions inherited from the media and in the other technological monopolies present in post industrial societies, I still like to think that perhaps freer forms of communication can emerge out of new interactive artistic practices that make the process of symbolic exchange the very nature of the work.

Disembodied Voices

An assessment of the parallel development of telecommunications media and new art forms throughout the twentieth-century reveals an interesting transition: one first sees the impact of new media on much older forms, such as radio influencing theater. Later, it is possible to detect more experimental uses of these media. At last, artists master the new electronic media and explore their interactive and communicative potential. In this perspective, radio is the first electronic mass communications medium used by artists.

In the late 1920's commercialization of air waves was in its infancy. Radio was a new medium that captured the imagination of the listeners with an auditory space capable of evoking mental images with no spatiotemporal limits. A remote and undetected source of sound dissociated from optical images, radio opened listeners to their own mindscapes, enveloping them in an acoustic space that could provide both socialization and private experiences. Radio was the first true mass medium, capable of remotely addressing millions at once, as opposed to cinema, for example, which was only available to a local audience.

In 1928 German film maker Walter Ruttmann (1887-1941) was invited by the Berlin Broadcasting System to create a piece for radio. Ruttmann had already achieved international recognition for his

The artist working with telecommunication media gives up his or her responsibility for the "work" to present the event as something which restores or tries to restore the responsibility of... the media.

abstract animated films, such as Opus I, II, III, and IV, which pioneered the genre and anticipated computer animation by half a century. His experimental documentary "Berlin, Symphony of a Great City" (1927) also was acclaimed worldwide, and inspired a whole generation of film makers who then created filmic "city symphonies." In addition to his contribution to film making, Ruttmann's innovative work for radio opened the air waves to the aesthetic of the avant-garde, challenging the standardization of programming imposed by commercial imperatives.

In order to create the commissioned piece, Ruttmann was given access to what was one of the best recording systems for film in the world, the "Triergon" process. Coming from the world of cinema, Ruttmann decided to create "Weekend," a movie without images. It is a discontinuous narrative based on the mental images projected by sounds alone. He employed the sound tracks in the reel as he would have employed the frame to record images

"Weekend" lasts about fifteen minutes and creates an aural atmosphere that portrays workers leaving the city and going to the countryside after a working day. At first sounds produced by saws, cars, and trains are predominant; later sounds of birds chirping and children speaking appear more often. As he had done with "Symphony of a Great City," Ruttmann edited this pictureless film in experimental fashion: splicing the reel and with it the sound track, repeating certain sounds, reorganizing the sequence and duration of sounds. He edited sound like one edits film.

"Weekend" as a sound montage, conceived for a recording medium and for radio transmission, opened new venues and anticipated the aesthetics of movements such as Concrete Music and of John Cage and Karlheinz Stockhausen. Ruttmann defined his abstract films as "optical

music," and one should not hesitate to describe "Weekend" as the first "acoustic film" created for radio.

As it became more popular, radio inspired and attracted professionals from different backgrounds, including artists, performers, writers, and members

of the avant-garde, such as the Italian Futurists. Since the very beginning of Futurism in 1909, Marinetti and his supporters promoted the surpassing of traditional forms and the invention of new ones at the same time that they celebrated technological militarization and war. Marinetti collaborated closely with Mussolini's regime. In 1929 Marinetti became a member of the Italian Academy, founded by Mussolini, and in 1939 he served in a commission organized by the Fascist regime to censor undesirable books, including those written by Jewish authors. In 1935 he volunteered to serve in the war in Ethiopia, and in 1942 he departed, again as a volunteer, to the Russian front.

The Futurists' last cry for a new art form come in September-October of 1933, with the "Manifesto Della Radio" or "La Radia," signed by Marinetti and Pino Masnata, and published both in "Gazzetta del Popolo," Torino, September 22, and in their own periodical entitled

"Futurismo," Rome, October 1 (although in the last one only Marinetti's name appears) [15]. The manifesto was drafted two years after Masnata wrote the libretto for the radio opera "Tum Tum Lullaby (or Wanda's Heart)."

In the manifesto, they proposed that radio be freed from artistic and literary tradition and that the art of radio begin where theater and movies stop. Clearly, their project for an art of sounds and silences evolved from Russolo's art of noises and, like Russolo, they tried to expand the spectrum of sources the artist could use in radio. Marinetti and Masnata proposed the reception, amplification, and transfiguration of vibrations emitted by living beings and matter. This proposal was furthered by the mixture of concrete and abstract noises and "the singing" of inanimate objects such as flowers and diamonds. They claimed that the radio artist ("radiastata") would create words-in-freedom ("parole in libertà"), making a phonetic transposition of the absolute typographic liberty explored by Futurist writers in the visual compositions of their poems. But even if the radio artist would not air words-in-freedom, his broadcasts still must be:

in the parolibero style (derived from our words-in-freedom) that already circulates in avantgarde novels and in the newspapers; a style typically fast, dashing, simultaneous, and synthetic.

Futurist radio could employ isolated words and repeat verbs in the infinitive form. It could explore the "music" of gastronomy, gymnastics, or love-making, as well as use simultaneously sounds, noises, harmonies, clusters, and silences to compose gradations of crescendo and diminuendo. It could make the interference between stations a part of the work, or create "geometric" constructions of silence. At last, Futurist radio, by addressing the masses, could eliminate the concept and the prestige of the specialized public, which always had "a deforming and denigrating influence." On November 24, 1933, Fortunato Depero and Marinetti made the first futurist transmissions over Radio Milano [16].

In 1941, Marinetti published an anthology of Futurist theater with a long title, "The futurist theater synthetic (dynamic-illogical-autonomous-simultaneous-visionistic) surprising aeroradiotelevisual music-hall radiophonic (without criticisms but with Misurazioni)," [17] in which he compiled nine of Masnata's and five of his own radio works ("radiophonic synthesis").

Throughout the 1930's radio not only became technically reliable but tunable, allowing the listener to choose among several programming options. Radio could now receive short, medium, and long waves from considerable distances. Whether enjoyed for entertainment or hailed as a tool for political propaganda, radio became a domestic convergence point. Listening to radio became a generalized habit in the 1930s, when the world was at the verge of another global conflict.

On October 30, 1938, the Sunday program "The Mercury Theater on the Air" directed by twenty-three year old Orson Welles and aired by The Columbia Broadcasting System (CBS)—in New Jersey, always at 8pm—would present another adaptation of a literary text, this time to celebrate Halloween. Writer Howard Koch adapted the novel chosen by Orson Welles, "The War of The Worlds" (1898) by Herbert George Wells (1866-1946), updating the story and transposing the action to a virtually unknown but real place, Grovers Mill, in New Jersey. The choice was accidental but convenient, since it was close to the Princeton Observatory, where Koch placed the fictitious Astronomy authority Prof. Pierson. More importantly, Koch structured the story, apparently following a suggestion by Mercury Theater producer John Houseman, intercalating music and news, so that it seemed that the music was being interrupted every now and then because of strange events and news flashes that reported them live.

In Orson Welles' dramatic voice, listeners became aware, little by little, that the initial explosions observed on the surface of Mars turned out to be disturbances caused by unidentified flying objects that landed in Grovers Mill. Next, the monstrous Mart-

13 Robert Adrian X addressed this issue when he observed ("Communicating," in *Art Telecommunications*, Heidi Grundmann, ed., The Western Front, Vancouver, Canada (Shakespeare Company, Vienna, Austria), 1984, pp. 76-80): "Nobody in eastern Europe can get access to telefacsimile equipment or computer timesharing equipment... and the situation is much grimmer in Africa and most of Asia and Latin America. If these parts of the world are to be considered for inclusion in artists' telecommunications projects it has to be at the level of ACCESSIBLE electronic technology... the telephone or short wave radio."

14 In October 28, 1991, Joran Lanier lectured at the auditorium of The School of The Art Institute of Chicago. At that occasion I had the opportunity to ask him what he meant by this often-quoted and seldom-explained phrase ("post-symbolic communication"). Lanier explained that one direction he envisions for virtual reality is for it to be taken over by telephone companies, so that time-sharing in cyberspace becomes possible. In this setting, it would be possible for people in distant locations, wearing datasuits, to meet in cyberspace. These people would be able to exercise visual thinking on a regular basis and communicate by other means different than spoken words; they would be able to express an idea by simply making that idea visible in cyberspace, or by manipulating their own databody or by manipulating their interlocutors' databodies [I'm calling "databody" the human body of a VR user as seen by the user once immersed in cyberspace]. This kind of communication, achieved by a still symbolic but perhaps more direct use of visual signs, is what Lanier called "post-symbolic communication." His "Reality Built for Two," or "RB2," is a step in that direction, and we can expect videophone services to provide support for it as well.

15 Luciana Caruso, *Manifesti Futuristi* (Firenze: Spes-Solimbeni, 1980), pp. 255-256.

16 Pantus Hulten, org., *Futurism & Futurisms* (Venice and New York: Palazzo Grassi and Abbeville Press, 1986), p. 546.

17 Filippo Marinetti, *Il teatro futurista sintetica (dinamica-logica-autonoma-simultanea-visionica) a sorpresa aeroradiotelevisiva caffè concerto radiofonico (senza critiche ma con Misurazioni)* (Naples: Clet, 1941). Some words in this title were neologisms coined by Marinetti and allow for multiple interpretations. My choices in the translation of the title are but some of the possible solutions.

ian invaders started to use their "heat ray" and project its "parallel beam" against everything surrounding them, burning people alive and destroying cars, houses, and cities. Despite several announcements during the program that it was fictitious, the news format of the broadcast caught casual listeners by surprise. At the end, when Prof. Pierson read his diary and revealed that the Martians had been defeated by terrestrial micro-organisms, it was too late.

With nervous voices, Mercury Theater actors and actresses depicted the landing of Martian war machines, the fire ignited by the deadly rays, and the panic of witnesses. The public reacted with anguish and despair. Nobody died but several people got injured, miscarriages occurred, houses were left behind without a second thought, roads were caught in huge traffic jams, and policemen and firemen were mobilized against the invisible menace. In New York City, many residents loaded their cars and drove away from New Jersey. Calls from the East overloaded the telephone lines in the Southwestern United States and in Newark, New Jersey, hundreds of doctors and nurses

called hospitals to volunteer their services. In Concrete, Washington, an accidental blackout happened exactly at the point in the transmission when the Martians were taking control over the country's power system. In the South, people sought refuge in local churches and in Pennsylvania a woman was saved from suicide by the timely return home of her husband. Angry listeners filled lawsuits against Welles and CBS, without major consequences. Welles' contract made him not responsible for consequences of any of the program's broadcasts, and CBS could not be severely penalized since there was no previous similar case which might have allowed them to anticipate the incident.

Welles' simulated Martian invasion revealed, for the first time, the true power of radio. It exhibited the unique ability of radio to play with the breath of speech and the plastic sonority of its special effects to excite the imagination of the listener. It showed how the technical reliability of the medium built its credibility, giving veracity to the "news" transmitted through it. It explored unique temporal rhythms,

mixing real-time (the transmission lasted about one hour) and dramatized time (Prof. Pierson tells us at the end that the whole event happened in a few days). The silence between the cuts (from music to news and vice-versa) was not simply an absence of sound, as in a musical pause; it was presented to the listener as the actual waiting time to link the reporter at the scene of the landing to the crew in the studio. Perhaps, even more significant was the fact that during the transmission the panic felt by thousand of listeners was very real. The invasion was an event that happened in the medium of radio and this medium was already so much a part of the lives of the listeners, it was so transparent and unquestionably reliable, that the transmission was not experienced as a representation or enactment. It was "hyper-real" in Baudrillard's sense of the word, an experience in which signs not grounded in reality are so much real that they become more real than the real.[18] Welles made explicit the pseudo-transparency of the mass media by unveiling the mechanisms by which the media tries to make itself a clear window to truth, the way it pretends to ignore its own mediation and the influence it has on the collective unconsciousness of society. No doubt, Welles attracted the rage of lawmakers with a propensity to censorship. Radio and electronic media would never be the same after the simulated invasion from Mars.

Telephone Pictures

The telephone, the automobile, the airplane, and, of course, radio, were for the avant-garde artists of the first decades of this century a symbol of modern life. Through them one could extend human perception and capabilities. The Dadaists, however, deviated from the general enthusiasm for scientific rationalism and criticized technology's destructive power. In 1920, in the "Dada-Almanac" edited in Berlin by Richard Huelsenbeck, they published the irreverent proposal that a painter could now order pictures by telephone and have them made by a cabinet-maker. This idea appeared in the "Almanac" as a joke and a provocation. Constructivist Hungarian artist Laszlo Moholy-Nagy

(1895-1946) was living in Berlin at the time, but it is uncertain whether he read it or heard about it. What is certain is that the soon-to-be member of the Bauhaus believed that intellectual motivations were as valid as emotional ones in creating art and decided to prove it to himself. Years later, the artist wrote:

In 1922 I ordered by telephone from a sign factory five paintings in porcelain enamel. I had the factory's color chart before me and I sketched my paintings on graph paper. At the other end of the telephone the factory supervisor had the same kind of paper, divided into squares. He took down the dictated shapes in the correct position. (It was like playing chess by correspondence.) One of the pictures was delivered in three different sizes, so that I could study the subtle differences in the color relations caused by the enlargement and reduction. [19]

With the three telephone pictures described above, the artist took his Constructivist ideas several steps further. First, he had to determine precisely the position of forms in the picture plane with the minute squares in the graph paper as the grid through which the pictorial elements were structured. This process of pixellation in a sense anticipated the methods of raster based, computer art. In order to explain the composition over the phone, Moholy had to convert the art work from a physical entity to a description of the object, establishing a relationship of semiotic equivalence. This procedure antedates concerns set forth by conceptual art in the 1960s. Next, Moholy transmitted the pictorial data making the process of transmission a significant part of the overall experience. The transmission dramatized the idea that the modern artist can be subjectively distant, personally removed from the work. It expanded the notion that the art object doesn't have to be the direct result of the hand or the craft of the artist. Moholy's decision to call the sign factory, capable of providing industrial finishing and scientific precision, instead of an amateur painter for instance, attests to his motifs. Furthermore, the multiplication of the final object in three variations destroyed the notion of the "original" work, pointing toward the new artforms that emerge in the age of mechanical reproduction. Unlike Monet's sequential paintings, the three similar telephone pictures are not a series. They are copies

without an original. Another interesting aspect of the work is that scale, a fundamental aspect of any art piece, becomes relative and secondary. The work becomes volatilized, being able to be embodied in different sizes. Needless to say, relative scale is a characteristic of computer art, where the work exists in the virtual space of the screen and can be embodied in a small print or a mural of gigantic proportions.

Despite all the interesting ideas it announces, the case of the telephone pictures is controversial. Moholy's first wife, Lucia, with whom he was living at the time, states that in fact he ordered them in person. In her account of the experience, she recalls that he was so enthusiastic when the enamel paintings were delivered that he exclaimed, "I might even have done it over the phone!" [20] The third personal record of the event, and as far as I know there are only three, comes from Sybil Moholy Nagy, the artist's second wife:

He had to prove to himself the supra-individualism of the Constructivist concept, the existence of objective visual values, independent of the artist's inspiration and his specific *peinture*. He dictated his paintings to the foreman of a sign factory, using a color chart and an order blank of graph paper to specify the location of form elements and their exact hue. The transmitted sketch was executed in three different sizes to demonstrate through modifications of density and space relations the importance of structure and its varying emotional impact. [21]

We are left with the question, usually set aside by commentators, of whether Moholy actually employed the telephone or not. Although apparently irrelevant, since the three works were actually painted by an employee of a sign factory according to the artist's specifications and were named "Telephone Pictures" by Moholy-Nagy himself, this question cannot be totally disregarded or answered. Lucia seems to remember the event clearly, but the artist's account, in the absence of proofs that state otherwise, would have to prevail. One tends to assume they could have been ordered over the phone because Moholy was an enthusiast of new technologies in general and of telecommunications in particular. In the book "Painting, Photography, Film," [22] originally

published in 1925, he reproduced two "wireless telegraphed photographs" and a sequence of two images he described as examples of "telegraphed cinema," all by Prof. A. Korn. In the same book, Moholy seems to conclude this chapter by launching an early call for new art forms to emerge out of the age of telecommunications:

Men still kill one another, they have not yet understood how they live, why they live; politicians fail to observe that the earth is an entity, yet television has been invented: the "Far Seer" — tomorrow we shall be able to look into the heart of our fellow-man, be everywhere and yet be alone. (...) With the development of phototelegraphy, which enables reproductions and accurate illustrations to be made instantaneously, even philosophical works will presumably use the same means—though on a higher plane—as the present day American magazines. [23]

With Moholy-Nagy's three "telephone pictures," which were shown in his first one-man show in 1924 at the gallery Der Sturm in Berlin, we see the artist acknowledging the conceptual power of the telephone exchange. This first experience was recognized by The Museum of Contemporary Art in Chicago as a forerunner of the conceptual art of the 1960s with its November 1-December 14, 1969 exhibit "Art by Telephone." Thirty-six artists were asked to place a phone call to the Museum, or to answer the Museum's call, and then to instruct Museum staff about what their contribution to the show would be. The Museum then produced the pieces and displayed them. A record-catalogue was produced with recordings of the phone conversations between artists and the Museum. The Director of the Museum, Jan van der Marck, asserted that no group exhibition had before tested the aesthetic possibilities of remote-control creation: "Making the telephone ancillary to creation and employing it as a link between mind and hand has never been attempted in any formal fashion." [24]

"Art by Telephone" was not meant as a telecommunications art event. It was a group exhibition of works produced by an unusual method: telephone descriptions followed by the curator's own implementations. The artist was to be, as in the case of Moholy, physically absent from the process. Marck saw this as an expansion of the syncretism between language, per-

18 Jean Baudrillard, *Simulations* (New York: Semiotext(e), 1983) p 54. Telecommunication media now efface the distinction between themselves and what used to be perceived as something apart, totally different from and independent of themselves, something we used to call the "real." Baudrillard calls this situation "hyperreal," or "hyperreality." This lack of distinction between sign (or form or medium) and referent (or content or real) as stable entities is by the same token a step further away from McLuhan and a step closer to the new literary criticism as epitomized by Derrida. In what is likely to be his most celebrated essay, "The Precession of Simulacra," he once again acknowledges McLuhan's perception that in the electronic age the media are no longer identifiable as opposed to its content. But Baudrillard goes further saying that: "There is no longer any medium in the literal sense: it is now intangible, diffuse and diffracted in the real, and it can no longer even be said that the latter is distorted by it."

19 Laszlo Moholy-Nagy, *The New Vision and Abstract of an Artist* (New York: Wittenborn, 1947), p. 79.

20 Kiszitino Possuth, *Moholy-Nagy* (New York: Thames and Hudson, 1985), p. 33.

21 Sybil Moholy-Nagy, *Moholy-Nagy: Experiment in Totality* (Massachusetts: MIT Press, 1969), p XV.

22 Laszlo Moholy-Nagy, *Painting, Photography, Film* (Massachusetts: MIT Press, 1987).

23 Moholy-Nagy [*Painting, Photography, Film*], pp. 38-39.

24 *Art by Telephone*, record-catalogue of the show, Museum of Contemporary Art, Chicago, 1969.

formance, and visual arts characteristic of the decade. Conceptual art set the framework for the emergence of telecommunications art by emphasizing that *cosa mentale* that Duchamp had already defended against the purely visual result of retinal painting. Marck wrote that the participants:

want to get away from the interpretation of art as specific, handcrafted, precious object. They value process over product and experience over possession. They are more concerned about time and place than about space and form. They are fascinated with the object quality of words and the literary connotation of images. They reject illusion, subjectivity, formalist treatment, and a hierarchy of values in art. [25]

This exhibit's pioneering status in the development of the aesthetics of telecommunications was counterbalanced by many artists' rather shy response to the challenge of making creative use of the telephone. The majority of the participants never worked with communications or telecommunications before, but what is noticeable is that their response to this unique opportunity was still bound by the notion that the work of art is embodied in tangible matter, even if in matter without durable substance. Most artists used the telephone in an ordinary way, providing instructions for the making of objects and installations. Only a few dared to transform an actual communication experience in the work itself. The most notable exceptions are Stan VanDerBeek, Joseph Kosuth, James Lee Byars, and Robert Huot.

Huot's interactive proposal was the most unusual if not the most literal. It potentially involved all visitors of the museum and attempted to generate unexpected first meetings by employing chance and anonymity. Twenty-six cities in America were chosen, each starting with a letter of the alphabet, and twenty-six men named Arthur were selected, one in each city. Each Arthur's last name was the first listing under the initial letter of the city (Arthur Bacon, in Baltimore, for instance). The Museum displayed a list of all cities and names, and invited visitors to call and ask for "Art." The work was the unexpected conversation between "Art" and the visitor, and its development totally up to them.

Huot's piece, no matter if intended as a pun on the title of the show, presents the artist as the creator of a context, not a passive experience. It disregards pictorial representation, gives up control over the work and takes advantage of the real-time and interactive qualities of the telephone. The piece was meant to spark relationships, and by doing so anticipated much of the telecommunications work of the next two decades.

Visual Telephonics and Beyond

For all the social, political, and cultural implications of the telephone, or more precisely, the dialogic structuring of the telephone, one is compelled to observe that little critical attention has been paid to it. Historical, technical, and quantitative sociological studies can shed little light on the deeper problems of the telephone, which are adjacent to linguistics, semiology, philosophy, and art. Avital Ronell has brought to the fore a long-distance philosophical call that is as unprecedented as it is welcome. Letting her own discourse oscillate between speech and writing in the connections and reroutings of a metaphorical switchboard, Ronell's book [26] has provided a new philosophical insight, a multi-party line between Martin Heidegger, Sigmund Freud, Jacques Derrida, and, of course, Alexander Graham Bell. Ronell's gesture, albeit on another plane, is similar to that of those artists that since the late 1970s have found in the telephone an incomparable source for experimentation. Why the telephone?

In some ways it [the telephone] was the cleanest way to reach the regime of any number of metaphysical certitudes. It destabilizes the identity of self and other, subject and thing, it abolishes the originariness of site; it undermines the authority of the Book and constantly menaces the existence of literature. It is itself unsure of its identity as object, thing, piece of equipment, perlocutionary intensity, or artwork (the beginnings of telephony argue for its place as artwork); it offers itself as instrument of the destinal alarm, and the disconnecting force of the telephone enables us to establish something like the maternal superego. [27]

The beginnings of telephony argued for the artistic merits of the telephone based on its capacity for transmitting sound over long distances, i.e., based on its resem-

blance to what we know today as radio. It would be possible, Bell and other pioneers hoped, to listen to operas, news, concerts, and plays over the phone. In Bell's earliest lectures and performances, when the two-wayness of the medium was still a technical obstacle, Watson would play the organ and sing over the phone to entertain the audience and demonstrate the possibilities of the new device. Several decades later, if business over the telephone multiplied transactions, its use in the coziness of the household provoked mixed reactions. John Brooks points out [28] that H. G. Wells, in his "Experiment in Autobiography" (1934), complained about the invasion of privacy spawned by the telephone. Wells expressed his desire for "a one-way telephone, so that when we wanted news we could ask for it, and when we were not in a state to receive and digest news, we should not have it forced upon us." [29]

Wells was conjuring the image of a future all-news radio station, the creation of which, as McLuhan noticed, would later result from television's impact on radio. More importantly, Wells was reacting to the intrusion of that "destinal alarm" that Ronell refers to, to that "disconnecting force" of the telephone that is so disturbing and attractive, so unsettling and arresting. When Wells stresses that the telephone provides news even when he does not desire it, he takes notice of the projective trait of the telephone, which is the launching of speech, and speech alone, in the direction of the other, in constant demand for immediate readiness. This demand takes place in the linguistic domain and is properly answered by a question which is at the same time a dubious answer: "yes?"

Perhaps what is unique about ordinary telephony is that in its circuitry only spoken language circulates. As Robert Hopper has suggested [30], the telephone emphasizes the linearity of signs by splitting sound off from all other senses, by isolating the vocal element of communication from its natural congruity with the facial and the gestural. By cutting the audible out of its interrelation with the visual and the tactile, and by separating interlocutors from the speech community, the telephone abstracts communication processes and

reinforces Western phonocentrism [31], now translated into an outreaching telephonocentrism. It is to destabilize this phonocentrism, and subsequently to contribute in undoing hierarchies and centralization of meaning, knowledge, and experience, that theorists like Ronell and telecommunications artists construct their calls. In the twentieth-century, what Derrida calls phonocentrism can be traced back to Saussure. Hopper cautiously finds Saussure bound to the telephone and supports his argument with evidence that Saussure lived in Paris when the city saw the boom of telephony. But more than that, he reminds us that the telephone was invented by a speech teacher of the deaf (Bell) and he stresses the acute resemblance of Saussure's speaking-circuit to telephonic communication.[32] In the almost scientific vocal isolation of telephony and in the presence of absent speakers, speech speaks loudly of its linear structure and offers itself for theoretical (and artistic) investigation.

Being a modality which excludes all that is different from vocal immediacy, the telephone speaks volumes about its platonic metaphysical framework. But when zeroing in on several particulars of telematic experience, one instantiates new insights on the telephonic structure that contribute to a possible deconstruction of that framework. Perhaps the most relevant aspect of the new telephonic syntax is its recent technical absorption of the graphic element. It is now technically possible not only to talk but to write over the phone (e-mail), to print over the phone (fax), to produce and record sound and video (answering machine, slow-scan TV, videophone) over the phone. As we have seen, it is also very likely that in the future, fiber optics will give us access to tele-cyberspace. The telephone is becoming the medium par excellence of that "enlarged and radicalized" writing that signals Derrida. But contrary to what one would otherwise hypothesize, the more the telephone becomes speechless the more central its role becomes in our lives. It is clear that the telephone is slowly but continuously ceasing to owe its existence exclusively to speech and that the cultural implications of

this new aspect of contemporary life remains to be elaborated as an aesthetic experience.

If the artist can have a unique encounter with technology because he or she is an expert, aware of the changes in sense perception, as McLuhan purported [33], then it is the artist who will instigate the discovery of new realms of experience beyond ordinary cognition. Today small numbers of artists informed by a spirit of genuine artistic inquiry are turning their backs on the art market and are committing themselves to creating telecommunications events in the placeless place of networking.

Starting in 1982, after the pioneering telecommunication activities of Bill Bartlett, Stan VanDerBeek and Liza Bear, Bruce Breland, Matt Wrbican and other members of the Pittsburgh-based Dax group (which now has an extension in Bellingham, Washington), have worked consistently with fax and slow-scan TV as artistic media. Dax has created or participated in telecommunications events in which telephone lines are saturated with signals that flow in multiple directions carrying graphic information. These interactions often include other media as well (dance, computer music, etc.), span over several time zones, are geographically dispersed, and establish varied kinds of relationships between participants. Bruce Breland, Director of the group, wrote that:

The concept of interactive systems has erased the old boundaries of regionalism or nationalistic art. Telematics has created the possibility of a new setting for interactive participation between individuals and groups. Telematics provides a means for instantaneous and immediate dissemination of information granting the individual a choice between simple retrieval or intricate collaborative art events. [34]

One of their first activities was participation in "The World in 24 Hours" (1982), a global network organized by Robert Adrian for Ars Electronica, in Austria, which linked sixteen cities on three continents for a day and a night. Three years later, they stretched the notion of worldwide interaction with "The Ultimate Contact," a slow-scan TV piece created over FM radio in collaboration with the orbiting space shuttle Challenger. The Dax group

25 *Art by Telephone*, op. cit.

26 Avital Ronell, *The Telephone Book; Technology, Schizophrenia, Electric Speech* (Lincoln: University of Nebraska Press, 1989).

27 Ronell, op. cit., p. 9.

28 John Brooks, "The First and Only Century of Telephone Literature," in *The Social Impact of the Telephone*, Ithiel de Sola Pool, ed., (Massachusetts: MIT Press, 1977), p. 220.

29 Quoted by Brooks, op. cit., p. 220.

30 Robert Hopper, "Telephone Speaking and the Rediscovery of Conversation," in *Communication and the Culture of Technology*, Martin J. Medhurst, Alberto Gonzalez and Torlo Rai Peterson, eds., (Pullman: Washington State University, 1990), p. 221.

31 The history of Western civilization, the history of our philosophy, is one of what Derrida calls "metaphysics of presence." It is a history of the privilege of the spoken word which is thought as the immediate, direct expression of consciousness, as the presence or manifestation of consciousness to itself. In a communication event, for example, the signifier seems to become transparent as if allowing the concept to make itself present as what it is. Derrida shows that this reasoning is not only present in Plato (only spoken language delivers truth) and Aristotle (spoken words as symbols of mental experience), but in Descartes (to be is to think, or to pronounce this proposition in one self's mind), Rousseau (condemnation of writing as destruction of presence and as disease of speech), Hegel (the ear perceiving the manifestation of the ideal activity of the soul), Husserl (meaning as present to consciousness at the instant of speaking), Heidegger (the ambiguity of the "voice of being" which is not heard), and virtually in any instance of the development of the philosophy of the West. The rationale and implications of this logocentrism/phonocentrism are not obvious and one must research its functioning. Derrida explains that language is impregnated by and with these notions; therefore, in every proposition or system of semiotic investigation metaphysical assumptions coexist with their own criticism, all affirmations of logocentrism also show another side that undermine them. See Jacques Derrida, *Of Grammatology* (Baltimore and London: Johns Hopkins University Press, 1976); also Jacques Derrida, *Positions* (Chicago: University of Chicago Press, 1981).

32 What Hopper does not account for is the fact that, in his discussion of linguistic intercourse, Saussure only employs examples of face-to-face exchanges, eliminating telephonic intercourse. Saussure (*Course in General Linguistics* (New York: McGraw-Hill, 1966), p. 206): "Whereas provincialism makes men sedentary, intercourse obliges them to move about. Intercourse brings passers-by from other localities into a village, displaces a part of the population whenever there is a festival or fair, unites men from different provinces in the army, etc."

33 Marshall McLuhan, *Understanding Media* (New York: McGraw-Hill, 1964) p. 18.

34 Breland [*New Observations*], p.10.

also participated in larger networks realized in acknowledged art institutions, such as the "Ubiqua" (1986) telecommunications lab at the 42nd Biennale de Venezia. In it, they participated with text (IP Sharp), slow-scan TV, and fax. More recently, they were the first to collaborate with African artists in a telecommunications event. On July 1990, they created "Dax Dakar d'Accord," a slow-scan TV exchange with artists in Pittsburgh and Dakar, Senegal, as part of a Senegalese five-year commemoration of the African Diaspora, the "Goree-Almadies Memorial" [35]. Participants from Dakar included Breland, Wrbican, Bruce Taylor, Mor Gueye (glass paintings), Serigne Saliou Mbacke, De C.A.S.A. (sand paintings), Les Ambassadeurs (dance and music), Le Ballet Unité Africaine (dance and music), and Fanta Mbacke Kouyate performing "Goree Song," which makes reference to Goree Island in Dakar Harbour, holding and embarkation place for the slave trade that took place over a four-hundred year period.

In Brazil, or perhaps I should say, in and out of Brazil, artists such as Mario Ramiro, Gilberto Prado (a member of French Art Reseaux), Paulo Bruscky, and Carlos Fadon have worked with telecommunications since the early or mid 1980s. The events created by these artists, some of whom have occasionally worked together, encompassed exchanges both on a national and international scale. Mario Ramiro, now living in Germany, is also a sculptor who works with zero-gravity and infrared radiation. He has initiated and participated in a number of telecommunications events with fax, slow-scan TV, videotext, live television broadcasts, and radio. He has also written extensively on the subject. Paulo Bruscky, from Recife, well-known for his work in xerography and mail-art, is one of the few Brazilian artists to have been awarded a Guggenheim fellowship. His early work in telecommunications involved experiments with telex and fax. Carlos Fadon, who lived in Chicago and now is back in São Paulo, is a photographer and computer artist whose work is part of several international collections. One of his most original slow-scan TV

pieces [36] is "Natureza Morta ao Vivo" ("Still Life/Alive"), which proposes that once one artist (B) sends an image to another (B), the image received becomes the background for a still life created live. The artist (B) places objects in front of the electronic image and the combination of both object and image is captured as a video still which is now sent back to the artist (A). This artist now uses this new image as the background for a new composition with new objects and sends it to the artist (B). This process is repeated with no terminus, so that the generation of a still life remains a work-in-progress through which a visual dialogue takes place.

In Paris, France, the Art Reseaux group, formed by Karen O'Rourke, Gilberto Prado, Christophe Le François and others, has been developing elaborate projects such as O'Rourke's "City Portraits" [37],

How can there be a receiver or a transmitter as positive values if it is only in the connecting act, if it is only in the crisscrossings of telephonic exchanges, that such positions temporarily constitute themselves?

which call for participants in a global network to travel in imaginary cities by means of exchange of fax images. The project usually involves the initial creation of a pair of images, the entrance and the exit, which other artists then take as the extremes of the route they will explore in the metamorphosis of images exchanged over the telephone line. Artists create entrances and exits using images of the cities they live in, by manipulating other images to form synthetic landscapes or both, blending aspects of direct and imaginary experiences of the urban environment. Gilberto Prado has been working on the "Connect" project, which involves at least two sites and two fax machines in each site. Artists in each site are asked not to cut the roll of thermal paper in the machine when fax images start to appear. Instead, they are asked to feed that roll into another fax machine and interfere in the images in the process. A loop is then formed, connecting not only the artists but

the machines themselves. This new configuration forms a circle in electronic space, linking in an imaginary topology cities that can be as far apart as Paris and Chicago. As an example of possible systems of interaction beyond linear models, Prado designed a circular diagram in which the hands (and not the mouths or the ears of the interlocutors) are the organs used for communication.

Le François' most recent project is "Infest," in which artists are invited to investigate aesthetically that new aspect of contemporary life which is the deterioration of images and documents due to contamination and infection by computer viruses. During the exchanges, images suffer manipulations that attempt to destroy and reconstruct them (infection/disinfection), pointing to the new condition of electronic decay in the world of digital epidemiology.

As the metaphors of human existence continue to intermingle with those of cybernetic existence, designers learn how to cope with issues of interfacing and artists compare remote communication to face-to-face interaction. Acknowledging the

place of telephony in art, Karen O'Rourke reflected on the nature of fax exchanges as an artistic practice:

Most of us today have taken not pointing (nor even photography) as a starting point for our images, but the telephone itself. We use it not only to send images but to receive them as well. This nearly instantaneous feedback transforms the nature of the messages we send, just as the presence of a live audience inflects the way in which actors interpret their roles or musicians their scores. [38]

Traditionally, as in the sign/idea relationship, representation (painting, sculpture) takes place as absence (the sign is that which evokes the object in its absence). Likewise, experience (happening, performance) is that which takes place as presence. One only experiences something when this something is present in the field of perception. In telecommunications art, presence and absence are engaged in a long-distance call that upsets the poles of representation and experience. The telephone is in constant displacement. It is logocentric but its phonetic space, now in

congruity with inscription systems (fax, e-mail etc), signifies in the absence more typically associated with writing (absence of sender, absence of receiver). The telephone momentarily displaces presence and absence to instantiate experience not as pure presence, but, as Derrida wrote, "chains of differential marks."^[39]

Conclusion

The new aesthetic outlined in the previous pages certainly escapes from the problematic rubric of *fine arts*. The roles of artists and audience become intertwined, the exhibition *qua* forum where physical objects engage the perception of the viewer loses its central position. The very notion of meaning and representation in the visual arts—associated with the presence of the artist and stable semi-linguistic conventions—is revised and neutralized by the experiential setting of communications. Having evolved from early experiments pursued by artists associated with the movement of conceptual art, where language and media were first investigated programmatically as artistic realms, telecommunications art provides a new context for the postmodern debate.

Our traditional notions about symbolic exchanges have been relativized by new technologies, from answering machines to cellular telephony, from cash stations to voice interface computers, from surveillance systems to satellites, from radio to wireless modems, from broadcast networks to e-mail networks, from telegraphy to free-space communications. Nothing in these promoters of social intercourse allows either optimism nor despair; they call for a disengagement from the concept of communication as transmission of a message, as expression of one's own consciousness, as correspondent to a pre-defined meaning.

The experimental use of telecommunications by artists points to a new set of cultural problems and to a new art. How to describe, for example, the encounter now possible between two or more people in the space of the image in a videophone call? If two people can talk at the same time on the phone, if their voices can meet and overlap, what shall we say about the

new experience of telemeeting in the reciprocal space of the image? What is the fate of all the telecommunication models [40] that don't account for the multi-party interwoven fabric of planetary networks? After minimal and conceptual art, does it suffice to return to the decorative elements of parody and pastiche in painting? And what of the hybridization of media, which now compress maximum information-processing capabilities in minimum space? How will we deal with the new hypermedia that unite in one apparatus—telephone, television, answering machine, video disk, sound recorder, computer, fax/e-mail, videophone, word processing, and much more? How can there be a receiver or a transmitter as positive values if it is only in the connecting act, if it is only in the crisscrossings of telephonic exchanges, that such positions temporarily constitute themselves? Contemporary artists must dare to work with the material and immaterial means of our time and address the pervasive influence of new technologies in every aspect of our lives, even if that implies that they interact from afar and remain out of sight, at-a-distance from the art market and its accomplices. I quote Derrida [41], now in conclusive mode:

One never sees a new art, one thinks one sees it; but a "new art," as people say a little loosely, may be recognized by the fact that it is not recognized, one would say that it cannot be seen because one lacks not only a ready discourse which organizes the experience of this art itself and is working even on our optical apparatus, our most elementary vision. And yet, if this "new art" arises, it is because within the vague terrain of the implicit, something is already enveloped—and developing.

35 For a complete list, see *Art Cam*, Number 40, Vol. 10, August 1990.

36 Carlos Fodon, "Still Life/Alive," in *Connectivity: Art and Interactive Telecommunications*, Roy Ascott and Carl Eugene Loeffler, eds., Leonardo, Vol. 24, N.2, 1991, p. 235.

37 See *Connectivity: Art and Interactive Telecommunications*, p. 233.

38 O'Rourke, "Notes on Fax-Art," op. cit., p. 24.

39 Jacques Derrida, *Limited Inc* (Evanston, IL: Northwestern University Press, 1988), p. 10.

40 For a summary of communication models, see Denis McQuail and Sven Windahl, *Communication Models for the Study of Mass Communications* (London and New York: Longman, 1981).

41 Jacques Derrida, "Videar," in *Passages de L'Image* (Barcelona: Coixa de Pensions, 1991), p. 176. "Passages de L'Image" was a traveling exhibition of medio arts (video, holography, digital imaging, etc) organized by the Musée National D'Art Moderne, Centre Georges Pompidou, Paris.

PUSHING THE ENVELOPE

Push engineering, science, or mathematics far enough and you get art. At its edges, physics is indistinguishable from poetry. Chaos and fractals have given artists new eyes, and graphical computer simulations can induce a kind of reverence normally reserved for the natural world.

At a conference called “Inner Reality and Outer Space” sponsored by the Jung Institute in San Francisco several years ago, former astronaut Rusty Schweickart told a wonderful story. He was outside the spacecraft, the first astronaut in space without a tether—nothing but a backpack to supply air. His goal was to determine whether a person could move hand-over-hand over the surface of the capsule to reenter it, and astronaut Dave Scott was to take pictures of him from inside. The camera jammed, and commander Jim McDivitt gave Scott five minutes to try to fix it. For that interval, Schweickart says, he became “the world’s first unemployed astronaut.” He swung out on one arm and regarded the Earth, and at that moment he realized that he had a choice. He asked himself, “Am I going to let it in?” He did, and his life changed.

Virtual reality (VR) is an extreme idea—human-computer interaction taken beyond familiar limits. By positing that one may treat a computer-generated world as if it were real, VR contradicts the notion that one needs a special-purpose language to interact with computers. “Direct manipulation” becomes direct sensory encounter, and the pane is blown out of the interface window to reveal an open portal to the imagination. As one gazes through it, one may ask Rusty Schweickart’s question.

From its strange childhood in military and government labs, VR has emerged as a Major Concept in the pop-culture scene. It has been hailed as the techno-wave of the future, with potential to transform everything from movies to medical imaging. It has also been demonized as the latest in mind-control drugs and the world’s baddest war machine. Philosophers have adopted it as a platform for renewed debates about the nature of reality, the evolution of global culture, and the relationship of technology to the body and the physical world. Nearly everyone agrees that a head-mounted display will give you a look inside Pandora’s black box. The mythos of VR seems to be a key ingredient in the pop-culture view of how the world is changing—a many-faceted icon for the coming weird times. Why?

In the book *Through the Vanishing Point*, Marshall McLuhan mused about how new technologies change our consciousness:

Anything that raises the environment to high intensity, whether it be a storm in nature or violent change resulting from new technology, turns the environment into an object of attention. When it becomes an object of attention, it assumes the character of an anti-environment or an art object. [MCLUHAN AND PARKER, 1968]

Such anti-environments, McLuhan believes, “open the door of perception to people otherwise numbed in a non-perceivable situation.” Shakespeare was barking up the same tree when he said that drama “holds the mirror up to nature.” Media represent us to ourselves in a multidimensional way—beyond the content of any particular representation, the characteristics of the medium itself give us insight into the invisible cultural context. Whoever discovered the ocean, as the saying goes, it certainly wasn’t a fish.

If McLuhan was right about anti-environments, the media-making impulse may be a built-in species-level survival mechanism. In this sense, VR manifests humanity’s need to encounter and transform the notion of control. No matter how you look at VR, the control issue is center stage. The public and the press are worried about mind control: Is VR addictive? Can it be used for brainwashing? Can special interests, from secret police to commercial advertisers, alter our beliefs and desires with hypnotic potency? Will it be used as a way to deny and circumvent the blood-and-guts realities of war? Will it replace condoms, cosmetic surgery, and real, live lovers with electronic sex?

What we fear is the loss of control—over our minds, our society, our government, our bodies, and our sexuality. And with good reason. VR functions as an anti-environment that boosts our awareness of conditions that already exist in our culture, but to which we have become, if not completely numb, at least resigned and mute. VR may ultimately function to demonstrate that Control is a toxic philosophy in the contemporary world, not only in terms of culture and art, but also in terms of our relationships with individuals, societies,

and environments—and especially in terms of how we define and measure our own freedom and self-esteem [LAUREL, 1992].

VR is also about control in the way that it challenges traditional views of human-computer interaction. Since the inception of the idea of intelligent machines in fiction and fantasy, the hope has been that computers would be the servants of humanity; the fear has been that they would be our masters. In the last decade, empowerment has become a leading buzzword—computers empower people to do things, make things, learn things, find information, and play games.

VR questions whether explicit choice-making through a formal interface language is empowering enough. In general terms, a traditional interface only allows people to do what a programmer has decided to let them do. Out of all the millions of things we might want to do in a representational world, interfaces only empower us to do a tiny subset. Our channel of communication with computers is a drop from the fire hose of human bandwidth. In the philosophy of VR, empowerment means enabling people to do whatever they think of. VR aspires to respond to our choices and actions with the robustness of the real world; it aims to let the whole body in where only bits have gone before.

Similarly, VR confronts the issue of control in the paradigm of authorship. Without predetermined sets of choices for users, it is impossible to preconstruct a “story,” or even a set of alternative stories, that a user can experience. Some designers of interactive environments are beginning to work with a notion that replaces “user” with “participant” and the author/consumer dichotomy with a model of collaborative co-creation. The collaborative model suggests that what is designed is a dynamic environment with predispositions and potentialities, and an essential element in the authorship of experience is a dynamic participant who changes the world by being in it.

“Pushing the envelope” in VR involves both engineering expertise and artistic sensibility. While engineering provides the means for accomplishing dazzling photorealism in graphics and animation, art recognizes

that ambiguity evokes imaginative participation. While engineering gives us the capability to create both visual and auditory representations with great fidelity and resolution, art examines how the senses combine to affect our experience. Engineers are often disgruntled by the inevitable invasion of artists as their technologies mature, and artists are often strident in their criticisms of the arcane tools at their disposal.

But forced marriages sometimes turn out well. As Paul Heckel observed about the history of film, “Movies did not flourish until the engineers lost control to artists—or more precisely, to the communications craftsmen” [HECKEL, 1982]. It is important to remember that engineering and art are different sensibilities which may exist in the same person. You will note that I have cleverly avoided providing definitions for

VR functions as an antienvironment that boosts our awareness of conditions that already exist in our culture, but to which we have become, if not completely numb, at least resigned and mute.

either one. You might say that engineering focuses on functionality while art focuses on experience, and beauty is the common ground. The rest of this article describes some of the ways that workers in VR have arrived at a “fusion” approach, with examples of people and works that demonstrate the power of art and engineering in partnership.

Crossover People

Many prominent VR innovators share the characteristic of a multidisciplinary background. In some cases, people have consciously constructed educational programs for themselves that combine art, technology, and humanities. Others have backed into a fusion approach through discoveries and conversion experiences as they pursued their work in art or engineering.

Michael Naimark is a self-styled crossover person. Long before the hype, long before people started claiming they invented the term “virtual reality,” Mike was working on

virtual world-making in ways that the VR-in-crowd today would call unconventional. He earned his B.S. in Cybernetic Systems (a home-brewed major) at the University of Michigan in 1974, rubbed elbows with folks like Marshall McLuhan, then went on to get an M.S. in Visual Studies and Environmental Art at M.I.T. in 1979. This makes him an old-timer by anybody’s standards (except, perhaps, Ted Nelson’s). In fact, he’s one of the few people who says he or she worked on the famous Aspen disc who actually did.

Beginning with Aspen, Mike has been a principal designer of literally every significant work in a field called moviemapping (sometimes referred to as surrogate travel). The idea is to use film or video to create a three-dimensional representation of a real place that can be explored in a relatively unconstrained way. Going out of the studio to record with the intention of interactive end-use is what Mike describes as a “lateral approach” to 3D modeling. Mike has moviemapped San Francisco from the air, Paris from the sidewalk, and Karlsruhe, Germany, from the tram. One of his next projects, on which I am lucky enough to be a collaborator, will let people “walk” through natural environments and see them in 3D.

Similarly, Naimark has investigated spatial correspondence between representations and real-world objects, the concept behind both head-tracking and texture-mapping in VR, through the vehicle of novel projection environments. For example, in “Displacements,” an installation at the San Francisco Museum of Modern Art in 1984, he assembled a typical American living room (complete with bric-a-brac) and filmed it with a camera mounted on a turntable. Then he sprayed the entire room white, mounted the projector on the same turntable, and re-projected the room onto itself using the actual objects as projection surfaces. Mike and his students from the San Francisco Art Institute combined relief projection with live performance in an installation called EAT, shown at the Tomorrow’s Realities Gallery at SIGGRAPH ’91 and at various venues in Europe.

Michael Naimark has been “straddling the fence” in a conscious way throughout his career. “I’ve always been spinning two plates on two poles—one is art the other is media tech—and the intention has always been to do a 50/50 number. When I find myself going toward one I consciously head back toward the other.” Mike is also making technical contributions in capturing and employing camera-originated imagery to build 3D computer models. His Field Recording Study for Virtual Environments has been funded by the Banff Center for the Arts for the summer of 1993. When “hybrid VR” arrives, Michael Naimark will know exactly what to do with it.

Mark Bolas, founder and president of Fake Space Labs, also designed a multidisciplinary education for himself. With an undergraduate degree in Physics, Mark learned to program in the Computer Music program at the University of California at San Diego. He earned his Master’s degree in the Stanford Design Program, a joint program between art and engineering formed in the Sixties with an emphasis on product design. In addition to running his own company, Mark is currently a lecturer in the Stanford Design Program.

Bolas has designed some of the earliest examples of crossover work in VR, great engineering driven by artistic motivations. Several works in 1988, produced under the auspices of the Stanford Design Program in collaboration with the NASA Virtual Environment Workstation (VIEWW) Lab, investigated what one might describe as artistic issues. “During my master’s year,” Bolas says, “I tried to implement an idea or design in a virtual environment every week. My goal was to experientially find out what works, what pulls a person further into the illusion, and what doesn’t. Once I found phenomena and techniques that worked, I exploited them in more complex scenarios.”

“Flatlands” and “Enter” are works that explore tricks of perspective. In “Flatlands,” you find yourself standing in front of a simplified version of a Mondrian painting. You discover when you move toward this apparent painting that it is

actually a three-dimensional array of lines that recedes behind the frame. When you fly above the painting, you can see the lines like a swarm of elongated bees. Bolas has somewhat perversely transformed Mondrian’s “flatland” into a 3D composition. “Enter” employs the same trick, this time surrounding you with doors labeled “ENTER.” When you approach, the doors deconstruct themselves in the same way. From this work came the VR notion of a “G-spot”: a point in 3-space where some Graphic becomes recognizable.

With Phil Stone, Bolas also built a virtual theremin (itself a pretty virtual instrument). Gestures and contacts with the theremin produce different frequencies and series of tones and simulate various musical instruments via a sound synthesizer. Also in 1988, Bolas built “Touchface,” an exercise in synesthesia intended to help participants transition from “here” (the real world) to “there” (the virtual environment). Bolas describes it this way: “The scenario requires a user to reach out and touch a person’s face—a real person standing still in front of the user. The user cannot, of course, see the person standing there. When the user touches the person’s face, a drum beat is heard, and a small shaded polygon is placed at the fingertip of the user. After touching the person’s face for a while, a virtual representation of that face begins to form in front of the user. This is a Tactile to Sound to Sight transformation experience.

Creon Levit is an example of a designer who “backed into” an artistic approach through an engineering project. (Named after a character in the earliest Greek tragedy, Creon may have been destined to do artistic work whether he intended to or not.) At the Numerical Aerodynamic Simulation Facility at the NASA Ames Research Center, he was a principal designer of the “Virtual Windtunnel” exhibited at the SIGGRAPH ’91 Tomorrow’s Realities Gallery. In 1991 he was trying to make a benchmark program that would create an exact number of polygons, lines, and points in order to measure the performance of graphics systems. Specifically, he was exploring the rendering throughput of Silicon Graphics machines in different

configurations. “Tapeworld,” also shown at SIGGRAPH ’91, was originally displayed on a workstation screen. “You’d say, ‘give me 50,000 polygons,’” Levit explains, “and it would distribute them in these weird curly ribbons in a quasi-random way.” The results were “so beautiful to look at” that he moved them into a VR environment.

William Bricken’s Ph.D. is in Education. He also has an extensive background in philosophy, psychology, computer science, and mathematics. His work in boundary mathematics is playing a key role in the development of VEOS, the Virtual Environment Authoring System, at the Human Interface Technology Laboratory (HITL) associated with the University of Washington in Seattle. I met William when we worked together at the Atari Systems Research Laboratory in 1982-83. In those days, his talk about boundary math—always delivered with a cosmic glint in his eye—seemed like visionary ravings. Now, William has the beatific look of someone whose dreams are coming perpetually true.

When I asked him to tell me about VR art projects at HITL, William responded with some questions: “So, what is art in VR? Is it a world built by an artist? Is it specifically non-functional worlds? Is art narrowly defined as painting-like (so no inclusive work is art), or has art graduated to experiential (so whatever you do is art)? Is art an attitude?” Yes, William. “The 3D sound stuff at NASA is art. Myron [Krueger’s] work is art. The code in the VEOS is art that is, some coding style considerations are motivated by aesthetics.”

William believes that art in VR is inexorably bound up with a capacity for achieving beauty that is embedded in the tools. He cites the example of VSX, a virtual airplane model demonstrated by HITL at the Tomorrow’s Realities Gallery. In the original implementation language, Bricken says, the model was “colorful, enticing, comprehensible.” Then they ported the same model to a different implementation environment. The ported version was “a green blob, frustrating, nondescript, meshy.” He concludes, “The difference between the two models is art.” William’s

many faceted contributions to VR—philosophical, mathematical, and aesthetic—will, I believe, have a profound influence on the field for a long time.

Ann Lasko-Harvill works at VPL Research, the world's first VR company. Her work provides more strong examples of the value of a multidisciplinary background. After receiving her undergraduate degree in fine arts from the University of California at Santa Cruz, she ran a print studio and taught art for eight years at Evergreen State College in Washington state. She also worked as a rehabilitation engineer, designing things like seating for wheelchairs and new, improved skis for her boss, a paraplegic who was a world champion mono-skier. Ann moved to California when her husband came to get his MFA at Stanford, and after getting bored out of her mind "hanging around married student housing," she decided to get a Master's degree in the Stanford Design Program. Because of her anthropometric background, VPL hired her to design the DataSuit in 1987. Ann isn't a programmer by trade; she took some programming classes at Stanford but ended up working exclusively in Body Electric, a high-level VR programming language from VPL, which she learned as the language was being written.

One of the things that Ann has found herself doing at VPL is designing characters—both autonomous entities and virtual bodies that can be inhabited by real participants. Her first "electronic puppet" was the infamous VPL lobster. People seemed drawn to it, and seemed to have fun exploring "what a lobster is, or what they think lobsteriness might be." She also designed an angel, but discovered that few people were interested in putting it on. Her background in art has led her to make some interesting connections between virtual identities and the world of masks and costumes. "The self we design for pleasure, play, and social interaction" she writes, "can be very different from the highly constrained one determined by role or task... Everyone could invent a whole cast of characters, representing the range

from the utterly private to various forms of the public self." She adds that "Self-disclosure is not always synonymous with authenticity" [LASKO-HARVILL, 1992].

Ann's most complex autonomous character arose from a collaboration with film and television director Alex Singer. The Sprite is a trickster character with an ambivalent personality, a mischief maker who leads you into trouble and then helps you get out of it. Singer designed the character's inner traits and behavior, and Ann focused on the character's visual appearance and movement characteristics. For Ann, the ability to support such collaborations is a key criterion that must be met by any VR authoring environment. She proclaims: "Virtual reality is an art form. It is and should be a creative medium... In order for the virtual reality artist to function as an agent for change, the technology must be

...in the absence of tools for non-programmers, the best solution may be what we call "strapping an artist to a programmer..."

accessible." Ann should know since she's devoted much of her life to providing access for people with differing abilities.

Access to Tools

I asked Mark Bolas how the evolution of VR compared to the histories of other related fields that utilized computers. He was struck by similarities with computer music. Many of the pioneers in computer music took it upon themselves to learn the language of computing and construct their own tools. But as Mark points out, many of the musicians who began grappling with signal processing found (to their chagrin) that the process had blown a decade-wide hole in their lives as composers and performers.

There are two lessons here. The first is that, in the absence of tools for non-programmers, the best solution may be what we call "strapping an artist to a programmer"—that is, forming art/engineering

partnerships where both people can learn, produce interesting works together, and evolve the medium. The second is that first and second-generation tools will necessarily differ. In the first, the emphasis must be on facilitating skills transfer from the existing medium (in the case of VR, animation, theatrical improvisation, puppetry, or architectural design are examples) to the new. As with computer music, second-generation artists are much more like those kids in Marin who know how to swim because Mom threw them in the pool when they were babies. They are so intimately conversant with the new medium that they have absorbed the original contradictions.

Acting in Virtual Worlds

SimGraphics, a VR company in South Pasadena, California, can boast of significant technological innovations that have been developed through collaboration with artists. The company has transformed itself from a provider of engineering and defense applications to a major player in the Hollywood scene. Through the efforts of a number of people, including Steve Tice and Mike Fusco, Sim-

Graphics began developing virtual-world design tools and capabilities more than four years ago. A collaboration with Chris Walker of Mr. Film led to the implementation of dramatic new tools for real-time character animation. The Performance Animation System, introduced in 1991, was showcased in the Tomorrow's Realities Gallery with "Susie Surfer," a user controlled gleaming silver female body riding a surfboard.

In response to actors' requests for a hands-free interface, the Performance Animation System has been augmented with Waldo, a "facial armature" that consists of an array of pads that are medically glued to different parts of an actor's face. Through Waldo and a combination of joystick and foot pedals, actors can control eyes, mustaches, sound effects, gross physical movement, whatever they want. SimGraphics is developing applications for their system in live stage shows, film, and

television. It is likely that their techniques will revolutionize the production of animation by making it cheaper, faster, and more expressive. The system will be demonstrated in a live multimedia stage show at SIGGRAPH '93.

Both LaskoHarvill and the designers at SimGraphics are making use of a fundamental truth about dramatic character: traits can be few and sparsely drawn because human enactment and human perception are so good at filling in the gaps. The trick to good characterization, as playwrights know, is to do a good job of matching semiotic traits (the traits we perceive) with actionable traits (the traits we infer from observing a character's behavior). The right match produces a wealth of information and hypotheses in the minds of an audience for two reasons: one, we have a few millennia of experience with theatrical representations; and two, because it's a skill we use every day in getting acquainted with new people [LAUREL, 1991].

VR Down Under

At the Royal Melbourne Institute of Technology (RMIT) in Australia, Michael Gigante's Advanced Computer Graphics Centre supports an amazing collection of artistic endeavors. There are some fairly normal collaborations—a virtual sculpting environment that's been worked up by a sculptor strapped to a programmer, for instance. There are projects that are breathtaking in scope and concept—for example, an 8,000 cubic meter white-light hologram. Holographic artist Paula Dawson explains that the work, entitled "You Are Here," will depict sea-level changes over the past 2.5 million years, and will be illuminated by the light of the full moon on a beach in Northern Queensland, Australia [JEPSEN AND DAWSON, 1991].

Then there is the downright bizarre performance artist Stelarc's Virtual Arm project, which adds a third arm and one or more additional hands or fingers to the body of the performer. Stelarc is interested in "how normal performance parameters can be extended by a Virtual Arm and how the body can be visually augmented by such images and choreographed by

biosensors." This is not strange to a man whose performances have included suspending his body from the ceiling of a gallery on hooks through his skin, and it is also not bizarre to Michael Gigante, the director of the lab, who both appreciates the work as art and sees enormous practical potential in it. Gigante believes that the Virtual Arm could be useful for teleoperations on manipulators in remote locations, and that it can be seen as sophisticated human-like extended manipulators for handling objects in a virtual task environment. He and his technically oriented colleagues have filled several complex technical papers with new information and theories derived from this project.

Gigante founded the lab in 1988. Of his motivations, he says:

I was a regular SIGGRAPH attendee, and like many others, I dreamed of producing wonderful animations or beautiful pieces of computer graphics art. Unfortunately for me, this desire was not accompanied by much in the way of artistic talent. I had some ideas I would love to explore and knew that I could provide technical skills to complement someone with artistic talent, but that I could not do it on my own. It was clear that there was a real synergy possible, that many of the artists I spoke to needed someone with technical skills, and just as important technical facilities to make their ideas possible.

Gigante managed to convince RMIT to create a multi-disciplinary computer graphics center by garnering the support of the Associate Director of RMIT, who in turn persuaded the faculties of Art, Science, and Engineering to throw their computer budgets into the kitty. With the help of computer graphics artist Paul Brown, Gigante managed to keep the center alive through an extremely lean year until a large government grant came through. Holographer Paula Dawson helped him design an art program in which each artist had a "buddy" from the research staff. Initially, Gigante had difficulty gaining the trust of some of the artists, but in the end, he says, a key group of artists "were so enthusiastic that it propelled the program faster than I would have believed possible." Indisputably the leading lab of its kind in Australia and one of the best in the world, the Advanced Computer Graphics Centre will not be complete, Gigante says, until artists can be supported by in-residence programs or generous fellowships.

Australia seems to have more than its share of artists working in new media, including VR. Jon McCormack of Melbourne produced a work entitled "Four Imaginary Walls" which was exhibited in 1991 in Australia's largest show of contemporary art, *Perspecta*. McCormack's virtual world is animated by data supplied from a digital meteorology station outside the gallery space. Wind speed and direction, temperature, and light conditions are monitored and transformed into sound and image. Tim Gruchy in Brisbane is working on a third person, video-based system (similar to Vivid Effects) for interactive sculpture and performance events. I am waiting eagerly for the day that aboriginal artists bring the notion of Dreaming to a medium that seems to have been made for it.

Mecca in the Mountains

The Banff Centre for the Arts in Alberta, Canada, has sustained a reputation for supporting excellent experimental work in the arts for many years. Under the direction of Douglas MacLeod, the Art and Virtual Environments Project supports artists working in the VR medium with access to an impressive array of equipment, a staff of technical experts, and a chance to reside in one of Canada's most breathtaking landscapes. MacLeod's fundamental goal is access for artists:

Virtual technologies represent a new and hotly contested site for artistic exploration. Just as it is important for artists to open themselves up to technology, it is also paramount for artists to have access to equipment. More than any other group, their explorations, investigations, and debates have the potential to expand our relationship to both technology and the world.

The program was inaugurated in 1991 with the Bioapparatus project, directed by Catherine Richards and Nell Tenhaaf, focusing on explorations of "the technologized body and the new biology." Among the works produced was a piece by Ottawa-based artist Robert McFadden entitled "Picture Yourself in Fiction," combining scanned imagery of the artist's body with digitized samples of his poetry. Another piece, entitled "Inherent Vision, Inherent Rights," was developed by Lawrence Paul, a native Canadian of the Salish tribe. Paul created a spirit lodge environment inhabited by figures derived from his paintings

and incorporating smoke, fire, and environmental sounds. This fall, Paul's piece will be part of an exhibition entitled "Land, Spirit, and Power" at the National Gallery of Canada in Ottawa—the first VR art work to be exhibited at the Gallery

Outreach at the HIT-Lab

Similarly, the Human Interface Technology Laboratory in Seattle has been providing access to VR for young people. Until spring of 1992, Meredith Bricken served as director of the education program at HITL. In the summer of 1991 she arranged a collaboration with the Technology Academy, a technology oriented summer day camp for students from ages five through eighteen. In cooperation with HITL researchers and sponsors, students were given the option to explore VR for the first time in 1991. A total of fifty-nine students, aged ten through fifteen, participated, in weekly groups of ten, over the course of the summer. VPL provided a cost-free site license for the Macintosh modelling software package Swivel 3-D, the Technology Academy supplied Mac IIs, and HITL furnished a "protoworld" implemented in Swivel for the students to explore and customize. Seven new worlds were created by the students, ranging from a moon colony to a neighborhood with houses to a "medieval space station" [BRICKEN AND BYRNE, 1992]

In the course of their work, the students mastered a variety of computer graphics concepts and techniques, VR concepts (like the idea of "presence"), 3D modeling techniques, and methods of data organization. The students filled out opinion surveys that predictably revealed an extremely high level of enthusiasm for VR. Not so predictable was their preference (76%) for experiencing worlds that they had built themselves as opposed to worlds that had already been built. Meredith concludes, "Most important was the demonstration of the students' desire and ability to use VR constructively to build expressions of their knowledge and imagination. It is our preliminary conclusion from this study that VR is a significantly compelling creative environment in which to teach and learn."

Another project supported by HITL was a VR piece called *Angels*, designed by Nicole Stenger. HITL provided technical support and access to tools. Stenger refers to the outcome as "my first real-time movie," the culmination of a ten-year quest. Her work was driven by an interest in textures "I started my journey through tactility using textured glass in the late Seventies, then maintained this artistic necessity throughout my computer work. In VR I hope to eventually bring the pleasure of touch to users, and when tactile systems are integrated, have the participants feel the folds of the *Angels'* sleeves." In supporting work like Stenger's and the Technology Academy project, HITL demonstrates the insight that the creative impulse is an excellent guide in the development of technology and tools.

Moving into the Future

The people mentioned in this article are certainly not VR's only artistic pioneers. The works of Myron Krueger, Vincent John Vincent, and Ed Tannenbaum in the domain of immersive second-person environments, to name some examples, have contributed enormously to our understanding of how people experience and express themselves in virtual worlds. Their works have been guided by the belief, shared by Michael Naimark, that an immersive environment need not be worn on one's head.

Today, thanks to the pioneering efforts of many engineers and artists and aggressively enlightened programs like those at RMIT, HITL, and Banff, more artists—and more renowned artists, like Jenny Holzer and Shalom Gorewitz—are exploring VR as a medium. Several new works have been funded at Banff in the summers of 1992 and 1993. Doug MacLeod describes the new crop of projects:

Each of these works is uniquely different. Will Bauer's "Objects of Ritual" will use his gesture and media system to create multidimensional "hyperobjects" through human gestures. "Virtual Coyote" by Rachel Strickland and myself will explore new means of narrative action in interactive virtual environments. Michael Naimark's "Field Recording Studies" proposes to study the notion of "place" by

creating three-dimensional computer models of the physical world... And in Michael Scroggins' "Topological Slide" viewers will be invited to slide over four-dimensional objects. [MACLEOD, 1992]

Other upcoming Banff projects include Perry Hoberman's "Virtual Hat;" "Dancing with the Virtual Dervish" by Diane Gromala, Marcos Novak, and Yacov Sharir; "Virtual Reality on Five Dollars a Day" by Ron Kuivila; and, a piece by Toni Dove and Michael Mackenzie.

"Breaking the Art Barrier" took the better part of a decade in computer graphics. Thanks in part to the persistence and success of CG pioneers, the transition seems to be happening much more quickly in VR. My hopes for VR, as well as for the future of human-computer interaction, are founded on the quick and strong response of artists and of the artistic impulse in engineers. Whatever else the world may make of VR, the work on the artistic frontier assures that it can be used to empower the imagination and to nourish the spirit.

References

- Bricken, Meredith, and Chris M. Byrne. "Summer Students in Virtual Reality: A Pilot Study on Educational Applications of Virtual Reality Technology." Washington Technology Center, 1992.
- Heckel, Paul. *The Art of Friendly Software Design*. New York: Warner Books, 1982.
- Jepsen, Mary Lou, and Paula Dawson. "Lunar Illuminated Outdoor Hologram." Royal Melbourne Institute of Technology, Advanced Computer Graphics Centre, 1991.
- Losko-Horvill, Ann. "Identity and Mask in Virtual Reality." *Discourse* 14.2, forthcoming.
- Laurel, Brenda. "Interface Agents: Metaphors with Character." In *The Art of Human-Computer Interface Design*, B. Laurel Ed., Reading, MA: Addison-Wesley Publishing Company, 1991.
- Laurel, Brenda. "A VR Field Report." *Proceedings of the Computer Game Developers' Conference*, 1992.
- MacLeod, Douglas. "Art and VR." *Art and Virtual Environments Project*, Banff Center for the Arts, March 1992.
- McLuhan, Marshall, and Harley Parker. *Through the Vanishing Point*, 1968.

Acknowledgments

In addition to the artists interviewed, several people contributed to the preparation of this article. I would like to thank Paul Brown, Roger Trilling, John Grimes, Gary Warner, and Rachel Strickland.

COMMITTEE*Chair*

John Grimes

Institute of Design, Illinois Institute of Technology (IIT)

Assistant

Alex Traube

Institute of Design, IIT

Committee

Peter Belmontocchi, computer modeling

Paul Brown, international liaison

Ron Clark, exhibit design and planning

Lorry Kolosch, telecommunications

George Kraft, telecommunications

Irv May, networking

Sylvie Rueff, interactive works

Marlo Schweppe, installations and performance

Joan Truckenbrod, Chicago events

Dietmor Winkler, design consultant

Kirk Woolford, telecommunications

JURY

John Pearson

Young-Hunter Professor of Studio Art, Oberlin College

Patric Prince

Independent curator, SIGGRAPH Traveling Art Show chair

John Sturgeon

Associate Professor of Art, Carnegie Mellon University

Lynne Warren

Associate Curator of Collections, Museum of Contemporary Art, Chicago

CORPORATE SUPPORT

Special thanks to our industry partners and supporters:

Esprit Projection Systems, video projectors

RGB Spectrum, Media Wall

RosterOps, color printer, video boards

Apple Computer, Inc., many Macintoshes

ABB Robotics, industrial robot

Silicon Graphics Computer Systems, workstations

Truevision, video boards

Pioneer, video wall

Wocom Technology Corporation, tablets

Fractal Design, software

Compression Labs Inc., software

AT&T, corporate support for State of Illinois Gallery Show

Digital Arts, software

Time Arts, software

Adobe Systems, software

IIS Technologies, technical assistance

Nippon Telegraph and Telephone Corporation, technical assistance

Macromedia, software

Pacific Bell Market Application Development Group, technical assistance

Leonardo, the journal of the International Society for the Arts, Sciences, and Technology

Hayes, ISDN products

Sun Microsystems, workstations

Switch Digital International, ISDN service

Audio Visual Systems, screens

The IBM Research Center at Almaden, technical support

Network Express Incorporated, ISDN multiplexers

WINDY CITY

R/Greenberg Associates, Inc.
New York
0:29

CONTRIBUTORS

DIRECTOR/DESIGNER:

Joe Francis

PRODUCER:

Chip Houghton

CGI ANIMATORS:

Jacques Stroweis

David Horsley

C. Robert Hoffman III

Mark Voelpel

Eileen O'Neill

Joe Francis

DIGITAL RETOUCHERS:

Robert Bowen

Karen Sideman

Brian Loube

STOCK PHOTOGRAPHY:

The Image Bank, NYC

ORIGINAL PHOTOGRAPHY:

Dan Wilby

Robert Bowen

TYPE DESIGNER:

Michael Riley

EDITOR:

Nelson Sacristan

ORIGINAL MUSIC:

Elias Associates, Inc.

CONTACT

Joe Francis

R/Greenberg Associates, Inc.

350 West 39th Street

New York, NY 10018

(01) 212-239-6767



ELECTRONIC

THEATER

GRAY LORIG
CHAIR

**THE ANCIENT WORLD
REVISITED, PART II**

Taisei Corporation
2:00

This animation was originally produced for the NHK documentary series, *The Mongol*. Based on archaeological research, it aims to reproduce with the greatest possible authenticity the architecture and cityscape of the capital of the Mongol Empire and of Mongol-ruled China, Qaraqorum, and Dadu (modern Beijing).

CONTRIBUTORS

ANIMATION:

Osamu Ishizawa
Nobushige Morota
Takashi Izoto

MODELING:

Yoshiki Nishimura
Yuko Kono
Modoka Kikuchi
Sowako Furihata
Ayumu Fukase
Shigeki Yoshida
Midori Ueda

Music:

Isao Tomita

HARDWARE

IRIS 4D/35TG, 4D/440S
Symbolics, VAX 6000

SOFTWARE

GDS, PATAPATA, Links,
S-geometry, Explore

CONTACT

Makoto Mojima
Taisei Corporation
25-1, Nishi-Shinjuku
1-Chome
Shinjuku-ku, Tokyo 163-06
Japan
(81) 33-348-1111
(81) 35-381-5221 fax



**BANDE-ANNONCE DE LA
QUINZAINE**

Fani Films/DHD PostImage
0:30

Opening sequence for
Quinzaine des Realizateurs
(Director's Fortnight) at
Cannes Film Festival 1992.

CONTRIBUTORS

DIRECTOR:

Nick Boisvert

HARDWARE

SGI Personal Iris

SOFTWARE

Softimage 4D Creative
Environment

CONTACT

Bruce Granofsky
DHD PostImage
6265, rue St-Jacques
Montréal, Québec H4B 1T8
Canada
(01) 514-489-8989
(01) 514-489-0242 fax





**BANRI NO CHŌJŌ
ODYSSEY OF THE GREAT
WALL**

TBS
1:25

This computer-animated segment is from a television program that illustrates the wondrous architecture and history of the Great Wall of China.

CONTRIBUTORS

Yukihira Noda
PRODUCER:
Kazuhiko Hoshi

HARDWARE

Symbolics XL1200

SOFTWARE

S-Products

CONTACT

Yukihira Noda
TBS Vision CG Room
5-2-8 TBS Bekkan 1F
Akasaka Minatoku,
Tokyo 107
Japan
(81) 33-505-7092
(81) 33-505-7451 fax

**BEST OF GEOMETRIC FABLES
(2 EB 3)**

Fantôme Animation
4:30

The series *The Geometric Fables* is a free adaptation of the Fables by J De La Fontaine and by Esope, made by Fantôme. Pierre Perret, a very famous French singer, wrote a new text, made songs, and is also the storyteller.

HARDWARE

Silicon Graphics

SOFTWARE

TDI Explore

CONTACT

Philippe Baudort
Fantôme Animation
71 rue Ampère
75017 Paris
France
(33) 1-40-53-01-23
(33) 1-40-53-02-07 fax



"BATMAN RETURNS"

VISUAL EFFECTS

Video Image Associates

1:00

This work includes the visual effects of bats and the Bat-Mobile shield. The bats were "behaviorally" animated. Both the bats and Bat-Mobile shield were digitally composited on digitized live-action background and foreground elements.

CONTRIBUTORS

PRODUCED BY:

Tim Burton
Denise DiNovi
Larry Franco

DIRECTED BY:

Tim Burton

VISUAL EFFECTS SUPERVISOR:

Michael Fink

VIDEO IMAGE CREW:

Richard Hollander
John Wosh
Andy Kopro
Joseph Goldstone
Stanley Liu
Antoine Durr
Craig Reynolds
Glenn Neufeld
John DesJardin
Larry Weiss
Scott Peterson
Scott Gieger
Marc Scoparro
Mary Nelson
Cheryl Budgett

CONTACT

Richard Hollander

Video Image Associates
5333 McConnell Avenue
Los Angeles, CA 90066
(01) 310-822-8872
(01) 310-821-1012 fax



Coca-Cola / AMC
MetroLight Studios for
McConn-Erickson/Atlanta
0:27

This piece is a photo-realistic simulation of the surface of a soft drink, including wave motion, effervescence, bubbles, and floating ice cubes.



CONTRIBUTORS

CREATIVE DIRECTOR:
Jon Townley
EXECUTIVE DIRECTOR:
Dobbie Schiff
DIRECTOR/DESIGNER:
Jeff Doud
PRODUCER:
George Merkert
TECHNICAL DIRECTORS:
Tim McGovern
Jerry Weil
Kelley Roy
John McLoughlin
MODELERS:
Eduardo Batres
Bill Kent
Alon Ridenour
Con Pederson
SOFTWARE:
Rob Rosenblum
POST PRODUCTION:
Gayle Reznik

HARDWARE

Solbourne S-604
SGI 4D workstation
A60 and A66 Abekas
Celco Film Recorder

SOFTWARE

MetroLight Proprietary

CONTACT

Dobbie Schiff
MetroLight Studios
5724 West Third Street
Los Angeles, CA 90036
(01) 213-932-0400
(01) 213-932-8440 fax

**CAUSTIC SKY: A PORTRAIT OF
REGIONAL ACID DEPOSITION**

North Carolina Supercomputing
Center (NCSC)
3:45

The causes of sulfuric acid deposition in the eastern US and Canada are shown graphically using data generated from the US EPA's Regional Acid Deposition Model (RADM). The data are shown with representation methods such as volume rendering, isosurface generation, and sonification.

CONTRIBUTORS

Christopher Landreth
Robin Dennis
Dove Back
Tom Palmer
Ed Williams
Scott Barber
Mike Clark
John McHenry
Doe Won Byun
Steve Thorpe
Theresa Rhyne

SPONSOR

US Environmental
Protection Agency

HARDWARE

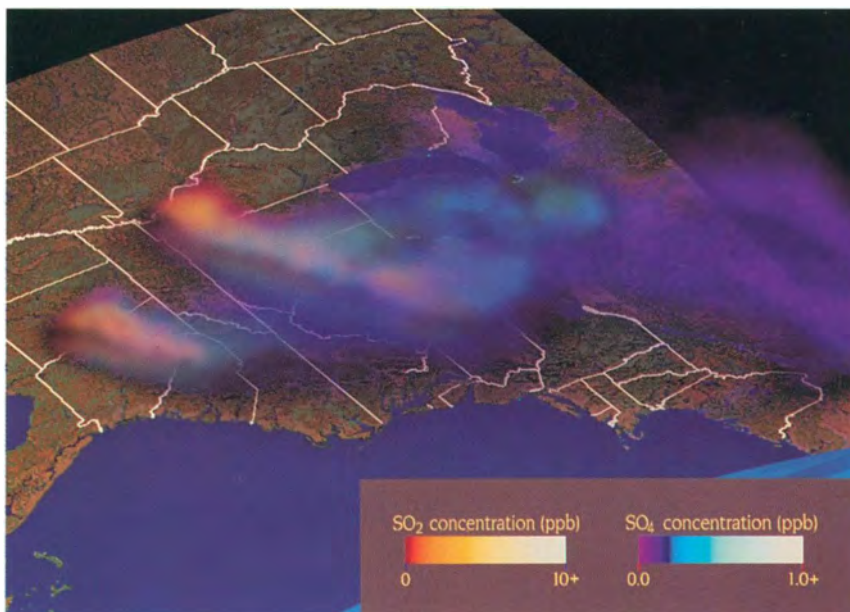
Cray Y-MP 8/464
SGI 4D/280GTX server and
4D/35TG workstations

SOFTWARE

Softimage 4D Creative
Environment
Wavefront Advanced Visualizer
NCSC Visualization Software

CONTACT

Chris Landreth
North Carolina Supercomputing Center
3021 Cornwallis Road
Research Triangle Park, NC 27709
(01) 919-248-1141
(01) 919-248-1101 fax
landreth@doppler.ncsc.org



COMING ATTRACTIONS

Susan Alexis Collins

2:00

Examining the ironies of being a strong, educated woman today, sandwiched between one's own needs and others' expectations, this piece is a reflection on modern mating habits and sexual balances of power. In *Coming Attractions*, moving drawings weave themselves into a time-based collage, "video wallpaper," which when layered expose a surprisingly menacing underbelly to our "everyday." *Coming Attractions*, as the title suggests, is just a hint at the promise of things to come.

CONTRIBUTORS

DIRECTOR, ANIMATOR, EDITOR:
Susan Alexis Collins
SOUND PRODUCTION:
Greg Petersen

SPONSOR

Commodore Amiga
(loan of Amiga 2000)

HARDWARE

Amiga 2000

SOFTWARE

Deluxe Paint III

CONTACT

Susan Alexis Collins
Computer Graphic Arts
Columbia College
600 South Michigan Avenue
Chicago, IL 60605
(01) 312-663-1600 x399
(01) 312-663-1707 fax



72

DANCE IN THE PANTS

Animal Logic

0:30

Dance in the Pants, a commercial for Bonds Grand Slam Menswear "South Pole" briefs, was produced by Animal Logic for OMON Australia. Discreet Logic's Eddie software was used for the morphing and shading in the piece.

CONTRIBUTORS

Chris Godfrey

HARDWARE

Silicon Graphics

SOFTWARE

Eddie by Discreet Logic

CONTACT

Diana Sherwood
Discreet Logic, Inc.
5505 Boulevard St. Laurent
#4201-B
Montréal, Québec H2T 1S6
Canada
(01) 514-272-0525
(01) 514-272-0585 fax





DeBug Op

Allen Edwards/TDI

1:00

Life on the golf course can be hard if you're two inches tall. These scenes of small creatures and flying golf balls were made after hours while testing beta software.

CONTRIBUTORS

DIRECTED BY:

Allen Glen Edwards

MATERIALS AND LIGHTING:

Pascal Nicot

MODELING AND ANIMATION:

Peter Warner

Felix Recalt

Bruno Chaffard

Allen Glen Edwards

ADDITIONAL MODELING AND

ANIMATION:

Anne Brotot

Corinne Schlumberger

Lutz Mueller

Ludovic Texier

Maurice Van Swaaij

RENDERING AND RECORDING:

Lutz Mueller with help from

Arnaud Hervas

ALSO, THANKS TO:

Jean Charles Hourcade

Alain Nicolas

Christian Rouet

Alain Behar

Denis Schlumberger

TDI R&D

Amy Hecht for initial spark

SOUND:

Digison

THANKS TO

Ex Machina and Videosystem

for rendering time

HD/CG for HiDef recording

Rebo for HiDef editing

HARDWARE

SGI Personal Iris

SGI Indigo

SGI Power Series

IBM RS/6000 Series

SOFTWARE

TDI Version 3.0

CONTACT

Allen Glen Edwards

Thomson Digital Image

29 rue Ganneuron

75018 Paris

France

(33) 1-43-87-58-58 x2088

(33) 1-43-87-61-11 fax

DINO TOURS PILOT

HD/CG New York

3:00

Dinosaurs which disappeared from the Earth 65 million years ago come back to life with the help of computer graphics and HDTV—the media of the 21st century.

CONTRIBUTORS**EXECUTIVE PRODUCER:**

Jun Kawakami

PRODUCER:

Jeon H. Kim

DIRECTOR:

Noriaki Kaneko

ART & DESIGN:

Albertosaurus &

Corythosaurus—

Nori Kaneko

OCEAN SEQUENCE AND**LANDSCAPES:**

Debbie Pashkoff

2D PAINT/TEXTURES:

Carol Hayden

TECHNICAL DIRECTOR:

Hiroyuki Miyoshi

TECHNICAL SUPPORT:

Robert Zimmelman

TDI CONSULTANT:

Michael Takayama

PAST PRODUCTION SUPERVISOR:

Philip Hock

SCIENTIFIC CONSULTATION:

Dr. Philip Currie

Ex Terra Foundation

MUSIC:

Seth Forber

SPONSOR

MICO, Media International

Corporation

HARDWARE

Silicon Graphics (3D)

Shima Seiki 480 SGX (2D)

SOFTWARE

Meta Editor

Kinetic

Hi Trace

TDI Explore

CONTACT

Deborah Devgan

HD/CG New York

34-12 36th St.

Astoria, NY 11106

(01) 718-361-1118

(01) 718-361-1758 fax



ECCENTRIC DANCE

META Corporation Japan

0:56

A woman's torso made of only 24 super metaballs dances about randomly. The super metaball is a modeling primitive with density distributions that form equidensity surfaces at a threshold level. This animation is the first attempt to apply metaballs of eccentric density distribution to a human figure.

CONTRIBUTORS

ARTIST:

Eiji Takaoki

MUSIC:

Haruhiko Nada

ASSISTANT:

Takashi Isoko

HARDWARE

SGI IRIS Indigo

SOFTWARE

METAeditor

METArender

CONTRACT

Bruno Tsuchiya

META Corporation Japan

Hanabusoyama Heights

#103

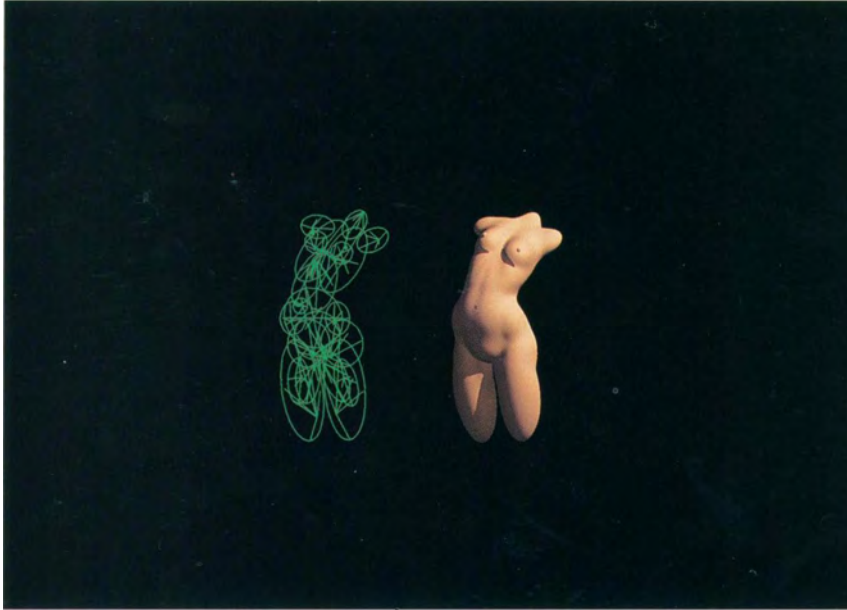
3-10-51 Kamiyohsoki

Shinagawa-ku, Tokyo 141

Japan

(81) 33-449-1261

(81) 33-449-1262 fax



DOES THIS PULSAR HAVE ORBITING PLANETS?

Cornell Theory Center

3:25

A pseudo-periodic drift in pulse arrival times from a pulsar suggests the presence of orbiting planets. This animation illustrates how pulse data is used to derive planetary mass and orbits, and how the presence of these planets may be verified.

CONTRIBUTORS

Alex Walszczan

Liang Peng

Bruce Land

Andy Pierce

Dave Grossman

Judy Warren

Martin Berggren

GRAPHICS, MUSIC, SCRIPT:

Wayne Lytle

SPONSOR

Cornell Theory Center

Cornell National

Supercomputer Facility

HARDWARE

IBM RS/6000 workstations

SOFTWARE

Wavefront Advanced Visualizer

In-house

CONTACT

Wayne Lytle

Cornell Theory Center

621 Engineering & Theory

Center Building

Ithaca, NY 14853-3801

(01) 607-254-8793

(01) 607-254-8888 fax

wayne@theory.tc.cornell.edu



EURODISNEYLAND "LE VISIONARIUM" ANIMATED SEQUENCE

Rhythm & Hues
0:50

A computer-generated future city of Paris for EuroDisneyland's "Le Visionarium," a CircleVision ride, features time travelers H.G. Wells and Jules Verne. The Rhythm & Hues'

section is a night flight underneath the Eiffel Tower soaring to 30,000 feet above the city.

CONTRIBUTORS

ANIMATION COMPANY:
Rhythm & Hues
DIRECTOR:
Clark Anderson
Co-DIRECTOR:
Dan Quansstrom
PRODUCER:
Bert Terzeri
TECHNICAL DIRECTORS:
Kevin Barnhill, Kathy White, Harold Buchman, Lorne Lanning, Min, Jennifer Pearce, Keith Hunter
SPECIAL PROGRAMMERS:
Steve Gray, Keith Goldfarb, Mark Henne, Paul Allen Newell
CHOREOGRAPHER:
John Hughes
FILM RECORDER:
David Keller
TAPE OPERATOR:
Howard Gersh
WALT DISNEY IMAGINEERING
THEME PARK PRODUCTIONS:
DIRECTOR:
Jeff Blythe
EFFECTS SUPERVISOR:
Jim Veilleux
PRODUCERS:
Antoin Compin, Charis Horton
ACCOUNTING:
Carl Griffin
CONTACT
Charles Gibson
Rhythm & Hues, Inc.
910 North Sycamore Avenue
Hollywood, CA 90038
(01) 213-851-6500
(01) 213-851-5505 fax



EX MEMORIAM

AGAVE SA
2:00

This is the story of a working memory: its resistances, its little noises, its concert, its worthless words. On a "Hand's labyrinth," the camera follows a long circuit (memory) and stops by precise hands (instants). We'll never see the whole labyrinth: memory's representation will stay confused forever.

CONTRIBUTORS

DIRECTOR AND AUTHOR:

Beriu

HARDWARE

Apollo
Hewlett-Packard

SOFTWARE

SV.4

CONTACT

Nathalie Vivien

AGAVE SA

Cop 108, 67 rue Robespierre

Montreuil Cedex 93558

France

(33) 1-48-57-89-06

(33) 1-48-57-93-32 fax





FIRE AND AIR

OSTRA DELTA

0:32

This opening animation was created for the Spanish Pavilion World Expo '92. The piece begins with the formation of the plaza. Particles flow, like the active streets of cars and people, towards the center of the plaza, the center of the fiesta. The dance is in the fire. The fire is the sun. From the fiery sun, fireworks erupt to form the symbol of the Spanish Pavilion. All of these elements combine to create an animated vision of the spirit of Spain.

CONTRIBUTORS

DIRECTION:

Rebecca Allen

DESIGN:

Juan Delcon

Rebecca Allen

PRODUCTION MANAGER:

José Munioin

ANIMATION:

Pedro Blanco

MUSIC:

Juan Alberto Arteche

POST PRODUCTION:

Telson

DIGITAL POST PRODUCTION:

Juanjo Redondo

LOGO DESIGN:

José Luis

Giménez de Pueblo

SPECIAL THANKS

Reina Sofía Modern Art
Museum

HARDWARE

SGI IRIS 4D/70

SGI IRIS Power Vision 320

SOFTWARE

TDI Explore

Telson

CONTACT

Patrick Rouchon

OSTRA DELTA

Don Ramon de la Cruz

75, 1ªA

28001 Madrid

Spain

(34) 1-401-88-00

(34) 1-401-09-89 fax

Rebecca Allen (In USA)

(01) 310-278-2980

(01) 310-278-3118 fax

FRACTAL ELLIPSOID FIRE

Geoffrey Y. Gardner

1:30

Grumman models fire with fractal ellipsoids. The Boise Interagency Fire Center is using the Grumman model in a training video for fire fighters to illustrate rapid fire propagation in specific terrain configurations. Two excerpts are shown.

CONTRIBUTORS

Bill Wertz

Jim Cook

Bob Kombitsch

SPONSOR

Grumman Data Systems

HARDWARE

SGI 4D/25G

SGI Personal IRIS

SOFTWARE

Original FORTRAN

CONTACT

Geoffrey Y. Gardner

Grumman Data Systems

MS D12-237

1000 Woodbury Road

Woodbury, NY 11797

(01) 516-682-8417

(01) 516-682-8357 fax



GLOBAL CLIMATE VISUALIZATION

Lawrence Livermore

National Laboratory

0:90

The film shows the wind velocity and cloud cover output of ten days in January of a general circulation model of the atmosphere. In two sequences, the wind velocity is represented by very fine vector segments, and in the third and fourth, the wind advects a transparent texture on cloud contour surfaces.

CONTRIBUTORS

Nelson Max

Roger Crowfis

Dean Williams

Chris Anderson

Gene Cronshagen

SPONSOR

US Department of Energy

HARDWARE

Cray-2

SGI Personal IRIS 4D/35

SOFTWARE

Specially written

CONTACT

Roger Crowfis

Lawrence Livermore National

Laboratory

PO Box 808/L-301

7000 East Avenue

Livermore, CA 94551

(01) 510-423-1320

(01) 510-423-8704 fax

crowfis@llnl.gov



ENERGY GENERATION BY CONTROLLED THUNDERSTORM

Bill Hibbard
2:00

Real-time interactive visual exploration of a simulation of an idea for generating energy from a controlled thunderstorm.

CONTRIBUTORS

Bill Hibbard
Brion Paul
Greg Tripoli
Peter Pokrondt
Bill Gray

HARDWARE

SGI 340 VGX

SOFTWARE

VIS-5D

CONTACT

Bill Hibbard
Space Science and
Engineering Center
University of Wisconsin
Madison, WI 53706
(01) 608-263-4427
(01) 608-263-6738 fax
whibbard@vms.mocc.wisc.edu



IN SEARCH OF PERFORMING AXIS

Polygon Pictures
0:36

This project is the result of our work to complete a character-based computer animation film. Based on the Skeleton Coordinate system, our system provides a complete mechanism for manipulation of various shapes of objects. Here we also introduce our new 3D pointing system and particle renderer.

CONTRIBUTORS

Toshifumi Kawahara
Takashi Fujimoto
Hideki Okano
Toshiaki Katoh
Keiichi Komeda
Yosuo Tojo
Toshiaki Shiozawa

HARDWARE

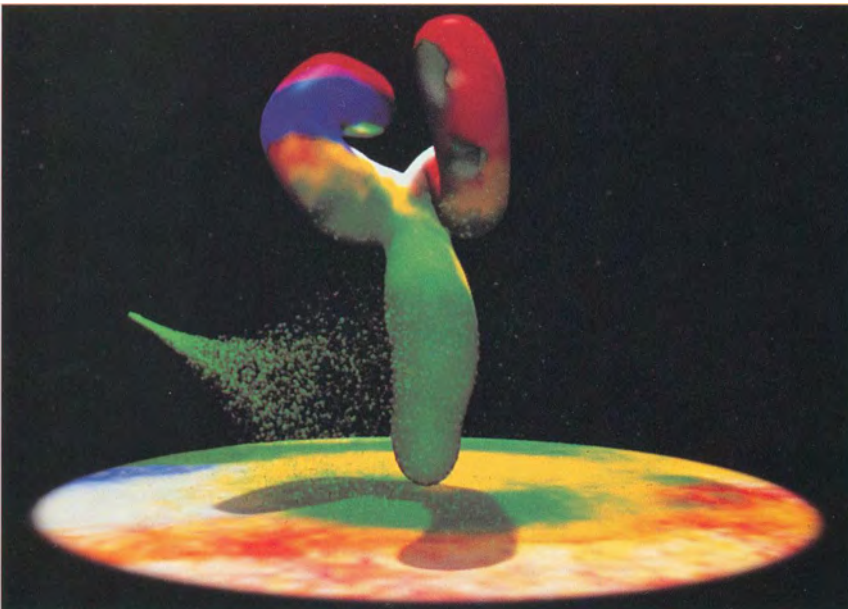
SGI IRIS 4D Series
Sun SparcStation

SOFTWARE

Original software MESOZOIC

CONTACT

Toshifumi Kawahara
Polygon Pictures
T11, 2-2-43 Higashi
Shinogawa
Shinogawa-ku, Tokyo 140
Japan
(81) 33-473-4321
(81) 33-474-4322 fax



**"LAWNMOWER MAN"
PARTICULATION SEQUENCE**

Xaos
1:12

Xaos created several minutes of animation for the virtual-reality thriller, *The Lawnmower Man*, including this "particulation" sequence where the character is reduced to small swirling particles which eventually disperse into the air. This was created by combining digitally modified live-action images with 2D and 3D effects.

CONTRIBUTORS

Mark Malmberg
Ken Pearce
Hayden Landis
Tony Lupidi
Eric Texier
Henry Preston
Roberto Brandao
Ric Tringali
Helene Plotkin
Brett Leonard
Gimel Everett

SPONSOR

Allied Vision/Lone Pringle Productions

HARDWARE

Silicon Graphics workstations

SOFTWARE

Xaos proprietary

CONTACT

Helene Plotkin
Xaos, Inc.
600 Townsend Street,
Suite 271E
San Francisco, CA 94103
(01) 415-558-9267
(01) 415-558-9160 fax



THE LAWMOWER MAN

Angel Studios
2:15

Angel Studios simulates a variety of futuristic VR environments in Stephen King's *The Lawnmower Man*, including an aggression-training battlefield, a high-speed obstacle course, and the ultimate interactive computer experience, CyberSex. Custom software techniques powerfully articulate the play between fact and fiction as Angel Studios' synthetic actor, CyberJobe, sets the stage for the movie's explosive ending.

CONTRIBUTORS

Allied Vision/Lone Pringle Productions in association with Fuji Eight Co., Ltd.
New Line Cinema Corporation
Brett Leonard
Gimel Everett
Benjade Films, Inc.
Angel Studios
Jill Hunt
Michael Limber
Brod Hunt
Diego Angel
Jeff Hayes
Paul Lewis
Lisa Santag
Roberto Javier
Dan Wyman
Frank Serafine
Serafine Studios

HARDWARE

Silicon Graphics workstations

SOFTWARE

Scenix proprietary
Wavefront

CONTACT

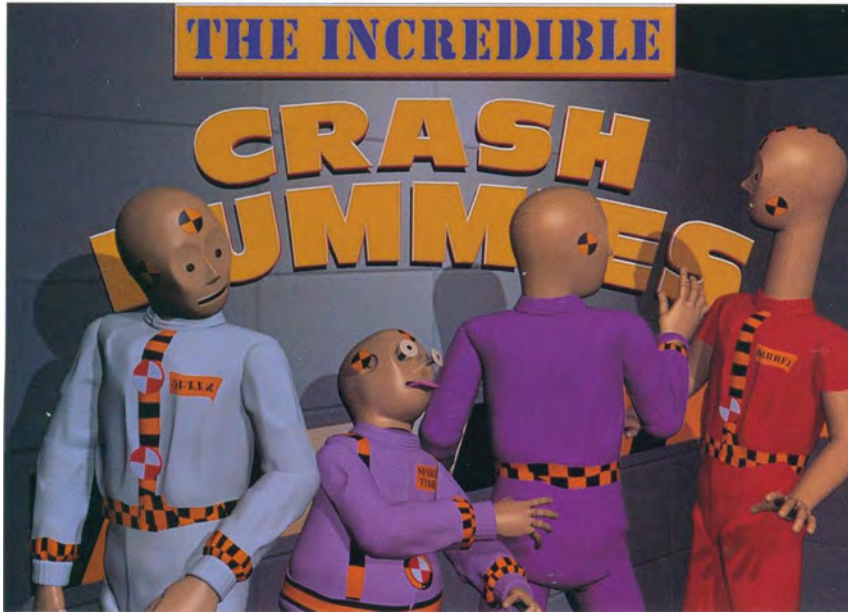
Lisa Santag
Angel Studios
5677 Oberlin Drive, Suite 101
San Diego, CA 92121
(01) 619-452-7775
(01) 619-452-8073 fax



THE INCREDIBLE CRASH DUMMIES

Lamb & Company
0:15

Character animation for a toy manufacturer. A driving force in character animation. Guaranteed to "crack you up."



CONTRIBUTORS

Beth Beyer
Bob Born
Paul Churchill
Keith Cormier
Marcia Dietrich
John Donkin
Rich Durkin
Scott Dyer
Jeff Faust
Scott Gaff
Gav Gnatovich
John Gorski
Doug Kingsbury
Larry Lamb
Pam Lehn
Mark Mariutto
Charlotte Matre
Richard Miller
Dave Novak
Doug Pfeifer
Ron Pitts
Jim Russell
Marci Selsberg

HARDWARE

Silicon Graphics 4D/420
Abacus A60
Sony D1

SOFTWARE

Wavefront Technologies
Lamb & Company proprietary

CONTACT

Lorry Lamb
Lamb & Company, Inc.
1010 South 7th Street,
Suite 600
Minneapolis, MN 55414
(01) 612-333-8666
(01) 612-333-9173 fax
l1b0001@uc.msc.edu

**LE CONCOMBRE MASQUE
THE LONE CUKE**

Neurones Cartoon
3:00

The Lone Cuke consists of 52 6:30 episodes. The series uses the basic fantasy world made popular by the comic, i.e., the central characters Cuke and Kohlrahi. The scripts are adapted from the first three albums of the famous Nikita Mandryka.

HARDWARE

Macintosh
Silicon Graphics

SOFTWARE

Chromos Pygma
Wavefront Advanced Visualizer

CONTACT

Paul Hannequart
Neurones Cartoon
Quai Van Beneden 3
4020 Liege
Belgium
(32) 41-44-28-00
(32) 41-44-29-27 fax



LIQUID SELVES

Karl Sims
2:15

In virtual worlds, our consistent recognizable faces are left behind and all faces become masks. Our ability to drink from and contribute to the global information pool is greatly enhanced, but the effective destruction of our natural bodies is a possible consequence.

CONTRIBUTORS

MUSIC:
Peter Gabriel
John Paul Jones
THANKS TO:
Lew Tucker
Jim Salem
Gary Oberbrunner
Matt Fitzgibbon
Dave Sheppard
David Marvit
Keith Waters
Kleiser-Walczak

SPONSOR
"Memory Palace"
Art Futuro '92

HARDWARE
Connection Machine System

SOFTWARE
Karl Sims

CONTACT

Karl Sims
Thinking Machines Corporation
245 First Street
Cambridge, MA 02142
(01) 617-234-1000
(01) 617-234-4444 fax
karl@think.com



"Let's Get Rocked"

Limelight
4:54

Music video for Def Leppard's song, *Let's Get Rocked*, done in a mixture of live-action and state-of-the-art computer graphics.

CONTRIBUTORS

PRODUCER:
Siobhan Barron
DIRECTOR:
Steve Barron
ANIMATORS:
Ian Pearson
Tim Waddy
Philippe Panzini

HARDWARE
SGI 440, 320, 35
SGI Personal IRIS

SOFTWARE
Softimage

CONTACT
Holly Ashwell
Limelight, Inc.
6806 Lexington Avenue
Los Angeles, CA 90038
(01) 213-464-5808
(01) 213-464-3109 fax





LIFESAVERS "AT THE BEACH"

Pixar
0:30

The Lifesaver family is all set for a day at a tropical beach. Under the watchful eye of the Lifesaver guard, the gang prepares for fun. Snorkeling, sunning, volleyball playing, sand castle building and kite flying are on the agenda. Lindberg—our kite flying friend—gets carried away, disrupts a volleyball game, and finally gets spiked into the container in this non-stop adventure.

CONTRIBUTORS

DIRECTOR:
John Lasseter
TECHNICAL DIRECTOR:
Yael Miló
PRODUCER:
Karen Robert Jackson

FOR PIXAR:
Pete Docter
Roger Gould
Jeff Pidgeon
Andrew Stanton
Rick Sayre
Darwyn Peachey
Eliot Smyrl
Galyn Susman
Tom Porter
Craig Good
Don Conway
FOR SKYWALKER SOUND:
Tom Johnson
Tom Myers
FOR FCB/LEBER KATZ PARTNERS:
Richard Carraro
Sam Guilisano
Joe Catena

TROPICANA PURE TROPICS "WAREHOUSE"

Pixar
0:30

An orange seeks adventure by sneaking out of his crate late one night to join a wild party being thrown by some tropical fruit.

CONTRIBUTORS

DIRECTOR:
John Lasseter
TECHNICAL DIRECTOR:
Yael Miló
PRODUCER:
FOR PIXAR:
Craig Good
FOR COLOSSAL PICTURES:
Shari Glusker

FOR PIXAR:
Andrew Stanton
Pete Docter
Galyn Susman
Tom Porter
Eliot Smyrl
Rick Sayre
Don Conway
FOR MUSIC ANNEX:
John Greer
FOR LEA BURNETT:
Wil Fieldhouse
Frank Parke
Mark Faulkner
Harry Ralston

LIFESAVERS "CONGA"

Pixar
0:30

Oh those covorting Candies! They can bend, they can jump, they can even do a little "dirty dancing." In this spot, New Gummi Lifesavers show their stuff at a night club.

CONTRIBUTORS

DIRECTOR:
John Lasseter
TECHNICAL DIRECTOR:
Yael Miló
PRODUCER:
FOR PIXAR:
Craig Good
FOR COLOSSAL PICTURES:
Shari Glusker

FOR PIXAR:
John Lasseter
Andrew Stanton
Flip Phillips
Yael Miló
Galyn Susman
Eben Ostby
Don Conway
FOR SKYWALKER SOUND:
Dave Slusser
FOR ONE PASS:
Bob Frisk
John Crossley
Bob Johns
FOR FCB/LEBER KATZ PARTNERS:
Richard Carraro
Sam Guilisano

SOFTWARE

Pixar's Menw modeling and animation software

CONTACT

Ralph J. Guggenheim
Pixar
1001 West Cutting Boulevard
Richmond, CA 94804
(01) 510-215-3413
(01) 510-236-0388 fax
ralph@pixar.com

THE LIVING ROOM
Texas A&M University
1:20

The animation contrasts everyday design problems to the larger problems of urban planning. It is the introduction to a larger video titled "Visualizing Change Before It Occurs." The animation was designed and executed in large part by graduate students in the Visualization program at Texas A&M University.

CONTRIBUTORS

Gayle Ayers
Matthew Brunner
Darrin Butts
Ed Cunniss
Eric Flaherty
Einar Kinsella
Thomas Linehan
James Price
Umakanth Thumrugoti

PRODUCER:

Susan Van Boerle

SPONSOR

The Design Arts Program,
The National Endowment for
the Arts

HARDWARE

Silican Graphics, Abekas

SOFTWARE

Wavefront, Softimage,
Discreet Logic (Eddie)

CONTACT

Susan Van Boerle
Visualization Laboratory
Texas A&M University
College Station, TX
77843-3137
(01) 409-845-3465
(01) 409-845-4491 fax
sue@archone.tamu.edu



MANDELSPLAT

Booker C. Bense
0:15

An amusing dive into the
Mandelbrot Set.

CONTRIBUTORS

John Moreland
Dave Nadeau
Jonathan Jenkins

SPONSOR

San Diego Supercomputer
Center

HARDWARE

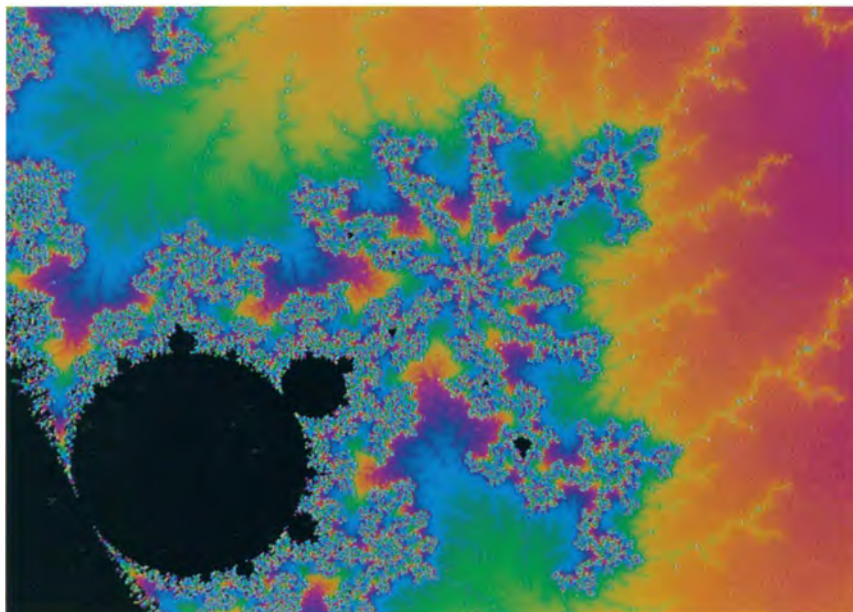
Cray Y-MP
Network of Sun workstations

SOFTWARE

Mostly homegrown
Mandelbrot viewer

CONTACT

Booker C. Bense
San Diego Supercomputer
Center
Box 85608
San Diego, CA 92186-9784
(01) 619-534-5118
(01) 619-534-5152 fax



SPACEBOY IN "SKY HIGH SCRAMBLE"

Blue Sky Productions
0:50

Coming attraction: SpaceBoy, on a mission to demolish a derelict weather station, encounters more than he bargained for.

CONTRIBUTORS

Chris Wedge
Jahn Kahrs
Mark Barneman
Michael Ferrara
Carl Ludwig
Oliver Rockwell
Eugene Troubetzkoy
Alison Brown
David Brown
Brook Maher
Gary MacLaughlin
Brod deGraf
Matthew Hoffman
MOTION CAPTURE:
Brod deGraf
Super Flo S.P.L.
Francesco Chiarini
Umberto Lozzoni

SPECIAL THANKS TO:
Homer & Associates

HARWARE

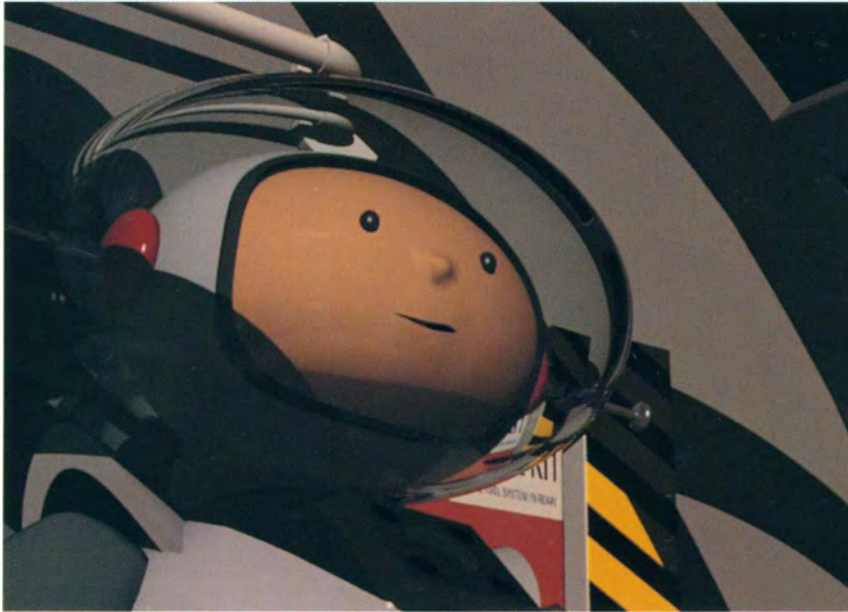
IBM PVS Supercomputer

SOFTWARE

CGI Studio

CONTACT

Alison Brown
Blue Sky Productions, Inc.
100 Executive Boulevard
Ossining, NY 10562
(01) 914-941-5260
(01) 914-923-9058 fax



OFF HIS ROCKERS

Tad Gielow
4:45

Toys take many forms, but there's no toy more enjoyable than imagination.

CONTRIBUTORS

DIRECTOR:
Barry Cook
ANIMATION:
Rob Bekuhrs
James Tooley
Alex Kupersmidt
TECHNICAL COORDINATOR:
Don Gwarek

CONTACT

Tad Gielow
Walt Disney Animation
Florida
PO Box 10,200
Lake Buena Vista, FL
32830-0200
(01) 407-560-5439
(01) 407-827-5090 fax



ORGAN HOUSE

Shima Seiki
1:00

CONTRIBUTORS

EXECUTIVE PRODUCER:
Kouchi Iwakura
CONCEPT:
Hirofumi Ito
DIRECTOR:
Masayoshi Obata
PRODUCTION COORDINATOR:
Osamu Sugihara
DESIGNERS:
Toshio Shimo, Daisuke Kishi
SOUND EFFECTS:
Tomokazu Okamura
ADVISOR:
Yoshiaki Fukunaga
POST PRODUCTION:
Sony PCL
SPECIAL THANKS TO:
Hideo Harada
Michiko Kitano
Neoteny
Mr. Hashimoto
CO-PRODUCTION:
Erte Inc., Gakken-Eizou-
Seishakushita
HARDWARE
Symbolics XL-1200
Shima Seiki - SGX
SOFTWARE
Symbolics S-products
Sima Paint
CONTACT
Masayoshi Obata
HD-TV Lab and Neoteny Daison
Kyodou Building
Shibuya-ku Tokyo 150
Japan
(81) 33-481-7813
(81) 33-481-7817 fax



86 | PDI Music Video Effects

Pacific Data Images
1:00

CONTRIBUTORS

CLIENT:
MJJ Productions
DIRECTOR:
John Landis
PRODUCTION COMPANY:
Propaganda Films
TRANSFORMATION SEQUENCES:
Pacific Data Images
DIGITAL EFFECTS SUPERVISOR:
Jamie Dixon
ANIMATORS:
George Bruder
Ray Giarratano
Barb Meir
Amie Slate
Neil Eskuri
Janet Rentel
Rebecca Marie
ASSISTANT ANIMATOR:
Cathy Wagner
PRODUCERS:
Julia Gibson
Michele Ferrone
EXECUTIVE PRODUCER:
Glenn Entis
HARDWARE
Silicon Graphics workstations
SOFTWARE
Proprietary

CONTACT

Deborah Giarratano
Pacific Data Images
1111 Karlstad Drive
Sunnyvale, CA 94089
(01) 408-745-6755
(01) 408-745-6746 fax





**PDI SCENES FROM "THE
LAST HALLOWEEN"**

Pacific Data Images
2:00

CONTRIBUTORS

HANNA BARBERA:

David Kirschner

Ken Koch

Don Cirillo

Savage Steve Holland

Sean Rache

Bruce Broughton

John Connor

Bill Eigenbrodt

Augie Hess

Alice Cassidy

C.S.A.:

Jim Davis

Gary Bentley

BOYINGTON FILMS, INC.:

William Hanno

Iwoo Takamoto

PACIFIC DATA IMAGES:

Carl Rosendahl

Brod Lewis

Patty Wooton

Henry Anderson

Rex Grignon

Ramon Hui

Glenn McQueen

Dick Walsh

Richard Chuong

Roy Giaratano

Ken Bielenberg

Sharon Calahan

Tod Heapy

HARDWARE

Silicon Graphics workstations

SOFTWARE

Proprietary

CONTACT

Deborah Giaratano

Pacific Data Images

1111 Karlstad Drive

Sunnyvale, CA 94089

(01) 408-745-6755

(01) 408-745-6746 fax

PENGUIN BLUES

Ex Machina
HD/CG New York
1:00

A miracle in Antartica.

CONTRIBUTORS

Xavier Nicolas
Philippe Billion

HARDWARE

SGI

SOFTWARE

Explore TDI

CONTACT

Xavier Nicolas
Ex Machina
22, rue Hégésippe Mareau
75018 Paris
France
(33) 1-42-93-26-27
(33) 1-42-93-53-44 fax



RIEN QU'UN SOUFFLE

A SLIGHT BREEZE

Videosystem

0:45

Drapes floating in the wind.

CONTRIBUTORS

Daniel Barenstein
Didier Levy
Shinji Santoh

HARDWARE

SGI Power Series 4D/480
Solitaire 35mm camera
Oxberry 35mm camera

SOFTWARE

Dynamic in-house software
TDI rendering

CONTACT

Alain Guiat
Videosystem
107, rue du Fg St-Honoré
75008 Paris
France
(33) 1-44-13-50-50
(33) 1-44-13-50-60 fax

REEBOK "COWARDLY BASKETS"

Rhythm & Hues
0:30

This combination of live action and computer animation features an animated basketball backboard that conveys a number of emotions: curiosity, insecurity, fear, and surprise, while interacting with a live-action basketball star.

CONTRIBUTORS

ANIMATION COMPANY:

Rhythm and Hues, Inc.

HOLLYWOOD DIRECTOR:

Dan Quarnstrom

EFFECTS SUPERVISOR:

Charles Gibson

HEAD TECHNICAL DIRECTOR:

Neil Richmond

TECHNICAL DIRECTORS:

Michael Tigar

Jennifer Pearce

Min

DYNAMICS SOFTWARE:

Mark Henne

ANIMATION SOFTWARE:

Paul Allen Newell

RENDERING SOFTWARE:

Keith Goldfarb

Steve Gray

EDITOR:

Rick Ross

ASSISTANT EDITOR:

Ladd McPartland

PRODUCER:

Lois Anderson

EXECUTIVE PRODUCER:

Lisa O'Brien

ASSISTANT PRODUCER:

Jean S. Tom

PRODUCTION COMPANY:

Image Point Productions, Inc.

HOLLYWOOD DIRECTOR:

Richard Taylor

PRODUCER/POST-PRODUCTION

SUPERVISOR:

Nick Bates

EXECUTIVE PRODUCER, NY:

Ivan Molomut

EXECUTIVE PRODUCER, LA:

JONATHAN MILLER

AGENCY:

CHIAT/DAY/MOJO

NEW YORK - PRODUCER:

Julie Hampel

CREATIVE DIRECTOR:

Richard Sabean

ART DIRECTOR:

Gil Witt

WRITER:

George Logothetis

HARDWARE

Silicon Graphics

SOFTWARE

Rhythm & Hues Proprietary

CONTACT

Charles Gibson

Rhythm & Hues, Inc.

910 North Sycamore Avenue

Hollywood, CA 90038

(01) 213-851-6500

(01) 213-851-5505 fax



**RETURNING WAVES
(NAMIGAESHI)**
Dai Nippon Printing Co.
4:00

This work is introduced at the Japan Pavilion at Expo '92 in Seville this year. In it, we visualize the Japanese sense of beauty in a modern style.

CONTRIBUTORS
Tsuayoshi Teshima
Masahiko Kishi
Hirotaka Harase
Shigeru Komatsubara
Hideki Murota
Akira Takakura
Kazuhiko Yoshida
Masao Sugawara
Masako Iimori
Shigefumi Kawase
Noriko M. Kobayashi
Takashi Kokubo
Takeshi Fujimori
Miki Okoshi

HARDWARE
SGI IRIS 4D
Sun 3

SOFTWARE
P-Render (In-house software)
Wavefront Advanced Visualizer

CONTACT
Hiro Harase
Dai Nippon Printing Co., Ltd.
1-1, Ichigaya -Kagacho
1-Chrome, Shinjuku-ku
Tokyo 162-01
Japan
(81) 33-266-3508
(81) 33-266-4599 fax



**S.C.A.M. STARVING
COMPUTER ARTIST'S MARKET**

New York Institute of
Technology
1:38

S.C.A.M. is a spoof on
electronic art being sold as
print art to the general public.

CONTRIBUTORS

Scott Breger
Dave Barosin
Margaret Brodman
Donna Minerva
Steve Schaffer
Peter Traugot
Brian Maroldo

PRODUCER:

Peter Voci

HARDWARE

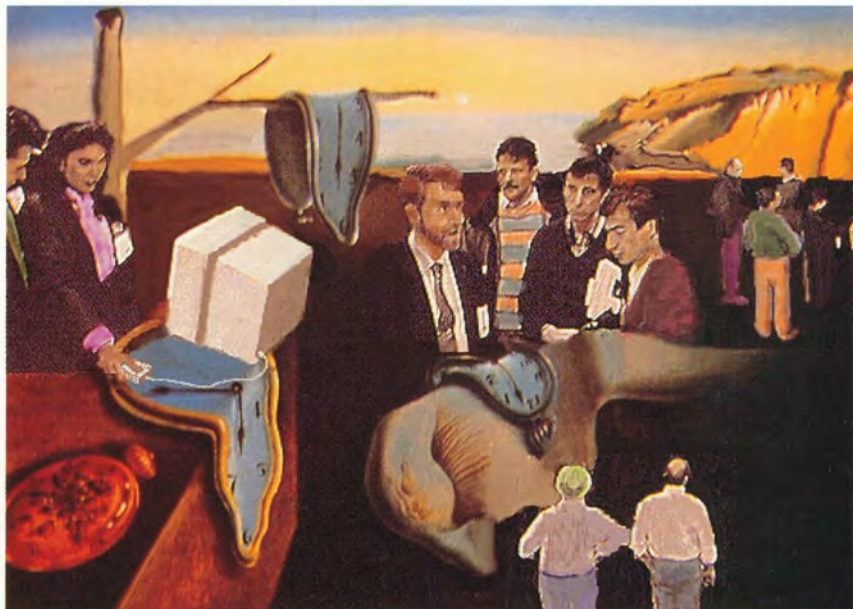
DEC Micro PDP 11
286 PC with custom buffers

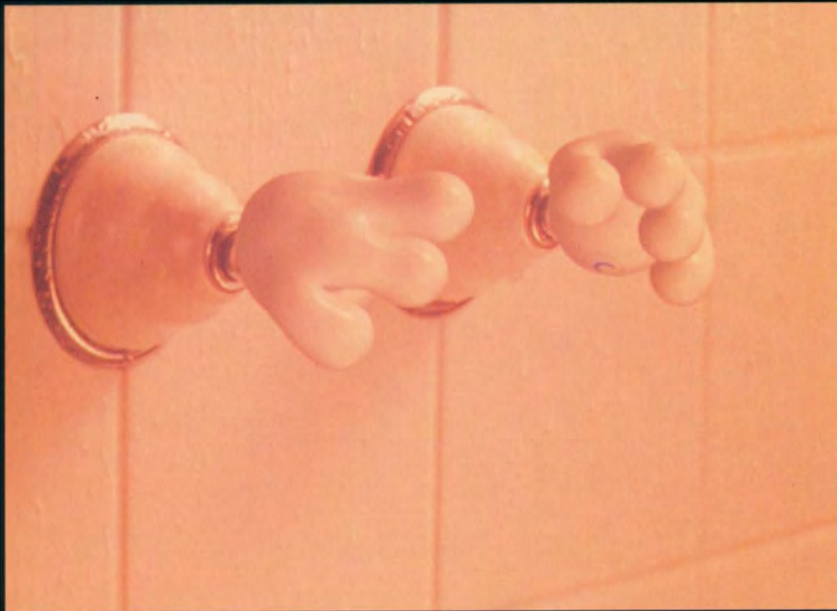
SOFTWARE

NYIT custom

CONTACT

Peter Voci
New York Institute of
Technology, Fine Arts Center
Old Westbury Campus
Old Westbury, NY 11568
(01) 516-686-7604
(01) 516-686-7542 fax





SHIELD SOAP

MetroLight Studios for Dream

Quest Images

0:30

A bathroom comes to life to the sound of colypso music, thanks to computer-animated transformations. A shower head becomes a bugle, faucet handles become hands, a bath brush becomes a moraca, geometric shapes fly off of a shower curtain, and soap bubble notes dance on a bar of Shield.

CONTRIBUTORS

CREATIVE DIRECTOR:

Jon Townley

EXECUTIVE PRODUCER:

Dobbie Schiff

DIRECTOR:

Patrice Dinhut

PRODUCER:

George Merkert

TECHNICAL DIRECTORS:

Jerry Weil

Aliza Carson

Alan Ridenour

SOFTWARE:

Rob Rosenblum

HARDWARE

Salbourne 5-604

SGI 4D workstation

A60 and A66 Abekas

Celco Film Recorder

SOFTWARE

MetroLight proprietary

CONTACT

Dobbie Schiff

MetroLight Studios

5724 West Third Street

Suite 400

Los Angeles, CA 90036

(01) 213-932-0400

(01) 213-932-8440 fax

"ROVER DANGERFIELD"

TITLE SEQUENCE

Rhythm & Hues
1:00

Rhythm & Hues' animated opening for the Warner Bros. film *Rover Dangerfield* features an integration of computer animation with traditional cel animation created by Hyperion Studios.

CONTRIBUTORS

COMPUTER ANIMATION/DIGITAL

COMPOSITING:

Rhythm & Hues, Inc.

SENIOR ANIMATOR:

Charles Gibson

TECHNICAL DIRECTOR:

Kevin Barnhill

PRODUCER:

Bert Terrieri

RENDERING, COMPOSITING

SOFTWARE:

Keith Goldfarb

ANIMATION SOFTWARE:

Paul Allen Newell

CEL ANIMATION:

Hyperion Films—

Tom Willhite, President

CLIENT:

Rover Dangerfield Productions

DIRECTORS:

Jim George

Bob Seeley

EFFECTS ANIMATOR:

Dick Sebast

PRODUCTION DESIGNER:

Fred Kline

BACKGROUND SUPERVISOR:

Ron Dias

PRODUCTION MANAGER:

Rick Sullivan

PRODUCTION COORDINATOR:

David Steinberg

HARDWARE

Silicon Graphics

SOFTWARE

Rhythm & Hues proprietary

CONTACT

Charles Gibson

Rhythm & Hues, Inc.

910 North Sycamore Avenue

Hollywood, CA 90038

(01) 213-851-6500

(01) 213-851-5505 fax



THE SEVEN WONDERS OF THE WORLD

Electric Images UK Ltd.

1:00

The seven wonders of the ancient world recreate themselves in their full glory—the Colossus of Rhodes rises from Rhodes harbour, the Temple of Zeus rebuilds itself complete with a forty-foot living Zeus, the Mausoleum at Halicarnassus materializes in a modern city—all at a level of realism that has rarely been seen.

CONTRIBUTORS

FOR ELECTRIC IMAGE UK LTD:

Paul Docherty

Ian Bird

David Benson

Sam Breach

Stephen Coren

Martin Foster

Karen Halliwell

Ian MacFadyen

Martin Nicholas

Simon McKeown

John Wake

Stewart McEwan

David Benson

Theo Lake

Jill Munro

Angie Wills

ZEPHA FILM AND TELEVISION

DENMARK:

Jorgen Riis

POST PRODUCTION AT WISEMAN,

LONDON:

Paul Farrell

TELECINE:

Jim Hagan

Thompson Digital Image

Paris (Plant Software)

PRODUCED BY:

Zepha Film and Television

Denmark for Jydsk Telefon

Denmark

HARDWARE

Sun workstations

Silicon Graphics workstations

AT&T Pixel Machines

SOFTWARE

Electric Images' Synthacam

TDI Explore

AMAP

Digital Arts

CONTACT

Angie Wills

Electric Images UK Ltd.

36/38 Lexington Street

London

W1R 3HR

United Kingdom

(44) 71-287-8800

(44) 71-287-3750 fax



SKETCHES OF ROME

William Paterson College
2:00

Sketches of Rome is an architectural animation. The piece focuses on the Pantheon and a Roman villa seen as they may have looked in ancient Roman times. The vehicle for viewing these structures is a sketchbook. The sketchbook appears in a present-day Roman plaza. Drawings in the book reveal the ancient Roman scenes.

CONTRIBUTORS**DIRECTOR:**

David Haxton

ASSISTANT DIRECTORS:

Chris Davies

Jennifer Shingelo

TECHNICAL DIRECTOR:

Dan Janowski

PRODUCTION MANAGERS:

Bridget Gaynor

Jane Mullaney

MODELERS AND ANIMATORS:

Chris Davies

Linda DeLeo

Bridget Gaynor

Dan Janowski

James Lee

Jane Mullaney

Jennifer Shingelo

Soung Nguy

HARDWARE

Silicon Graphics 4D series

SOFTWARE

Alias 3.1

Answer by 42INC

CONTACT

David Haxton

Art Department

William Paterson College

300 Pompton Road

Wayne, NJ 07470

(01) 201-595-2722

(01) 201-595-3273 fax

**SIEMENS "ALIENS"**

Spans & Partner
0:40

The animated sequence is about three aliens who come to Earth and discover what they think is a space ship. This innovative character animation was produced using inverse kinematics for the motion and flexible envelopes for the modeling of the characters.

HARDWARE

SGI

SOFTWARE

SoftImage

CONTACT

Peter Spans

Spans & Partner

Bueloustr. 8

2000 Homburg 1

Germany

(49) 40-280-3865

(49) 40-280-3467 fax



SOUND RENDERING
George Washington University
1:10

The animations were created using a new technique to generate and synchronize sound. A sound world is "modeled" by associating a characteristic sound for each object in a scene and is then "rendered" by tracing the propagation paths from these 3D objects to each microphone.

CONTRIBUTORS

Randy Rohrer
Youngses Park
David Florek

PRODUCERS:

Tapio Takala
James Hahn

HARDWARE

Macintosh II
HP 835 Turbo SRX

SOFTWARE

Tapio Takala
Rayshade

CONTACT

James K. Hahn
The George Washington
University
Department of EE&CS
801 22nd Street, NW
Washington, DC 20052
(01) 202-994-5920
(01) 202-994-0227 fax
hahn@seas.gwu.edu



TAGADA & FUGUE

Little Big One/Guionne
Leroy/La Cambre
4:00

The Bochloi Theatre presents a very special version of the ballet, "Kohpelia," starring Vladimir and Birgit as soloists. These two famous dancers are performing together for the first time. This might be an explosive meeting.

HARDWARE

Silicon Graphics

SOFTWARE

1Toon3/Mikerinos
SoftOriginal for 3D animation
created by Stephane Simal at
Little Big One

CONTACT

Guionne Leroy
Little Big One
34 Rue Du Danemark
1060 Brussels
Belgium
(32) 2-773-4811
(32) 2-773-4888 fax





FIGURE TO FIELD

Barbara Mones-Hattal
Ken O'Connell
5:00

The 23 segments in this animation were produced by 18 schools in Europe and the USA. Each school developed a transition from a Muybridge figure to a geometric pattern.

CONTRIBUTORS

ROYAL COLLEGE OF ART

London, England

FACULTY:

Robin Baker

STUDENTS:

Paulo Vieira Ramalho

Michele Januzzi

Ruth Farrington

SUP.INFO.COM.

Paris, France

FACULTY:

Marie-Anne Fontenier

STUDENTS:

Alexandre Dubosc

David Martinez-Fernandez

Isabelle Sabaty

UTRECHT SCHOOL OF ARTS

The Netherlands

FACULTY:

Mels Nieuwenhoven

Wijnand Ott

Leon Wennekes

STUDENTS:

Paul Boots

Simone Brinkman

Joost Smit

Harold Kuiper

Allert Aalders

SPECIAL THANKS:

Gerard Ranke

UNIVERSITY OF ILLINOIS AT CHICAGO, ELECTRONIC

VISUALIZATION

LABORATORY

Chicago, Illinois

FACULTY:

Dan Sandin

STUDENTS:

Margaret B. Hallam

F. Joseph Hoy

Martin Donohue

Jason Leigh

Gary Lindahl

Alan Millman

Dana Plepys

Lewis Siegel

**UNIVERSITY OF ILLINOIS,
URBANA-CHAMPAIGN**
Urbana, Illinois

FACULTY:
Donna Cox
STUDENTS:
Steve McCure
Alex Moore
Robert Potterson

**EPSON SCHOOL OF ART
AND DESIGN**
England

FACULTY:
Anne Lloyd
STUDENTS:
Gary Burchell
Danny Copozzi
Jason Lee
Matthew Parish
Nicola Smith

**RANCHO SANTIAGO
COLLEGE**
Santa Ana, California

FACULTY:
Sharon E. Ford
STUDENTS:
Randy Debber
Lynn Sue
Richard Tirabosso
Michael Wood

SCHOOL OF VISUAL ARTS
New York, New York

FACULTY:
Bruce Wands
STUDENTS:
Shirley Chin
Jill Hartley
Wichor Jiempreecho
Mikita Mikros
William Nelson
Dan Raabe

**UNIVERSITY OF OREGON
FINE AND APPLIED ARTS**
Eugene, Oregon

FACULTY:
Ken O'Connell
STUDENTS:
Bonnie Mitchell
Peter Patchen
SPECIAL THANKS:
Paul Block
Gary Meyers
Carl Johnson, Tektronix

**UNIVERSITY OF CENTRAL
FLORIDA**
Orlando, Florida

FACULTY:
Jacquelyn Ford Marie
STUDENTS:
Eduardo Arellano
Carl Julioa
Nick Lilovais
Ted Newman
Theresa Weber
Jason Wolbert

**GEORGE MASON
UNIVERSITY, V.I.T.
ANIMATION LAB**
Fairfax, Virginia

FACULTY:
Barbara Manes-Hottal
STUDENTS:
Tamar Cohen
David Gessell
John Rainey
Karen Thorne
Erik Kunze

**UNIVERSITAT DE LES ILLES
BALEARS**
Spain

Juan Montes de Oca

**UNIVERSIDAD COMPLUTENSE
DE MADRID, T.I.P.O.**
Madrid, Spain

FACULTY:
Gerardo Alvarez
Raquel Avila
Ursula Garcia
Gabriel Ibañez
Gustavo Lopez
Hipolito Vivar
STUDENTS:
Año Amada,
Miguel G. Villoroco
Francisco Gomez
Solud Gismera
David Lopez
Alicia Martinez
Francisco Ortego
Año Belen Sanchez
Begoña Toledano
Marta Zuñiga

**CENTRE NATIONAL DE LA
BANDE DESSINÉE ET DE
L'IMAGE**
Angouleme, France

**ECOLE NATIONALE
SUPERIEURE DES ARTS
DECORATIVES, ATELIER
D'IMAGE ET
D'INFORMATIQUE**
Paris, France

FACULTY:
Anne Brotot
Rodolphe Chabrier
Pierre F. Hénon
Jerzy Kulor
STUDENTS:
Beatrice Garnier Cousin
Delphine Potevin

**UNIVERSITY OF CALIFORNIA,
BERKELEY, BERKELEY
ELECTRONIC ARCHITECTURE
RESEARCH STUDIO**
Berkeley, California

FACULTY:
Penny Dhoemers
STUDENTS:
Alonzo C. Addison
Deanon Da Silva
Ruieto Do Silva
Chris Hamilton
Yifon Mao
James McNulty
Chinh Nguyenphuc
James Spily
Lisa Stewart
Kevin Gilson
SPECIAL THANKS:
Roger Montgomery
Jean-Pierre Protzen

**ECOLE CANTONALE D'ART
DE LAUSANNE, UMITE DE
SYNTHESE DE L'IMAGE
NUMERIQUE (USINE)**
Switzerland

FACULTY:
Gerald Garcia
STUDENTS:
Giuliano Manzo
Christian Mareillon
Konrad Walder

RUTGERS UNIVERSITY
Camden, New Jersey

FACULTY:
Anne Seidman
STUDENTS:
J.N. Argentina
Adrienne Cavazos
Salvatore J.D. Paolo
Bob Hallisey

MUSIC
Glenn Smith, Skyeway MIDI
Labs

TITLES
Jim Sayers, Sheridan College

SPECIAL THANKS
Sylvie Rueff
Rachael Nicole
Gray Lorig
David Potter
Zito Tyer
Carol Mattusch
George Mason University

Not Pictured

**WALT DISNEY PICTURES
CGI DEPARTMENT**
Walt Disney Pictures
2:00

Clips from "Beauty and the Beast" that contain CGI elements.

CONTRIBUTORS
Walt Disney Pictures Feature Animation
Computer-Generated Imagery Department
CONTACT
Don Philips
Walt Disney Feature Animation
1420 Flower Street
Glendale, CA 91221
(01) 818-544-2504
(01) 818-544-2658
(01) 818-544-2660 fax
rozanne@mickey.disney.com

**SIGGRAPH '92
TECHNICAL HIGHLIGHTS**
John C. Hart
Jim Blinn
3:00

This promotional piece contains selections from the SIGGRAPH '92 Conference Proceedings' Video Supplement (SIGGRAPH Video Review Issue 86).

CONTRIBUTORS

PRODUCER:
John C. Hart
NARRATOR:
Jim Blinn
MUSIC:
Domenico Scarlatti
"Sonata in C-graph"
CONTACT
John C. Hart
Electronic Visualization Lab
EECS Dept. M/C 154
University of Illinois at Chicago
Chicago, IL 60680-4348
(01) 312-996-3002
(01) 312-413-7585 fax
hart@eecs.uic.edu

COMMITTEE

Chair

Gray Lorig

Associate Producer

Nancy St. John

Assistant

Sue Gardner

Committee

Tom Cosey

Hugette Chesnois

John C. Hort

Doug Lerner

Jonathan Lusk

Barbara Mones-Hattal

Ken O'Connell

Sylvie Rueff

Joel Welling

JURY

Brad deGraf

Copper Giloth

Bill Reeves

Craig Upson

Openings and

Performance Jury

Jamie Dixon

Michael Wahrmon

CORPORATE SPONSORS

The SIGGRAPH electronic theater gratefully acknowledges the support of the companies listed below. Support such as this is instrumental in maintaining the level of quality and innovation we have come to expect at SIGGRAPH.

Cray Research, Inc.

Crossfield Dicomed

Editel, Chicago

Imogino—INA

General Electric Company

HD/CG New York

Macromedio

Magic Box Productions

The Pittsburgh Supercomputing Center

Production Masters, Inc., Pittsburgh

Sony Corporation of America

Rebo Studio

Rhythm & Hues

Computer Graphics Screening Room Contributors

A VISUALIZATION STUDY OF NETWORKING

University of Illinois/NCSA
1:10

This high-definition computer animation educates general audiences about the exponential growth of networking in the US and the world. A data visualization spanning a two-year period represents rapid traffic growth that exceeds tens of billions of bytes per day. Networking is particularly relevant to SIGGRAPH '92 which is connected to the NSFNET.

CONTRIBUTORS

Donna Cox
Robert Patterson
Robin Bargar
Keishi Kandori
Mark Bajuk
Amy Swanson
William Sherman
Mike McNeill
Fred Daab
NSF
Merit Network
NCAR
NASA
JPL

HARDWARE

Silicon Graphics 360VGX
Silicon Graphics 240GPX
240 Server

SOFTWARE

Wavefront Technologies
In-house software

CONTACT

Donna Cox
Robert Patterson
National Center for
Supercomputing Applications
University of Illinois
4051 Beckman Institute
405 N. Mathews Ave.
Urbana, IL 61801
(01) 217-244-2005
(01) 217-244-2909 fax
cox@ncsa.uiuc.edu

AFFD: ANIMATED FREE- FORM DEFORMATION

INRIA SEDIS Audiovisuel
6:00

This tape explains the AFFD technique: the first part is didactic while the second is 42 seconds of animation.

CONTRIBUTORS

Sabine Coquillart
Pierre Jancéne

HARDWARE

Silicon Graphics IRIS 4D

SOFTWARE

INRIA—Sogitec Action-3D
modeler

CONTACT

Pierre Jancéne
INRIA
Domoine de Voluceau—
BP.105
78153 Le Chesnay Cedex
France
(33) 1-39-63-54-31
(33) 1-39-63-53-30 fax
Pierre.Jancene@inria.fr

AFTER BIRTH

N.C.C.A., UK
2:00

The flight of the stork is based on a procedural model of run-time deformation and guidance. The metamorphosis of the underwater creatures and the human embryo is based on synchronous inbetweening of 3D models and hand painted texture maps.

CONTRIBUTORS

PRODUCER:
Vassilios Hurmusiadis
Jacqueline Anne Wrather
SOUND:
Stephen Deutsch Digital
Music Studio

HARDWARE

HP Apollo DN 10000

SOFTWARE

CGAL written by Prof. Peter
P. Comninos

CONTACT

Vassilios Hurmusiadis
Jacqueline Anne Wrather
The National Centre for
Computer Animation
Bournemouth University
Fern Barrow
Bournemouth, Dorset
BH12 5BB
United Kingdom
(44) 202-59-53-58
(44) 202-59-50-40
(44) 202-59-55-30 fax

ALEPH

Rebus
0:30

Aleph explores the history of communications from prehistory to the present. The evolution of the letter "A" from a hieroglyphic representation of a bull to a pattern of light on a computer screen symbolizes the resonant relationship between word, image, and concept, suggesting the new horizons opened up by the computer.

CONTRIBUTORS

Steve Theodore
Penelope Theodore
Chris Haff
Randy Goux

SPONSOR

Cambridge Electronics
PFS Inc.

HARDWARE

Macintosh II
Macintosh Quadra

SOFTWARE

Adobe Photoshop
Adobe Illustrator
Adobe ElectricImage
VIDI Presenter Professional

CONTACT

Steve Theodore
Rebus
209 Medway Street 7B
Providence, RI 02906
(01) 401-272-6511
(01) 401-272-6309 fax
Penny_Theodore@
postoffice.brown.edu

AMC FEATURES PRESENTATION II

MetroLight Studios
0:25

This opening for AMC Theaters brings to life the animated character "Clip" who after spryly popping from his film can, waves his metallic companion on through a particle quest into the AMC logo.

CONTRIBUTORS

CREATIVE DIRECTOR:
Jon Townley

EXECUTIVE DIRECTOR:
Dobbie Schiff

DESIGNER/DIRECTOR:
Cliff Iwoi

LINE PRODUCER:
Paul Hettler

ASSISTANT PRODUCER:
Gayle Reznik

SENIOR CHARACTER ANIMATOR:
Neil Eskuri

HEAD TECHNICAL DIRECTOR:
Tom Hutchinson

ANIMATOR/PARTICLES:
Kelley Ray

ANIMATOR/COLOR AND LIGHTING:
John McLaughlin

MODELERS:
Con Pederson

Eduardo Batres

Alan Ridenour

CAMERAMAN:
Bill Kent

SOFTWARE:
Yun-Chen Sung

Rob Rosenblum

Jahn McLaughlin

POST PRODUCTION:
Gayle Reznik

SPONSOR
AMC Theaters

HARDWARE

Solbourne 5-604

Silicon Graphics 4D

workstation

A60 and A66 Abekas

Celco Film Recorder

SOFTWARE

MetroLight proprietary

CONTACT

Dobbie Schiff

MetroLight Studios

5724 West Third Street

Suite 400

Los Angeles, CA 90036

(01) 213-932-0400

(01) 213-932-8440 fax

AROUND AGAIN

University of British
Columbia, GraFiC Lab
0:30

Primarily intended as a study in 3D character animation, *Around Again* also served as the vehicle for a group of computer animators to contribute to the global environment message. Intended for grade-school viewers, the animation was kept to 30 seconds to fit within the broadcast television time constraints.

CONTRIBUTORS

Finale Post Production Inc.,
The GraFiC Lab of U.B.C.

DEPARTMENT OF COMPUTER

SCIENCE—DIRECTOR:

Alain Fournier

WRITER/DIRECTOR:

Markus Tessmann

ANIMATORS:

Jason Dowdeswell

Robin Hackl

Ken Pool

Markus Tessmann

BACKGROUNDS AND TEXTURES:

Carl Chaplin

Robin Hackl

Russ Krywolt

CHARACTER VOICES:

Geoff Wright

Deidre Tessmann

AUDIO:

Marty Taylor

SPONSOR

U.B.C. GraFiC

Finale Post Production, Inc.

HARDWARE

SGI 240VGX

Indigo Elon

IBM PS/2 with TARGA+64

SOFTWARE

Vertigo 3D animation

package

CONTACT

Markus Tessmann

University of British

Columbia, GraFiC Lab

#302-6356 Agricultural Rd.

Vancouver, BC V6T 1W5

Canada

(01) 604-822-9248

(01) 604-822-5485 fax

tessmann@cs.ubc.co

BABYFRESH "THE ARK"

The Moving Picture Company
0:30

A totally computer generated commercial. The various animals (lions, birds, elephants, fish, rabbits) represent those on the product itself and interact with the baby to convey the properties of the product—soft, strong, supple.

CONTRIBUTORS

THE MOVING PICTURE COMPANY:

DIRECTOR:

Richard Dean

ANIMATORS:

Hazel Hindler

Sheila Dunn

ANIMATION ASSISTANT:

Charles Cash

Rob Hodgson

CGT:

Graham Fink

Tim Mellors

Diane Croll

HARDWARE

SGI Personal IRIS

SOFTWARE

Alias

CONTACT

Maggi Allison

The Moving Picture Company

25 Noel Street

London W1V 3RD

United Kingdom

(44) 71-434-3100

(44) 71-437-3951 fax

BFT 2

The Moving Picture Company
0:15

A program title sequence with surreal computer generated elements combined with a live-action head. Additional special effects and final combination done on Paintbox/Harry.

CONTRIBUTORS

BBC (LONDON):

DESIGNERS:

Jane Wyatt

Maylin Lee

THE MOVING PICTURE COMPANY:

ANIMATOR:

Erik-Jan de Boer

PAINTBOX/HARRY OPERATOR:

Jerry Steele

PRODUCTION CO-ORDINATOR:

Patrick Davenport

HARDWARE

SGI Personal IRIS

SOFTWARE

Alias

CONTACT

Maggi Allison

Patrick Davenport

The Moving Picture Company

25 Noel Street

London W1V 3RD

United Kingdom

(44) 71-434-3100

(44) 71-437-3951 fax

BLOOD SWEAT AND TEARS

Bos Hoorn
0:30

CONTACT

Bos Hoorn

Hogschool voor de Kunsten

Utrecht

Van Hogendorpstraat 62

1215 EH Hilversum

The Netherlands

(31) 30-35-42-130

BOB THE FROG IN "BURP"

Darren D. Kiner
2:25

Bob the Frog in "BURP" is the first animated short to combine 3D computer animated characters with clay animation.

CONTRIBUTORS

Simon Haslet

Isa Alsop

Stewart Dickson

Marcie Bretts

Kevin Haug

Larry Litle

Kevin Kiner

Mike Marinelli

DESIGNER, ANIMATOR, DIRECTOR:

Darren Kiner

HARDWARE

SGI workstation

IMC Motion Control

SOFTWARE

Wavefront

CONTACT

Darren D. Kiner

Darren Kiner Design

4105 McFarlane Avenue

Burbank, CA 91505

(01) 818-544-2673

(01) 213-651-2726 fax

BOSCH "MAP"

MetroLight Studios
0:30

The look of the Bosch piece is 3D animated poster art in the style of WWII era propaganda posters. This was accomplished with algorithmic shaders and texture maps which both limited the color palette and simulated organic motion of the water and the bridge.

CONTRIBUTORS

CREATIVE DIRECTOR:

Jon Townley

EXECUTIVE DIRECTOR:

Dabbie Schiff

DESIGNER/DIRECTOR:

Jeff Doud

PRODUCER:

Jim Wheelock

ASSISTANT PRODUCER:

Jini Dayaneni

TECHNICAL DIRECTORS:

John McLaughlin

Kelley Ray

John Ornelas

MODELERS:

Alan Ridenour

Can Pederson

SOFTWARE:

John McLaughlin

Rob Rosenblum

ILLUSTRATOR:

Bob Commander

POST PRODUCTION:

Gayle Reznik

SPONSOR

J. Walter Thompson

HARDWARE

Solbourne 5-604

Silicon Graphics 4D workstation

A60 and A66 Abekas

Celco Film Recorder

SOFTWARE

MetroLight proprietary

CONTACT

Dabbie Schiff

MetroLight Studios

5724 West Third Street

Suite 400

Los Angeles, CA 90036

(01) 213-932-0400

(01) 213-932-8440 fax

BUGSY FOR PREZ

Realta
2:05

Human motion animating flexible 3D mouse. Piece demonstrates conversion of actual human motion and speech into motion paths and dynamics for 3D model.

CONTRIBUTORS

Jeff Drzycimski

Dave Keller

Carol Keller

Lee Gramling

Tom McLaughlin

Nels Madsen

Ela Dixon-Haizlip

Patrick Scholes, Viewpoint

HARDWARE

Silicon Graphics Power

Series

SOFTWARE

Wavefront

CONTACT

Kimble L. Jenkins

Realta

2000 Madison Avenue

Memphis, TN 38104

(01) 901-725-0855

(01) 901-725-7011 fax

CCTT BATTLE SCENARIO

General Electric Company

11:30

The video was generated by GE's PT2000 Flight Simulator. The scenario demonstrates the state-of-the-art Computer Image Generator techniques: Terrain following, explosions, missile launches, articulated part movement, color cell texture, multiple moving models, and microtexture.

CONTRIBUTORS

Rosalie Bibona

Robert Hichborn

Michelle Breithart

Bruce Howie

SCSD's Visual Simulation Group

HARDWARE

General Electric's

Compuscene PT2000

SOFTWARE

General Electric's TARGET

Database Generation System

CONTACT

Rosalie Bibona

General Electric Company

PO Box 2825

1800 Valusia Avenue

Daytona Beach, FL 32120

(01) 904-239-2045

(01) 904-239-3231 fax

Rosalie@sunny.dab.ge.com

CHICAGO BURNING

Efraim Gons
0:32

The development of new ideas and techniques is the central idea behind *Chicago Burning*. Chicago rising up after the flames like a phoenix out of the ashes was the embodiment of new ideas and techniques in art. SIGGRAPH '92 appears on the scene, again bringing the novelties in art to Chicago.

CONTRIBUTORS

Music:

Aart de Song

Jeroen Iterson

SPONSOR

Condor

SOFTWARE

Harry

CONTACT

Efraim Gons

Bilderdam 26

2451 CW

Bilderdam

The Netherlands

(31) 17-21-81-47

COMPUTER GRAPHICS FOR CT AND MRI

Cemax, Inc.

2:30

Images were produced with a volume rendering and animation package developed in-house. It is important to realize that the data is "real" data. It was not acquired specifically for demonstrating graphics, but it is actual patient data supplied by hospitals.

CONTRIBUTORS

Rodica Schileru-Key

David Fent

HARDWARE

Sun SPARC Workstation

SOFTWARE

In-house

CONTACT

Rodica Schileru-Key

Cemax, Inc.

46750 Fremont Boulevard

Suite 207

Fremont, CA 94538

(01) 510-770-8612

(01) 510-770-8555 fax

DAY BREAK

The Bureau
1:00

Commercial for milk's delivery in the morning.

CONTRIBUTORS

ADVERTISING AGENCY:
BMP DDB Needham
DIRECTOR:
Bill Mather (at Redwing)
POST PRODUCTION:

The Bureau
ELECTRONIC SPECIAL EFFECTS:
Sarah Marchant
M.J. Azzopardi

COMPUTER ANIMATION:
Dave Throssell
Lindo Johnson

HARDWARE
Silicon Graphics Personal Iris

SOFTWARE
Softimage

CONTACT
Helen Stanley

The Bureau
81 Dean Street
London W1V 5AB
United Kingdom
(44) 71-439-2901
(44) 71-753-0345 fax

DEC: WINDOWS OF OPPORTUNITY

TOPIX
0:30

A modern office tower at sunset responds to the narration by turning on interior lights in various configurations. The city is very realistically reflected in the glass facade of the tower as we ascend to see the client's name mounted on a huge neon sign on the roof.

CONTRIBUTORS

PRODUCER:
Chris Wallace
DIRECTOR:
Harold Harris
ANIMATORS:
Harold Harris
Doug Masters
Ken Neilson
Bob Munroe
William Cameron

HARDWARE
Silicon Graphics

SOFTWARE
Wavefront
In-house proprietary

CONTACT
Chris Wallace
TOPIX

217 Richmond Street West
Toronto, Ontario M5V 1W2
Canada
(01) 416-971-7711
(01) 416-971-6188 fax

**"EL IDIOMA ESPAÑOL"
AREA 4 PABELLON DE
ESPAÑA EXPO '92**

COM4
5:52

Six weeks of intense 3D production and digital postproduction for the Spanish pavilion at Expo '92, a world showcase for the Spanish language.

CONTRIBUTORS

Computer Arts Developments
Daquiri Digital Pictures
Lopez Azul
Jose Manuel Pagon

HARDWARE

SGI 4D and Indigo
Abekos A60 Digital Disk

SOFTWARE

Pixar RenderMan
TDI Explore

Alias
Wavefront

Custom

CONTACT

Manuela Gutierrez
COM4 S.A.
Gron Via, 88 (Edificio
España)
Madrid 28013
Spain
(34) 1-542-6190 or
(34) 1-542-9687
(34) 1-247-0638 fox

**ENGINEERING ANIMATION,
INC. DEMONSTRATION
TAPE**

3:00

Animations of mechanical systems and other physical phenomena used for engineering analysis and litigation support.

CONTRIBUTORS

Terron Boylan
Martin Vanderploeg
Jeff Trom
Jay Shannan
Jim Lynch
Jim Troy

Todd Teske
Donald Garwood
Brett Weichers
Craig Muncaster
Jodi Zimmerline
Darren Knopp
Armond Assodi

HARDWARE

SGI
SOFTWARE
ERNIE and other EAI
animation software

CONTACT

Martin Vanderploeg
Engineering Animation, Inc.
2625 North Loop Drive
Suite 300
Ames, IA 50010
(01) 515-296-9908
(01) 515-296-7025 fox

**FAT LULU IS GOING BACK
TO VENICE**

Videoscop
3:40

Conflict relationship between a man and a woman.

CONTRIBUTORS

DIRECTION AND SCENARIO:
Mario Martin Buendia
ARTISTIC CONTRIBUTION:
Christophe Delamare

HARDWARE
SGI 4D/25

SOFTWARE
TDI Explore

CONTACT

Christophe Delamare
Videoscop (Université de
Nancy II)
BP 722 - 9 Rue Michel Ney
Nancy 54000
France
(33) 83-35-09-09
(33) 83-32-74-81 fax

FLUX

Jon McCormack
0:57

This is a "work in progress" animation created with a procedural modeling and animation language developed by the producer. The language combines L-systems and cellular automata.

CONTRIBUTORS

This project was produced with the assistance of the Australian Film Commission and Wavefront Technologies under their independent artist program.

SPONSOR

Australian Film Commission

HARDWARE
Silicon Graphics 4D/209

SOFTWARE
Custom by producer
Wavefront Advanced
Visualizer

CONTACT

Jon McCormack
Donald Garwood
Unit 4/50 Grove Road
Hawthorn, VIC 3122
Australia
(61) 3-862-2056
(61) 3-565-5146 fax
jonmc@bruce.cs.monash.
edu.au

FOUR-SIGHT

Andrew J. Hanson
Pheng A. Heng
4:25

Objects embedded in four-dimensional space can be readily studied using computer graphics simulations even though we cannot physically perceive objects in 4D. This video provides an elementary introduction to the production and interpretation of 4D images, along with a remarkable series of images of mathematical objects never before represented in this way.

CONTRIBUTORS

PRODUCED AND DIRECTED BY:
Andrew J. Hanson
Pheng A. Heng
ARTISTIC DESIGN AND ANIMATION:
Brion Kaplan

STORY AND VISUALIZATION
CONCEPTS:

Andrew J. Hanson
MATHEMATICAL DESIGN AND
ANIMATION:

Pheng A. Heng

ANIMATION:

Donald F. McMullen
Robert Cross

TECHNICAL PRODUCTION AND

EDITING:

Eric Ost
NARRATION:
Virginia Berry

AUDIO EDITING:

David Rust

SPONSOR

Indiana University CICA &
Computer Science
Department

HARDWARE

Kubota Pacific Computer
(Titan)

Silicon Graphics Iris

SOFTWARE

Wavefront Advanced
Visualizer

AVS

In-house

CONTACT

Andrew J. Hanson
Indiana University
Computer Science
Department
Lindley Hall 215
Bloomington, IN 47405
(01) 812-855-5855
(01) 812-855-4829 fax

**FUN WITH OCTREES:
GRAPH TOPOLOGIES ON
THE RECURRENT CUBE**

John C. Hart
1:20

The attractors of recurrent iterated function systems are explored. The some eight transformations, which take the cube to its octants, are used. The control graphs are altered to produce a variety of fractal shapes.

CONTRIBUTORS

Music:

Sumit Dos

HARDWARE

AT&T Pixel Machines

SOFTWARE

Proprietary

CONTACT

John C. Hart
Electronic Visualization Lab
EECS Dept. M/C 154
University of Illinois at
Chicago
Chicago, IL 60680-4348
(01) 312-996-3002
(01) 312-413-7585 fax
hart@eeecs.uic.edu

GRAPHIC VIOLENCE

The George Washington
University
2:05

Introducing Hermon as the entomologically frustrated computer animator, who vents his anger with a spray can. Can a character with no lips prevail? Features sounds effects generated automatically from the motion.

CONTRIBUTORS

STORY DIRECTION AND IMAGE
RENDERING SOFTWARE:

Lorry Gritz

BEE MODELING AND BEHAVIORAL
MOTION:

Daria Bergen

MODELING AND KEYFRAMING:

Rudy Darken

SOUND RENDERING:

Tapio Takala

ORIGINAL MUSIC:

David Michael

HARDWARE

HP 9000/720

SGI 440/480 VGX

SOFTWARE

Custom motion, rendering,

and sound software

CONTACT

Lorry Gritz
The George Washington
University
Department of EE&CS
801 22nd Street, NW
Room T624G
Washington, DC 20052
(01) 202-994-0460
(01) 202-994-0227 fax
gritz@seas.gwu.edu

GRINNING EVIL DEATH

MIT Media Lab
6:50

A blood splattered tale of modern-day pest control, the animation *Grinning Evil Death* tells a tale of break-fast, blood, superheroes, and roaches. This award-winning piece combines computer-generated, three-dimensional, dynamic simulations with hand-drawn cel animation.

CONTRIBUTORS

Mike McKenna
Bob Sabiston
David Atherton
David Chen
Peter Schroeder
David Small
Michael Johnson
Steve Strassmann
Steve Drucker
David Sturman
John Underkoffler
Radhiko Nagpal
Jory Bell
Wayne Ross
David Zeltzer
Muriel Cooper
Nicholas Negroponte
Ted the Dog

SPONSOR

MIT Media Laboratory
Apple Computer, Inc.
Bitstream, Inc.
Stordent Computer Corp.
Hewlett-Packard Co.
MIT UROP Program
NHK (Japan Broadcast Corp.)
National Science Foundation
NYNEX Corp.
Symbolics, Inc.
Thinking Machines Corp.
Wacom, Inc.

HARDWARE

HP 835 Turbo SRX
Connection Machine 2
Wacom Tablet

SOFTWARE

Custom/Research

CONTACT

Mike McKenna
Bob Sabiston
MIT Media Lab
20 Ames Street, E15-023
Cambridge, MA 02139
(01) 617-253-0661
(01) 617-258-6264 fax
mikey@media-lab.mit.edu

HIGHLIGHTS FROM KNOTTY (1)

Hewlett-Packard
2:00

Knotty is a video about B-spline technology. It is a sequence of animation completely in computer graphics that illustrates the fundamental properties and kernel algorithms about B-splines.

CONTRIBUTORS

Jonathan Yen

HARDWARE

HP Graphics Workstation

SOFTWARE

HP Graphics Library:
starbase

CONTACT

Jonathan Yen
Hewlett-Packard
1501 Page Mill Road
Palo Alto, CA 94304
(01) 415-857-4769
(01) 415-857-4691 fax
jyen@hpl.hp.com

HOW TO MAKE A DECISION

Visualization Laboratory,
Texas A&M

2:34

This animation explores the decision-making process and makes light of the authority of decisions made in high places. It depicts a situation where the validity of an answer, which would have resonance and power if arrived at inwardly, takes on the potential for absurdity when it comes from outside.

CONTRIBUTORS

PRODUCER:

Matthew Brunner

MUSIC:

Bart Harlan

NARRATION:

Sean Groves

HARDWARE

Silicon Graphics

SOFTWARE

Wavefront

Discreet Logic (Eddie)

CONTACT

Matthew Brunner
Visualization Laboratory
College of Architecture
Texas A&M University
College Station, TX
77843-3137
(01) 409-845-3465
(01) 409-845-4491 fax
matt@archone.tamu.edu

HUBBLE SPACE TELESCOPE: IMAGE DEBLURRING WITH A PARALLEL COMPUTER

NASA/Goddard Space Flight Center
2:45

An image of the binary star system R-Aquarii, taken by the Hubble Space Telescope, is deblurred using a massively parallel implementation of the Maximum Entropy Method.

CONTRIBUTORS

Mike Hollis
John Dorband

PRODUCER:

Dave Pope

HARDWARE

SGI 4D/210 VGX

SOFTWARE

Custom

CONTACT

Dave Pope
NASA/Goddard Space Flight Center
Code 932
Greenbelt, MD 20771
(01) 301-286-7980
(01) 301-286-5152 fax
dave@okeeffe.gsfc.nasa.gov

HUMMING ALONG

IBM T.J. Watson Research Center
2:00

Physically accurate models were combined with control systems to simulate the hovering flight of a hummingbird and the motion of human-sized downs on swings, seesaws, and unicycles.

CONTRIBUTORS

CREATED BY:

David Houmann

Jessica Hodgins

Paula Sweeney

CHARACTER DESIGN AND STORY

DIRECTION:

Chris Wedge

MODELING:

Marcos Martins

SOUND AND MUSIC:

Michael Wolf

Clack Studios, NYC

HARDWARE

IBM RS/6000

SOFTWARE

TDImage

Sdfast

MIT LegLab Simulation Environment

CONTACT

David R. Haumann
IBM T.J. Watson Research Center
POB 704
Yorktown Heights, NY
10598
(01) 914-784-7013
(01) 914-784-6273 fax
houmann@watson.ibm.com

INNATUBE SMARTIES

The Bureau
1:00

Commercial for "Smarties" candies.

CONTRIBUTORS

ADVERTISING AGENCY:

J. Walter Thompson

DIRECTOR:

David Anderson (at Redwing)

POST PRODUCTION:

The Bureau

ELECTRONIC SPECIAL EFFECTS:

Sarah Marchant

M.J. Azzopardi

COMPUTER ANIMATION:

Linda Johnson

Dave Throssell

HARDWARE

Silicon Graphics Personal Iris

SOFTWARE

Softimage

CONTACT

Helen Stanley
The Bureau
81 Dean Street
London W1V 5AB
United Kingdom
(44) 71-439-2901
(44) 71-753-0345 fax

IWATE '92

Iwate University
0:45

The botanical tree is generated by using a new growth model having abilities of heliotropism, dormancy break, and apical dominance which was developed at Iwate University. The flames are simulated by improved behavioral models of a 2D vortex and a partial tracer developed at Iwate University and Morioka Junior College.

CONTRIBUTORS

Kazunobu Muraoka

Hiroimichi Takahashi

PRODUCER:

Norishige Chiba

HARDWARE

Sony Workstation NWS-

3260

SIG framebuffer S1000

SOFTWARE

In-house modelers for trees and flames

CONTACT

Norishige Chiba
Iwate University
Morioka 020
Japan
(81) 196-23-51-71
(81) 196-24-40-78 fax

KODAK "LET THE MEMORIES BEGIN"

R/Greenberg Associates, Inc.
1:00

Stadium spectators are entertained by photographs in a choreographed "cord-file" display of olympic proportions.

CONTRIBUTORS

DIRECTOR:

John Clive

PRODUCERS:

Brian Williams

Diane Peardon

COMPUTER GRAPHICS:

Joe Francis

Cassidy Curtis

Eileen O'Neill

SOFTWARE:

Joe Francis

Cassidy Curtis

AD AGENCY:

Young & Rubicam, NY

SPONSOR

The Eastman Kodak Company

HARDWARE

Sun Microsystems SPARC-2

SOFTWARE

R/GA proprietary modeling,

rendering, and animation

software

CONTACT

Lisa Smith
R/Greenberg Associates
350 West 39th Street
New York, NY 10018
(01) 212-239-6767
(01) 212-947-3769 fax
joe@rga.com

L'OISEAU REBELLE

Computer Graphics Research
Lab, Simon Fraser University
3:15

This animation was produced to add "humanity" to an architectural model of a proposed arts centre. The human movement segments were choreographed interactively in real-time using LIFEFORMS, a 3D human motion choreography and animation system developed in the Graphics Research Lab at Simon Fraser University.

CONTRIBUTORS

Sang Mah
Thecla Schiphorst
Gene Radvenis
MariJose Auclair
Candice Scott
Pam Forth
Tom Calvert
Chris Welman
Armin Bruderlin
Frank Cambell

SPONSOR

Computer Graphics Research
Lab

HARDWARE

SGI workstation
486PC

SOFTWARE

LIFEFORMS (SFU/Kinetic
Effects)
3D Studio by Autodesk

CONTACT

Sang Mah
Computer Graphics Research
Lab
Computing Science
Simon Fraser University
Burnaby, B.C. V5A 1S6
Canada
(01) 604-291-3610
(01) 604-291-3045 fax
sang@cs.sfu.ca

LANL VIDEO SAMPLER

Los Alamos National
Laboratory
3:44

The video sampler displays several scientific animations that have been visualized and captured into video using different computers at Los Alamos National Laboratory (LANL).

CONTRIBUTORS

Harold Trease
John Fowler
Jeff Saltzman
Judy Winterkamp
James Bossert
Melvin L. Prueitt
Ted Yamada
Sue Bunker
Jim Painter
Chuck Hansen
Gary Glatzmaier
Susan Chandler
Thanasis Papathanasiou
Manuel Vigil
Stephany Bouchier
Ralph Ferguson
Dan Butler
Lorraine Whitman
Karl-Heinz Winkler
Stephen W. Hodson
Doug Kothe
Tomas Moore
Regina Valenzuela
John Mareda

PRODUCER:
Andy A. Martinez
HARDWARE
Silicon Graphics
CM-2
Cray
SOFTWARE
Mostly in-house
AVS
MOVIE.BYU

CONTACT

Andy A. Martinez
Los Alamos National
Laboratory
PO Box 1663, MS-B272
Los Alamos, NM 87545
(01) 505-667-4713
(01) 505-665-4361 fax
aam@lanl.gov

LEXUS "CAR COVER"

Rhythm & Hues
0:30

The animated car cover in the Lexus "Car Cover" commercial had to look like metal, behave like cloth, interact with wind, reveal a real car underneath, and still look totally believable. The cover is completely computer generated.

CONTRIBUTORS

ANIMATION COMPANY:
Rhythm & Hues
HOLLYWOOD:
ART DIRECTOR:
Clark Anderson
ANIMATORS:
Peter Farson
Charles Gibson
ANIMATOR/SOFTWARE:
Mark Henne
EDITOR:
Rick Ross
SOFTWARE:
Keith Goldfarb
Paul Allen Newell
Steve Gray
PRODUCER:
Doug Nichols
EXECUTIVE PRODUCER:
Lisa O'Brien
LIVE ACTION COMPANY:
Coppo Films
LOS ANGELES:
DIRECTOR:
Brent Thomas
EXECUTIVE PRODUCER:
Bill Bratkowski
PRODUCER:
Michael King
DIRECTOR OF PHOTOGRAPHY:
Bill Bennett
PRODUCTION MANAGER:
Nancy Edwards
ADVERTISING AGENCY:
Team One Advertising
EL SEGUNDO:
ART DIRECTOR:
John Boone
CREATIVE DIRECTOR:
Tom Corder
COPYWRITER:
Ron Huey
BROADCAST PRODUCER:
Karen Smith
PRODUCTION COORDINATOR:
Wendy Malkin
EXECUTIVE PRODUCER:
Francesca Cohn
ACCOUNT EXECUTIVE
ADVERTISING:
Kelley Hill
ACCOUNT EXECUTIVE
PRODUCT INFORMATION:
Brian Bittker
EXECUTIVE VICE PRESIDENT AND
MANAGEMENT DIRECTOR:
Scott Gilbert

ACCOUNT SUPERVISOR

ADVERTISING:
David Minkin
SR. VICE PRESIDENT AND
MANAGEMENT SUPERVISOR:
Skip Sullivan
CLIENT:
Lexus
TORRANCE:
NATIONAL ADVERTISING
MANAGERS:
Rich Anderman
Guillermo Hysaw
EXECUTIVE COORDINATOR,
MARKETING:
Hank Inoue
HARDWARE
Silicon Graphics
SOFTWARE
Rhythm & Hues proprietary
CONTACT
Charles Gibson
Rhythm & Hues, Inc.
910 N. Sycamore Avenue
Hollywood, CA 90038
(01) 213-851-6500
(01) 213-851-5505 fax

LISTERINE "KNIGHT"

Pixar
0:30

Our hero Listerine, deep in a torch-lit cavern and armed with glistening sword and shield, hurls himself into epic, mortal combat against the wretched Gingivitis.

CONTRIBUTORS

DIRECTOR:
John Lasseter
TECHNICAL DIRECTOR:
Eliot Smyrl
PRODUCER:
Craig Good
FOR PIXAR:
Andrew Stanton
Galyn Susman
Darwyn Peachey
Tony Apodaca
Don Conway
FOR SKYWALKER SOUND:
Dennis Leonard
FOR J. WALTER THOMPSON:
Judi Nieman
Stephanie Apt
Larry Volpi
Phil Halyard
CONTACT
Ralph J. Guggenheim
Pixar
1001 West Cutting
Boulevard
Richmond, CA 94804
(01) 510-215-3413
(01) 510-236-0388 fax
ralph@pixar.com

MEGGAMORPHOSIS

Sean Schur
2:10

A character-animated story of a lonely egg and a shifty snake, this piece gives a cynical view of human relationships and the fate which lies at the end for all of us.

CONTRIBUTORS

Sean Schur
HARDWARE
Silicon Graphics 4D/25
workstations
SOFTWARE
Alias
CONTACT
Sean Schur
2034 Holly Drive #2
Los Angeles, CA 90068
(01) 213-464-6143
schur@isi.edu

Moe's World

MetroLight Studios
1:10

Moe's World is a rendering and compositing tour-de-force, with its combination of live action, character animation, rotoscoping, fractal geometry, particle systems, and physically-based dynamics all serving to simulate the fantasy-filled imagination of a ten-year-old boy.

CONTRIBUTORS

CREATIVE DIRECTOR:
Jon Townley
EXECUTIVE PRODUCER:
Dobbie Schiff
DESIGNER/DIRECTOR:
Steve Mortino
DESIGNER:
Cliff Iwai
PRODUCER:
George Merkert
ASSISTANT PRODUCER:
Gayle Reznik
SENIOR ANIMATIONS AND
TECHNICAL DIRECTORS:
Tim McGovern
Tom Hutchinson
SENIOR ANIMATORS:
Jerry Weil
Patrice Dinhut
ANIMATORS:
Kelley Ray
Aliza Carson
Mark Lasoff
Scott Bendis
SOFTWARE:
Rob Rosenblum
POST PRODUCTION:
Gayle Reznik

SPONSOR

Kevin Sullivan in association
with New World Pictures
HARDWARE
Solbourne 5-604
SGI 4D workstation
A 60 and A 66 Abekas
Celco Film Recorder
SOFTWARE
MetroLight proprietary
CONTACT
Dobbie Schiff
MetroLight Studios
5724 West Third Street
Suite 400
Los Angeles, CA 90036
(01) 213-932-0400
(01) 213-932-8440 fax

NANO-VISION

NHK
2:58

The innovative *Nano-Vision* was developed to synthesize live shots and computer animations for the special, *Nano-Vision*, to effectively present the miracles and wide-ranging utility of this newly discovered world. Computer animation successfully synchronized the studio camera's 3D movement in real time, thus giving birth to the "virtual" studio with electronic setting.

CONTRIBUTORS

Naaji Ono
Mahito Onimaru
Tetsuo Akutsu
Sigekazu Sakai
Masaki Hayashi
Satoru Nagamine
Takahide Akiyama
Yosikazu Iwaoka
Akira Sakata
Hiroko Haruta

HARDWARE

HP9000/720 TURBO
VRXT4
MC68030 Board CPU
Ultimate (for video image synthesis)

SOFTWARE

In-house

CONTACT

Mahito Onimaru
NHK Creative
2-2-1 Jinnan Shibuya-ku
Tokyo 150-01
Japan
(81) 35-478-2567
(81) 33-466-6570 fax

PARTY HARDY

Homer & Associates
0:30

The lottery tickets from previous Pennsylvania Lottery games gather for a special surprise party for the new 20th anniversary game. All the motion of the facial animation and mouth and eye blinks were sampled in real time. Final choreography and rendering were done in Softimage.

CONTRIBUTORS

PRODUCER:

Peter Conn

DIRECTOR:

Michael A. Kory

TECHNICAL DIRECTOR:

John Adamczyk

MOTION CAPTURE:

Superflo

Francesco Chiarini

Umberto Lazzari

EXECUTIVE PRODUCER:

D. Rufus Friedman for

Harold Friedman Consortium

SPONSOR

FCB/LGK

HARDWARE

SGI 4D workstations
PC 486 with Vista card
BTS Elite motion tracker

SOFTWARE

Softimage

Wavefront

Digital Arts

Proprietary

CONTACT

Peter Conn
Homer & Associates
1420 N. Beachwood Drive
Hollywood, CA 90028
(01) 213-462-4710
(01) 213-472-2109 fax

PATELLAR REFLEX

META Corporation
3:00

The patellar reflex, a well-known spinal reflex, is induced by tapping the tendon which causes a stimulation of muscle spindles resulting in afferent impulses evoking the discharge of the motor neurons in the spinal cord. This educational animation shows the mechanism of this reflex arc and the gamma loop. We are constantly taking on the challenge to construct an improved and more complex anatomical database.

CONTRIBUTORS

DIRECTOR:

Eiji Takaoki

MODELING:

Michiru Minogawa

MODELING AND ANIMATION:

Koichi Yamagishi

PROGRAMMING AND SOUND:

Takashi Isako

Michio Hoiuchi

EDITING:

Junko Fujiwara

SPECIAL THANKS

META corporation U.S.A.

HARDWARE

SGI IRIS 4D/35

SGI IRIS 4D/25

SGI Indigo

SOFTWARE

METAEDITOR

PERSONAL LINKS

CONTACT

Bruno Tsuchiya
META Corporation Japan
Hanabusayama Heights
#103
3-10-51 Kamiohsaki
Shinagawa-ku, Tokyo 141
Japan
(81) 33-449-1261
(81) 33-449-1262 fax

PAVILLON DE LA ONCE

EDE Infographics
1:20

Visualization of the "Foundation Once" building for Séville's universal exhibition in 1992.

CONTRIBUTORS

Santiago Porramon

CONTACT

Santiago Porramon
EDE Infographics S.A.
155 Avda Barcelona
08230 Terrassa -
Barcelona
Spain
(34) 3-731-0241
(34) 3-785-1672 fax

PEPIN GEANT DE ARP

PANDORE

1:00

Animation of an ARP's sculpture

CONTRIBUTORS

PRODUCER:

Stéphane Druois

DIRECTOR:

Cecile Babiole

TRANSFORMER (3D studio)

HARDWARE

Silicon Graphics

SOFTWARE

TDI Explore

CONTACT

Stéphane Druois
PANDORE SARL
9, rue de Mulhouse
75002 Paris
France
(33) 1-40-41-98-37
(33) 1-40-26-67-13 fax

QUARXS PILOTE: THE ELASTO-FRAGMENTO-PLAST IS BACK

Z.A Production
2:15

The ELASTO-FRAGMENTO-PLAST is a pilot of a new 3D series featuring the Quarxs. The Quarxs are living creatures indifferent to the immutable laws of nature. Because of their strange relations to time, space, and matter, they are very odd creatures. We are trying to understand their behavior through observation and experimentation. We will soon discover the Spatio-Striata, the Spiro Thermophage, and the Mnemochrome.

CONTRIBUTORS

DIRECTOR:

Maurice Benayoun

ART DIRECTOR:

François Schuiten

SCRIPT WRITERS:

Maurice Benayoun

François Schuiten

PRODUCER:

Stephane Singier

MUSIC:

Michel Fano

IALOGUE WRITER:

Benoît Peeters

ENGLISH VOICE:

Brian Keith

3D TEAM:

Guillaume Caron

Thierry Prieur

M. Benayoun

WITH THE SUPPORT OF

C.N.A.P. and C.N.C.

Nouvelles Technologies

HARDWARE

PC COMPAQ 486/33

SOFTWARE

OPIUM (XCOM/Z.A.R&D)

CONTACT

Maurice Benayoun
Z.A Production
128, Boul. Richard Lenoir
75011 Paris
France
(33) 1-48-06-65-66
(33) 1-48-06-48-75 fax

QUATRE ANS CAFE

Genevieve Yee
1:25

A photo-realistic simulation of a walk-through of a cafe designed by the producer. The interior space and furniture are completely modeled and rendered on the computer. Paintings and exterior backgrounds are scanned images. The cafe is theoretically located on the penthouse level of a high-rise tower in Westwood, California.

HARDWARE

SGI Iris 4D/210VGX
SGI 220 VGX
SGI 35

SOFTWARE

Wavefront

CONTACT

Genevieve Yee
U.C.L.A./Graduate School of
Architecture and Urban
Planning
Perloff Hall
405 Hilgard Avenue
Los Angeles, CA 90024
(01) 213-932-0400
(01) 213-932-8440 fax

R/GREENBERG**ASSOCIATES MORPH REEL**

R/Greenberg Associates,
Inc.

1:12

A sampling of recent morphing and morph-related projects.

CONTRIBUTORS

The R/Greenberg
Associates' Computer
Generated Imagery
Department

HARDWARE

Silicon Graphics
Sun Microsystems SPARC-2
Hewlett-Packard HP700

SOFTWARE

R/GA proprietary morphing

CONTACT

Lisa Smith
R/Greenberg Associates
350 West 39th Street
New York, NY 10018
(01) 212-239-6767
(01) 212-947-3769 fax
joe@rga.com

**REGULAR CONVEX
POLYTOPES**

Texas A&M University
5:15

Using sophisticated lighting and transparency techniques, *Regular Convex Polytopes* displays higher-dimensional objects in a novel manner which allows the viewer to appreciate their internal beauty and symmetry.

CONTRIBUTORS

Tom Asbury
Glen Williams

SPONSOR

Texas A&M University
Computer Science/IBM ACIS
Division

HARDWARE

IBM RISC/6000 530

SOFTWARE

GL Library

CONTACT

Thomas M. Asbury
Texas A&M University
Computer Science
Department
10610 Morado Circle, #724
Austin, TX 78759
(01) 512-838-4845
(01) 409-847-9284 fax
auvasbu@auvsun1.tamu.edu

**RYDER TRANSPORTATION
SOLUTIONS**

ReZ.n8 Productions
1:00

This 60-second spot for Ryder trucks was completed by ReZ.n8 Productions for Ogilvy & Mather/New York and was produced entirely in 3D computer generated animation. The look is a hybrid of a theme park ride and a 3D video game incorporating a large database of object detail, environmental simulation, specialized lighting and shadowing detail, and numerous 3D special effects.

CONTRIBUTORS

SCOTT MILLER & ASSOCIATES:

ART DIRECTOR:

Scott Miller

PRODUCER:

Beth Fraikorn

CREATIVE DIRECTOR AND

EXECUTIVE PRODUCER:

Paul Sidlo

EXECUTIVE PRODUCER:

Evan Ricks

ReZ.n8:

HEAD TECHNICAL DIRECTOR:

Melinda Tidwell

TECHNICAL DIRECTORS:

Bob Peterson

Adrian Iler

Liza Keith

Ava Bubby

Jeff Hayes

SOFTWARE DEVELOPERS:

Scott Vye

Sean O'Gara

John Scheafer

ASSISTANT TECHNICAL DIRECTOR:

Ileana Garcia-Montes

DESIGNER:

David Williams

COORDINATING PRODUCER:

Karin Rainey

HARDWARE

SGL workstations

SOFTWARE

Wavefront Technologies

CONTACT

Ileana Garcia-Montes
ReZ.n8 Productions
6834 Hollywood Boulevard,
5th Floor
Los Angeles, CA 90028
(01) 310-550-8885
(01) 310-550-6123 fax

SAM'S WATER

CAL
1:22
Simulation of water.

CONTRIBUTORS

Sam Richards

HARDWARE

Silicon Graphics

CONTACT

Mara Bryan
CAL
8A Shelton Street
London WC2
United Kingdom
(44) 71-240-9741
(44) 71-240-2801 fax

**SCIENTIFIC VISUALIZATION
1992**

Pittsburgh Supercomputing
Center
2:38

HARDWARE

Cray Y-MP 8/32

Sony Laser videodisk

recorder

DECstation 5000

SOFTWARE

GLOT

P3D

DRAWCGM

Oasis

RenderMan

ART

CONTACT

Anjana Kar
Pittsburgh Supercomputing
Center
4400 Fifth Avenue
Pittsburgh, PA 15213
(01) 412-268-4960
(01) 412-268-5832 fax
kar@psc.edu

SCULPT

MIT Media Lab
3:04

A demo of an interactive volumetric modeling technique that is based on the notion of sculpting a solid material. A paper on this work appeared in SIGGRAPH '91.

CONTRIBUTORS

John Hughes
Dan Robbins
Joe Chung
Michael B. Johnson
Steven M. Drucker

PRODUCER:

Tinsley Galyean

SPONSOR

Brown University

MIT Media Laboratory

IBM

NCR

Sun Microsystems

HARDWARE

HP 835

Ascension Bird

CONTACT

Tinsley A. Galyean
MIT Media Lab
20 Ames Street, E15-023
Cambridge, MA 02139
(01) 617-253-0660
(01) 617-258-6264 fax
tag@media-lab.media.mit.
edu

SI

MIT Media Lab
1:20

The perils of political pretention.

CONTRIBUTORS

Tinsley A. Galyean
Steven M. Drucker
Joe Chung
Michael McKenna
Paul Dworkin

David Chen

HARDWARE

SGL Skywriter

HP 835

HP 750

CM-2 Connection Machine

Apple Macintosh

Cyberware Color 3D Digitizer

SOFTWARE

In-house

Set modeling in Vertigo

SPONSORS

MIT Media Laboratory

NHK (Japan Broadcasting

Corp.)

Silicon Graphics, Inc.

Apple Computer Inc

Hewlett-Packard Co.

Thinking Machines Corp.

CONTACT

Tinsley A. Galyean
Steven M. Drucker
MIT Media Lab
20 Ames Street, E15-023
Cambridge, MA 02139
(01) 617-253-0660
(01) 617-258-6264 fax
tag@media-lab.media.mit.
edu

SPENDING = Q X P

Federal Reserve Bank of San
Francisco
3:51

Educational computer generated video that explains how increases in spending lead to increases in production when the economy is producing below capacity.

CONTRIBUTORS

WRITER:

Lyndi Beale

Music:

Michael Porter

EDITOR:

Thom Coberg

PRODUCER:

Mark Hendricks

SPONSOR

Federal Reserve Bank of San

Francisco

HARDWARE

SGL 4D/25

Videopak

Betacom

SOFTWARE

Vertigo

CONTACT

Mark K. Hendricks
Federal Reserve Bank of San
Francisco
101 Market Street
San Francisco, CA 94105
(01) 415-974-3236
(01) 415-974-3341 fax

STYRO II

Sinnott & Associates

0:35

CONTRIBUTORS

DIRECTOR:

Tom Sinnott

ANIMATOR:

Joe Doll

MUSIC:

Terry Fryer

HARDWARE

Silicon Graphics

SOFTWARE

Wavefront

CONTACT

Cynthia Neal
Sinnott & Associates
676 North LaSalle Street
Chicago, IL 60610
(01) 312-440-1875
(01) 312-440-1537 fax

SUB OCEANIC SHUTTLE

Ex Mochino/Iwerks
Entertainment
3:45

In four minutes, entirely produced in computer graphics, *Sub Oceanic Shuttle* leads us into the most astonishing and mysterious underwater universe for a frantic obstacle course.

CONTRIBUTORS

Jerzy Kulor
Jean-Francois Henry
Hoel Couassin
Veronique Maloval
Eric Randall
Laurent Rullier
Michel Folduti
Estelle Chedebois
Fabrice Delopierre
Jean-Baptiste Lere
Patrick Pestel
Cecile Picard
Franck Schmidt
Violaine Jonssens
Steve Braggs
Pierrick Brault
Philippe Gluckman
Helene Gasset
Matthieu Gaspiron
Majid Loukil
Jean-Luc Savarino
Frederic Schmidt
Philippe Tastet
Yannick Violin
Marc Bellon

HARDWARE

Silicon Graphics

SOFTWARE

Explore TDI
In-house

CONTACT

Anno-Karin Quinto
Ex Mochino
22, rue Hégésippe Moreau
75018 Paris
France
(33) 1-42-93-26-27
(33) 1-42-93-53-44 fax

TETRA PAK "LUNCHBOX"

Pixar
0:30

A juice box discovers there is life after lunch.

CONTRIBUTORS

DIRECTOR:
Pete Docter
TECHNICAL DIRECTOR:
Rick Sayre
PRODUCER:
Tom Porter
FOR PIXAR:
Andrew Stanton
Tom Porter
Galyn Susman
Yael Miló
Don Conway
Rolph Guggenheim
Deirdre Worin
FOR SKYWALKER SOUND:
David Slusser
FOR LINTAS/NEW YORK:
Jeff Davidson
Linda Haas
Wickie Perla

SOFTWARE

Pixar's Menv modeling and animation software

CONTACT

Rolph J. Guggenheim
Pixar
1001 West Cutting Blvd.
Richmond, CA 94804
(01) 510-215-3413
(01) 510-236-0388 fax
ralph@pixar.com

THE ADVENTURE OF PETER PAN

NAMCO, Ltd.
6:00

Produced as the compact motion ride system of NAMCO Amusement Center over Japan. Two riders will adventure with hand animated "Peter Pan" in the computer graphics world.

CONTRIBUTORS

PRODUCER:
Nob Hasoda
Hitoshi Yamagata
EXECUTIVE PRODUCER:
Kozukuni Hiraoka
Jun Higashi

HARDWARE

TITAN
Iris 4D/320VGX

SOFTWARE

NAMCO original

CONTACT

Nob Hasoda
NAMCO Ltd. CG Division
15-1, Shin-ei-cho,
Kohaku-ku
Yokohama, Kanagawa Pref.
223
Japan
(81) 45-593-0711
(81) 45-592-8086 fax

THE BEST OF SRC 92

Société Radio-Canada
1:18

CONTRIBUTORS

André Vaudrin
Daniel Robichaud

HARDWARE

Silicon Graphics

SOFTWARE

ANIMATION 2D:
Quantel Paintbox
Abekas A60
ANIMATION 3D:
TDI Explore

CONTACT

Jacqueline Poudrier
Société Radio-Canada
1400, boul. René-Lévesque
est. 17e étage
Montréal, Québec H2L 2M2
Canada
(01) 514-597-4383

THE CYBERIAD

Cyberiad Project
13:05

In Stanislaw Lem's classic tales, humans no longer exist. "Trull" and "Klopoucius" are constructors—robots who invent other robots. Though they are celebrated throughout the galaxy, each jealously tries to prove that he is more clever than his partner.

CONTRIBUTORS

STORY:
Stanislaw Lem

ANIMATORS:

Bart Whitebook
Tom Krowczwicz
Valerie Pekarthe
Benoit Bedague
Sylvaine Delaine
Patrick Moniez

BACKGROUNDS:

Jane Potts

MUSIC:

Abe Roher
Jim Hedges

VOICES:

David Zema
Judy Jacobson

NON MUNTZING

STORYBOARD, VOICE, AND ANIMATION:
Mihal Szczepanski

DIRECTOR

ANIMATION AND SOFTWARE:
Dov Jacobson

HARDWARE

i386/ATTDSP32c/TI-34010 (Vista)

SOFTWARE

Nimble

CONTACT

Dov Jacobson
Cyberiad Project
6228 Lakeview Dr.
Falls Church, VA 22041
(01) 703-941-8851
(01) 703-642-1508 fax

THE INSIDER "L'HOMME OBLIQUE"

Terminal Image
8:23

The vain struggle of a hideous creature who strives to prove that he is a human being. This short fantastic film combines 2D animation, 3D, and live action.

CONTRIBUTORS

Anne Cozouron
Marc Druetz

HARDWARE

Vista Tips (2D)

SOFTWARE

Explore (3D)

CONTACT

Anne Cozouron
Terminal Image
54, rue David d'Angers
75019 Paris
France
(33) 1-42-49-21-06
(33) 1-42-02-40-65 fax

THE NEW ROUTINE

Bob Rossman
1:20

This is my second attempt at computer-generated character animation. It's an escape from the aerospace animation world, and utilizes my background in animation, theatrical directing, and acting.

HARDWARE

Silicon Graphics

SOFTWARE

Wavefront

CONTACT

Bob Rossman
3618 Olympic Ct.
North Pleasanton, CA
94588
(01) 408-756-9773
(01) 408-742-0641 fax

THE WIND TO BARCELONA

One Heart, Inc.
4:03

Construction of the Sagrada Familia Cathedral reportedly will take 200 to 300 years to complete. To adequately convey the magnificence of this structure, a massive amount of graphics data had to be generated—2.5 million polygons, requiring an IRIS with 200 megabytes of virtual memory and 64 megabytes or more of main memory.

CONTRIBUTORS

EXECUTIVE PRODUCERS:

Minoru Chikuma
Hitoshi Mituzowo
Takahiro Iido
Toshiharu Horiguchi

LINE PRODUCER:

Yosuhiso Asodo

PRODUCER:

Mosayuki Katsurayama

DIRECTOR:

Eiichi Asado

DIRECTOR OF PHOTOGRAPHY:

Shuuya Akogawo

CG DIRECTOR:

Hirayuki Hayashi

SOUND SUPERVISOR AND MUSIC

COMPOSER:

Takoshi Kokubo

SAGURADA FAMILIA

VISUAL CONSULTANT:

Takutasi Torii

EDITOR:

Yositomi Kuroiwo

CG PRODUCTION:

Fuji Television Network, Inc.

MASONORI IHARA

Cosmo Studio

Ken Fujiwara

Junichi Ohta

Yumiko Takahashi

Sanae Ebihara

Kohki Inoue

Tomii Kanbe

HD TECHNICAL:

Imagico Corp.

Tappan Printing Co., Ltd.

PRODUCTION SUPPORT:

Pock-in-Video Co., Ltd.

One Heart, Inc.

SPONSOR

Motsusito Electric Industrial

Co., Ltd.

HARDWARE

IRIS 4D/340 VGX

IRIS 4D/320VGX

Personal IRIS 35TG

SOFTWARE

Wavefront

Fuji TV original

CONTACT

Mosayuki Katsurayama

One Heart, Inc.

1-21 Wokabo Shinjuku-ku

Tokyo 160

Japan

(81) 33-225-0188

(81) 33-225-6518 fax

**THREE DIMENSIONAL
FRACTAL GROWTH (DLA)**

IBM

2:13

Fractal cluster growth occurs in a wide range of physical phenomena, such as particle aggregation and viscous fingering. A common model for this growth is Diffusion-Limited Aggregation (DLA) in which particles move following Brownian Motion and adhere when they strike existing particles. The music accompanying the video is also fractal, derived from a history of IBM stock prices.

CONTRIBUTORS

Daryl H. Hepting
F. David Fracchia
Lionel J. Woog
Richard F. Voss

PRODUCER:

Benoit B. Mandelbrot

SPONSOR

IBM and Yale University

HARDWAREIBM POWER Visualization
Server**SOFTWARE**Alias RayTracing by Alias
Research, Inc.**CONTACT**

Benoit B. Mandelbrot
IBM T.J. Watson Research
Center
Route 134, Kitchewon Road
Yorktown Heights, NY
10598
(01) 914-945-1712
(01) 914-945-4149 fax
fractal@watson.ibm.com

UNBURIED BONES

CFA

1:25

Dead or alive? An animated journey through the macabre chambers of horror. Only the fittest will survive.

CONTRIBUTORS**MUSIC:**

Willard Bond

PRODUCER AND ANIMATION:

James Eng

EDITORS:Dave Grein
Hercules Brasil**HARDWARE**

486/25

Vista 32 Board

BTS BCD-75

SOFTWARE

Crystal 3D

Topos/VGA

Lumena

DMH

CONTACT

James Eng

CFA

782 King Street West

Toronto, Ontario M5V 1N6

Canada

(01) 416-363-5071

(01) 416-363-7390 fax

**VISUALIZATION OF HUMAN
BIOMECHANICS**

Engineering Animation, Inc.
Iowa State University
2:18

Animation of anatomically correct motion of human skeletal arm and hand. Tendons and muscle ore added to the index finger.

CONTRIBUTORS

Jim Lynch

Terron Boylan

Martin Vanderploeg

Brett Weichers

Craig Muncaster

John Libby

HARDWARE

SGI

SOFTWARE

ERNIE

Hand Kinematics

CONTACT

Martin Vanderploeg

Engineering Animation, Inc.

Iowa State University

Ames, IA 50010

(01) 515-296-9908

(01) 515-296-7025 fax

**VISUALIZATION OF
TECTONIC FEATURES:
COLORADO RIVER
EXTENSION CORRIDOR**

JPL/Coltech

3:00

Image processing algorithms were developed to detail surface materials which defined fault zones. 3D terrain model with seismic data gave further evidence of long-term seismic activity in this region.

CONTRIBUTORS

Ron Blom

Kevin Hussey

Robert Crippen

Gloria Brown-Simmons

David Okayo

Kathy Beratan

Eric Frost

Lisa Wainio

Jim Knighton

Bob Martensen

MPL-JPL

Science Computing Network-

JPL

DIAL-JPL

JPL Supercomputing Project

Visualization Laboratory

SPONSOR

NASA Office of Space

Science Applications

Information Systems Branch

and Land Processes Branch

NSF funding for CALCRUST

HARDWARE

VAX

SGI 3030

Alliant

SOFTWARE

Wavefront

Vicar

CONTACT

Gloria Brown-Simmons

JPL/Coltech

4800 Oak Grove Drive,

MS 168-514

Pasadena, CA 91001

(01) 818-354-4370

(01) 818-393-6962 fax

nako314@jpl.jpl.nasa.gov

WATER COLORS

Hiroshima University

11:43

In order to display photo-realistic landscape images, many of the latest techniques based on optical phenomena are employed; atmospheric scattering model, solar penumbra, and radiative transfer in water.

CONTRIBUTORS

Tomoyuki Nishito

Katsumi Todomuro

Yoshinari Masumoto

Masoshi Baba

Masoyuki Kawano

Takeshi Yamanaka

Gan Yuan

Takushi Kagawa

Yoshinari Dobashi

Akira Ishida

Hirohiko Konetani

Takao Shirai

Shegeki Mori

Muneki Shimada

PRODUCER:

Eihachiro Nakomoe

HARDWARE

NEC EWS4800

Silicon Graphics IRIS 4D

SOFTWARE

In-house

CONTACT

Eihachiro Nakomoe

Hiroshima University

Faculty of Engineering

Higashi-hiroshima 724

Japan

(81) 82-422-7111 x3445

(81) 82-422-7195 fax

nako@eml.hiroshima-u.

ac.jp

WINDY MOMENT

Hitachi

0:30

Hairstyle modeling, dynamical behavior simulation of hair, anisotropic reflection model for hair, facial action control, motion generation with emotion, and deformation expression for muscle ore used to render natural human images.

CONTRIBUTORS

Munetoshi Unumo

Kiyoshi Arai

Yoshiaki Usami

Ken Anijo

Tsuneya Kurihara

Shinkichi Araki

Hiroaki Takatsuki

NAMCO crew:

Shinobu Suzuki

Akemi Inoue

Mosoaki Tsuchida

Yosuo Ohba

Akiko Saitou

Ryuji Ohdote

Naohiro Saitou

Suguru Suzuki

Kenji Watanabe

PRODUCER:

Ryoza Takeuchi

HARDWARE

Silicon Graphics IRIS 4D

SOFTWARE

In-house

CONTACT

Yoshiaki Usami

Hitachi Research Laboratory

Hitachi, Ltd.

4026 Kuji-cho, Hitachi-shi

Iboraki-ken 319-12

Japan

(81) 294-52-51-11

(81) 294-52-76-01 fax

usami@hrigw.hrl.hitachi.co.jp

WINTER WONDER LAND

Tricia Sprouer

John Moredo

2:00

A snowman comes to life and explores a winter wonderland.

CONTRIBUTORS

Peter Watterberg

HARDWARE

HP 700

Stordent

SOFTWARE

Mesa Rendering Package

written at Sandia National

Laboratories

CONTACT

Tricia Crotty Sprouer

John Moredo

Sandia National Laboratories

PO Box 5800, Div. 9617

Albuquerque, NM 87185

(01) 505-844-1555

(01) 505-844-9297 fax

XANADU CITY

Jérôme Estienne

Xavier Duval

2:10

The love affair between "Sultan" and "Barbara" on "Xanadu City's" magic island.

CONTRIBUTORS

Ex Machina

Thompson Digital

Silicon Graphics, France

HARDWARE

Silicon Graphics 4D/25

SOFTWARE

Explore TDI

CONTACT

Jérôme Estienne

La Vie est Belle-Films

Associés

6 rue Primotice

75013 Paris

France

(33) 1-43-43-40-67

(33) 1-42-93-53-11 fax

Art Show Animation Contributors

A CERTAIN UNCERTAINTY

Lynn Pocock-Williams
3:40

A Certain Uncertainty is an experimental music video, featuring The New York Guitar Project. The video takes its name from the music that accompanies it, which was written by Reinaldo Perez and R. Stuart Williams. Shot during an intensive rehearsal weekend, the images present The New York Guitar Project at work. *A Certain Uncertainty* is created according to intuition, and the images are computer processed, resulting in a very painterly quality. The method by which the images are composed focuses on the connections between the qualities of the sounds and visuals. The resulting video is intended to be an expression of the music.

HARDWARE

Amiga 500

SOFTWARE

Artist's personal software

CONTACT

Lynn Pocock-Williams
Pratt University
c/o 37 Huemmer Terrace
Clifton, NJ 07013
(01) 201-546-5607

ACACIA MOSAICS

Brian Evans
2:30

This work explores temporal design through thematic development of motion, color, and sound. Sonic and visual materials serve the same architectures, with serial techniques neutralizing musical pitch and atonal imagery neutralizing visual shapes. It invites the audience to slow down for a moment and learn to really look and listen.

CONTRIBUTORS

MUSIC/GRAPHICS:

Brian Evans

SPONSOR

National Center for
Supercomputing Applications

HARDWARE

Cray-YMP

SOFTWARE

By artist

CONTACT

Brian Evans
Vanderbilt University
Computer Center
105 Stevenson Center
Nashville, TN 37235
(01) 615-343-1621
(01) 615-343-1605 fax
evans@ctvax.vanderbilt.edu

ANGELS

Nicole Stenger
7:30

Real-time recording of schematic version of *Angels*, a virtual-reality movie.

CONTRIBUTORS

LABS:

MIT CAVS

MIT Visual Arts

U of W Human Interface Lab

MUSIC:

Diane Thome

V.R. ASSISTANTS:

Daniel Henry

Bryan Karr

SPONSORS

Prix Villa Medicis Biennale

Arts Electroniques

Silicon Graphics

Wavefront Technologies

Crystal River Engineering

VPL

HARDWARE

Silicon Graphics 4D/25G

Silicon Graphics 320VGX

DEC 5000

VPL LX and Data Glove

SOFTWARE

Wavefront

VPL

CONTACT

Nicole Stenger
Human Interface Technology
Lab
University of Washington
FJ-15
Seattle, WA 98195
(01) 206-543-5075
(01) 206-543-5380 fax

CHANCEFORMATION

You Chen
4:30

Dice is the main character in this project visualizing the variables of "chances." The objects, movements, colors, and lighting in this piece all deliver unexpected messages and variations. The final piece will consist of four parts, Stage, Dream, World, and Coffee. The audio resources mostly come from John Cage's work.

SPONSOR

UCLA Design Department

HARDWARE

SGI Personal IRIS 4D/35

SOFTWARE

Wavefront Advanced

Visualizer

CONTACT

You Chen
3217 Overland Ave., #9115
Los Angeles, CA 90034
(01) 310-559-8825

COMING ATTRACTIONS

Susan Alexis Collins
2:00

Examining the ironies of being a strong, educated woman today, sandwiched between one's own needs and others' expectations, this piece is a reflection on modern mating habits and sexual balances of power. In *Coming Attractions*, moving drawings weave themselves into a time-based collage, "video wallpaper," which when delayered expose a surprisingly menacing underbelly to our "everyday." *Coming Attractions*, as the title suggests, is just a hint at the promise of things to come.

CONTRIBUTORS

DIRECTOR, ANIMATOR, EDITOR:

Susan Alexis Collins

SOUND PRODUCTION:

Greg Petersen

SPONSOR

Commodore Amiga
(loan of Amiga 2000)

HARDWARE

Amiga 2000

SOFTWARE

Deluxe Paint III

CONTACT

Susan Alexis Collins
Computer Graphic Arts
Columbia College
600 South Michigan Avenue
Chicago, IL 60605
(01) 312-663-1600 x399
(01) 312-663-1707 fax

FALLING APART

Marcos Martins
1:38

Combining photography with computer-rendered images, *Falling Apart* wants to challenge people's trust in their own perceptions. Photography has traditionally been seen as the most accurate medium of representing reality. Computer rendering of images is now the most perfect medium to simulate reality. By mixing representation and simulation, this film creates contrasting levels of illusion in order to raise questions about the truthfulness or falseness of what is being shown. *Falling Apart* wants to show how much our perception can be manipulated.

SPONSOR

CNPQ Grant (Brazilian Government)

HARDWARE

SGI Personal IRIS 4D/35
Mavica 2000 (still video camera)
Macintosh IIx

SOFTWARE

TDI
Photoshop

CONTACT

Marcos Martins
School of Visual Arts
415 West 23rd Street, #9D
New York, NY 10011
(01) 212-989-8264

FROZEN GODS

Ryuchira Debuchi/High
Tech Lab. Japan, Inc.
0:65

Some animals are gods (Kamui) for the Ainu people (a minority tribe living in the northern islands of Japan). I wanted to create a new mythology for them. In this work, imaginary animals living in cold lands are introduced which are rendered by a new fur-renderer named "Limage."

CONTRIBUTORS**ARTIST:**

Ryuchira Debuchi

MUSIC:

Yasuhiro Kawasaki

ASSISTANT DESIGNER:

Iyaka Kuroda

HARDWARE

IBM RISC/6000
IRIS 4D/70GT
3Space Digitizers

SOFTWARE

Limage
Digital Dynamation System
Wavefront

CONTACT

Ryuchira Debuchi
Court-Setagaya-101
1-15-11
Mishyuku, Setagaya-ku
Tokyo 154
Japan
(81) 33-711-5111
(81) 33-711-5110 fax

HAVE YOU BEEN WAITING LONG?

Patricia A. Abt
1:30

A female crucifixion; she falls from a cross and breaks into pieces.

CONTRIBUTORS

Music, video and animation
by Patricia Abt

HARDWARE

Video Toaster

SOFTWARE

Toaster Paint

CONTACT

Patricia A. Abt
41 Second Street
Tray, NY 12180
(01) 518-276-4778
abt@iear.arts.rpi.edu

IDIOLECT.JAM

SCSU Art Department
7:20

In this experimental videotape, a performance interpreting the concept of self-portraiture is transformed into a video painting. The work operates on many levels, in the electronic space between event and representation, as a reflexive exploration of the imaging process.

CONTRIBUTORS

John McCarthy
(Self Portrait Performance)

PRODUCER:

Mitchell Bills

SPONSOR

Experimental Television
Center, South Dakota St.
Univ.

HARDWARE

Amiga 1000
Jones colorizer
Variety of video switches

SOFTWARE

Janes framebuffer
Deluxe Paint III
Misc. audio

CONTACT

Mitchell Bills
SCSU Art Department
75A Fairview Avenue
Hamden, CT 06514
(01) 203-397-4391
billsm@scsu.ctstateu.edu

INFINITY

Masa Inakage
0:40

This animation demonstrates a production technique called "infinite reflection models." Images are rendered by a ray-tracing technique on a personal computer-based system.

HARDWARE

NEC PC9801 VX2
Transputer Board

SOFTWARE

Visual Innovations "SUPER
TREK"

CONTACT

Masa Inakage
The Media Studio, Inc.
2-24-7 Shichirigahama-
Higashi
Kamakura, Kanagawa 248
Japan
(81) 467-32-79-41
(81) 467-32-79-43 fax

JAGUAR MOON

Apple Computer, Inc.
2:10

Moonlight illuminates stone temple ruins deep in the jungle. Three sculpted jaguars, carved from stone, come to life and dance in the moonlight, creating an entrance to the Mayan underworld. In a subterranean vault beneath the ruins, a micro-opera is performed by two peculiar Lords of the Night and a serpentine Dragon in counterpart to an aria by a lovely Dragon Lady. In the final sequence, a skeletal Death God performs a comical but chilling dance of death, and our players subside into stone once again.

CONTRIBUTORS**DIRECTED:**

Lance Williams

CONCEPT, CHARACTERS, AND SETS:

David Em

ANIMATION AND SOFTWARE:

Pete Litwinawicz

ANIMATION:

Laurence Arcadias
Amber Denker
Jack Liao

MUSIC:

Tam Montgomery

DRAGONLADY PERFORMED BY:

Georgia Montgomery

MALE VOICES:

Ed Cohn

DIGITAL SOUND EFFECTS:

Libby Patterson

VIDEO:

Todd Junkin

LOCATION PHOTOGRAPHY:

David D. Fracesca

HARDWARE

Apple Macintosh
Silicon Graphics IRIS
Digidesign

SOFTWARE

In-house animation and
rendering

CONTACT

Lance Williams
Apple Computer, Inc.
20525 Mariani Avenue
MS: 76-4J
Cupertino, CA 95014
(01) 408-974-0028
(01) 408-974-5505 fax
lance.w@applelink.apple.
com

"LABERINT," FROM THE SERIES, "POSTALS DE BARCELONA"

Animática/TVC
2:30

In *Laberint*, live-action and computer-generated characters weave between real and virtual worlds. Two locations in Barcelona, Parc Laberint and the old Gothic Quarter, serve as inspiration. This piece draws from the ancient myth that woman and man were once androgynous form. Beginning in the Cave, woman and man split. They enter the Garden, then move on to life in the City. Trying again to become one, they take off into the future.

CREDITS**CONCEPT AND DESIGN:**

Rebecca Allen

PRODUCTION:

Animática S.A.
Xavier Berenguer
Francesc Blanes
Remo Barcells

Anna Visa

Roger Cabezas

POST-PRODUCTION:

Filmтел, S.A.

MUSIC:

John Paul Jones, Opal
Records, Catalunya S.A.

HARDWARE

SGI
Cyberware Laser Scanner

SOFTWARE

Wavefront

In-house

CONTACT

Xavier Berenguer
Animática
Amiga 15
Barcelona 08021
Spain
(34) 3-201-0799
(34) 3-202-0324 fax
Rebecca Allen (In USA)
(01) 310-278-2980
(01) 310-278-3118 fax

LIPS

John Paul
0:20

Our beloved leader George Bush reveals his true self and continues to give forth words of wisdom claiming to have seen Elvis. 3D animation combined with 2D PhotoShop work. Continuous loop with varying audio.

CONTRIBUTORS**CONCEPT, DESIGN, PRODUCTION:**

John Paul

CUSTOM SOFTWARE:

Dana Marshall
Jason Decker

John Paul

EQUIPMENT PROVIDED BY:

Ozz Research Computers,
Inc.

HARDWARE

AT&T Pixel Machine
Mac II

SOFTWARE

Raylib
PhotoShop
Custom software

CONTACT

John W. Paul
918 East 48-1/2 Street
Austin, TX 78751
(01) 512-459-7216
(01) 512-794-8633 fax

LOST GROUND

Deanna Morse
2:25

Ribbon-like characters search for identity in their cut-out environments of hedges, people, and houses. *Lost Ground* is a modern love story for the nineties.

HARDWARE

SGI Personal IRIS

SOFTWARE

Alias

CONTACT

Deanna Morse
Associate Professor
School of Communications
268 Lake Superior Hall
Grand Valley State
University
Allendale, MI 49401
(01) 616-895-3101 or
(01) 616-895-3668

MUTATIONS

William Latham
3:18

Mutating, artificial life forms.

CONTRIBUTORS

William Latham

SOFTWARE:

Stephen Todd

Ramen Sen

Peter Hughes

MUSIC:

Mark Ayers

HARDWARE

IBM 3090

SOFTWARE

ESME

Windsom

CONTACT

William Latham
IBM UK Scientific Centre
St. Clement Street
Winchester SO23 9DR
United Kingdom
(44) 962-84-41-91
(44) 962-84-00-99 fax

OFF THE MAP

Sylvain Moreau
0:34

Off the Map is an animation completely realized using texture and procedural mapping. The only model used is a set of 3 squares. All of what you see happens on the surfaces of these squares. *Off the Map* is a 4-dimensional painting.

CONTRIBUTORS

ART, DESIGN, ANIMATION:

Sylvain Moreau

MUSIC:

Rudy Toussaint

HARDWARE

Silicon Graphics IRIS

SOFTWARE

Alias

CONTACT

Sylvain Moreau
34-41 78th Street #11
Jackson Heights, NY
11372
(01) 718-899-5811

**S.C.A.M. STARVING
COMPUTER ARTIST'S
MARKET**

New York Institute of
Technology
1:38

S.C.A.M. is a spoof on electronic art being sold as print art to the general public.

CONTRIBUTORS

Scott Bregger

Dave Barosin

Margaret Brodman

Donna Minerva

Steve Schaffer

Peter Traugot

Brian Marolda

PRODUCER:

Peter Voci

HARDWARE

DEC Micro PDP 11

286 PC with custom buffers

SOFTWARE

NYIT custom

CONTACT

Peter Voci
New York Institute of
Technology
Fine Arts Center
Old Westbury Campus
Old Westbury, NY 11568
(01) 516-686-7604
(01) 516-686-7542 fax

VENUS AND MARS

Ray Eales
2:13

Venus and Mars is a sort of homage to the 1960's and 1970's so-called Avant-Garde film (all done in software, of course).

HARDWARE

Silicon Graphics workstation

Sharp JX 100 Scanner

Amiga 2500

SOFTWARE

Alias

Vista Pro

Art Department Pro

Design Paint

CONTACT

Ray Eales

PO Box 24691

Tampa, FL 33623-4691

(01) 813-237-0248

Zen3 Tao2

ACCAD/OSU

The Ohio State University

4:13

Zen3 Tao2 is a spiritual journey through form, a metaformalism. The film depicts awareness of spirit through analytical contemplation and awareness of self through spiritual contemplation. The process of developing *Zen3 Tao2* was more important than the product of final film.

CONTRIBUTORS

ANIMATION:

John Donkin

IMAGE POST PROCESSING:

Jeff Light

RENDERING:

Scott Dyer

PRODUCER, PROCEDURAL

MODELING:

John Chadwick

HARDWARE

Sun SparcStations

CONTACT

Erika Galvao

ACCAD/OSU

The Ohio State University

1224 Kinnear Road

Columbus, OH 43212

(01) 614-292-3416

(01) 614-292-7168 fax

erika@cgrg.ohio-state.edu

1,2,3...N,N+1...

RATE X TIME = DISTANCE

TIME STOPS THE MOMENT

EXPANDS OUTWARD

Anne Morgan

Rhode Island School of

Design

Box 1730

Providence, RI 02903

"18G90"

Mark Wilson

18 River Road

West Cornwall, CT 06796

3D-SPACE TIME

Carrie Heeter

Communication Technology

Laboratory

253 Communication Arts

Building

Michigan State University

East Lansing, MI 48824

ABYSS

Josephine Starrs

22 Dunks Street - Parkside

Adelaide, S.A. 5063

Australia

ALICE

David Perlman

59 Stoneham Drive

Rochester, NY 14625

AT&T STEEPLECHASE

Jim Burris

R/Greenberg Associates

350 West 39th Street

New York, NY 10018

AWAKE

Scott Park

222 East 10th Street

New York, NY 10003

BLIND MAN'S BLUFF

Madge Gleeson

Art Department

Western Washington

University

Bellingham, WA 98225

BOOK OF ONTOLOGY

Robert Murray

100 Beaver West

Bryan, OH 43306

CALLIGRAPHY

Patrick Garret

20 Rue de Montmorency

Paris, 75003

France

THE CALL OF THE PIPER

Roger Dade

Bournemouth & Poole

College of Art & Design

Shelly Park,

Beechwood Avenue

Bascombe

Bournemouth, Dorset

BH5 1NE

United Kingdom

"CARDINAL POINTS"

Karen Hillier

Visualization Lab

College of Architecture,

Room 216

Texas A&M University

College Station, TX 77843

CIRCUS

Bill Davison

179 Main Street

Winooski, VT 05404

CLOSE INSPECTION

Steve Davis

Evergreen State College

L 1302

Olympia, WA 98505

**COMUNICACION, ENERGIA,
CASSANUELLAS**

Ellen Sandor

(Art)n Laboratory, IIT

3300 South Federal St.

Chicago, IL 60616

COUP

Marsha J. McDevitt

ACCAD

Ohio State University

1224 Kinnear Road

Columbus, OH 43212

CYCLES #1

Eric W. Flaherty

Visualization Lab

College of Architecture,

Room 216

Texas A&M University

College Station, TX 77843

DA STRING HEADS

Andrew C. Deck

325 East 21st Street, #2B

New York, NY 10010

D-3 UNTITLED ANGLE

Stephen Keltner

109 Sterling Place

Brooklyn, NY 11217

**DIGITAL DIORAMA:
AN EVOLVING
DOCUMENTARY**

Daniel Spikol

Center For Advanced Media

Studies

MIT

40 Moss Avenue, W11-069

Cambridge, MA 02139

DRY READING

Craig Hickman
615 East 39th Avenue
Eugene, OR 97405

EIGHTEEN

Todd Walker
2890 North Orlando Avenue
Tucson, AZ 85712

ELECTRONIC CAFE INTERNATIONAL

Kit Galloway
Sherrie Rabinowitz
1649 18th Street
Santa Monica, CA 90404

ENTERN

Kent Rollins
5920 Hillsboro Road
Nashville, TN 37215

EXHAUST & HEAT HAZE DETOUR (TRAVELING LIGHT)

Perry A. Haberman
Cooper Union School of Art
167 North 9th Street
Brooklyn, NY 11211

EXPERIMENT IN DEPTH PERCEPTION #2

Vibeke Sorensen
2322-D La Costa Avenue
Carlsbad, CA 92009

FEEL

Patric Old
Royal College of Art
23 West Common Drive
Haywards Heath, West
Sussex RH162AN
United Kingdom

FOLIO 700.**N.DIAMOND LAKE APOCALYPSE**

Roman Verostka
5535 Clinton Avenue South
Minneapolis, MN 55419

FREE-FALL CYBERBALL

Vincent John Vincent
The Vivid Group
317 Adelaide Street W.
#302
Toronto, Ontario M5V 1P9
Canada

GATHERING, PRODUCTION, PROGRESS

Leslie Wilson
Art Matters
208A Auburn
San Rafael, CA 94901

HEADLANDS MNEMONIC NOTATIONS

Phillip George
Zographics
11 Miller St. Bondi
Sydney, NSW 2026
Australia

HEIGHT FIELD OF SLOW BUT HAPPY

Charles R. Hoffman
R/ Greenberg Associates
350 West 39th Street
New York, NY 10018

HIGH-TECH FLOWER

Michael D. Cote
40 Bullock Street
Pawtucket, RI 02860

INTER CAETERA DIVINA

Ken Goldberg
Claudio Vera
204 Powell Hall
University of Southern
California
Los Angeles, CA 90089

INTERNATIONAL PAINTING INTERACTIVE

Stephanie Slade
The S.L.A.D.E. Corporation
9314 Sierra del Mar
Los Angeles, CA 90069

INTIMACIES

David S. Goodsell
The Scripps Research
Institute
10666 N. Torrey Pines Road
La Jolla, CA 92037

IS ANYONE THERE

Stephen Wilson
Art Department
San Francisco State
University
1600 Holloway
San Francisco, CA 94132

FUNCTION ALLEGRO MISTERIOSO

Kees Van Prooijen
Electro GIG
Amstel 222
Amsterdam, 1017AJ
The Netherlands

KAZAGURUMA (PINWHEELS OF SCHRODINGER)

Kay
Court Setagaya 101
1-15-11-Mishyuku
Setagaya-ku, Tokyo 154
Japan

LIFE ON A SLICE

Beverly Reiser
6979 Exeter Drive
Oakland, CA 94611

LOONY TOMBS #7

Jay Riskind
505 North Lake Shore
Drive, Apt 3505
Chicago, IL 60611

MAP.D

Leah Siegel
401 West 53rd Street, #3A
New York, NY 10019

MUTATION X

William Latham
IBM UK Scientific Centre
St.Clement Street
Winchester, SO23 9DR
United Kingdom

NOVA SCOTIA RAINFALL

Steven M. Herrnstadt
1613 Clark Street
Ames, IA 50010

ONYX ON TORUS

Sui Morita
3-15-2 Sengen-Cho
Higashikurume-shi, Tokyo
203
Japan

ORNITORINCO

Eduardo Koc
1525 West Farwell
Chicago, IL 60626

PARADISE TOSSED

Jill Scott
Lumagraph Productions
PO Box 1001
Dalinghurst, Sydney
N.S.W. 2010
Australia

PE ONE

Eric Egas
Box 600
Greenville, NY 12083

PIECES OF EIGHT

Kathryn Foot
260 West 52nd St., #4J
New York, NY 10019

PERFORMANCE FOR AMPLIFIED BODY

Stelarc
Advanced Computer Graphics
Centre
Royal Melbourne Institute of
Technology
CITRI
723 Swanston Street
Carlton, VIC. 3053
Australia

PRAXIS 2

Claudia Cumbie-Jones
School of The Art Institute
37 South Wabash
Chicago, IL 60603

QUASICRYSTAL SPHERE

Tony Robbin
423 Broome Street
New York, NY 10013

QUERELLE DE C'EAU ET DE LA TERRE

Jean-Pierre Hebert
4647 Via Huerto
Santa Barbara, CA 93110

THE RAINDEAR WITH TWISTED HORNS

Ryoichiro Debuchi
High Tech Lab Japan Inc.
Court Setagaya-101, 1-15-
11, Mishyuku,
Setagaya-ku, Tokyo 154
Japan

RANDOM ACCESS MEMORIES 400

Barbara Nessim
Nessim & Associates
63 Greene Street
New York, NY 10012

RATTE-1

Markus Riebe
Am Anger 4
Gallneukirchen, A-4210
Austria

ROSETTA STONE

Judith Mayer
2261 Market Street,
Suite 330
San Francisco, CA 94114

SELF-PORTRAIT

Karin Schminke
California State University,
Northridge
4226 Esteban Road
Woodland Hills, CA 91364

SHOW OF HANDS

Thomas A. DeBasso
2861 Dorman Ave. South
Minneapolis, MN 55406

SIGNING

John F. Sherman
University of Notre Dame
Department of Art and Art
History
Notre Dame, IN 46556

SKIN STATE

Robert Hamilton Jr.
2120 Enon Road
Atlanta, GA 30331

SLEEPING BEAUTY

Vuttichai Buranosinlapin
School of The Visual Arts
22-48 41st Street, #1R
Long Island City, NY 11105

SMART

Pamela Hobbs
Hobbs Studio—
CBS Fox Video
261 West 29th Street,
Suite 4R
New York, NY 10001

SMOKE SCREAM

Caral Flax
437 Seventh Place
Manhattan Beach, CA
90266

SPIRITS RISING GYPSY TRICKS

Craig A. Johnson
Salon Electron
63 Providence Avenue
Daylestown, PA 18901

SOMEWHERE ELSEWHERE

Myron Krueger
Artificial Reality
Box 786
Vernon, CT 06066

STREAM

Char Davies
Softimage Inc.
3510 boul. St-Laurent -Suite
214
Montreal, Quebec H2X 2V2
Canada

SYNTHETIC GALLERY No.1

David Haxton
139 Spring Street
New York, NY 10012

TED & LIZA

Gregory P. Garvey
Concordia University
Department of Design Art,
VA 244
1455 de Maisonneuve
Boulevard W.
Montreal, Quebec H3G 1M8
Canada

THANKS TO VIEWERS LIKE YOU

Blaise Porte
PO Box 20175
New York, NY 10009

TRANS BOWL 2A (REVISITED)

Stewart McSherry
1750 El Cerrito, #12
Hollywood, CA 90028

VENUS OF THE PLANES

Bruce and Susan Hamilton
Rt. 1, Box 5C
Glorieta, NM 87535

VNS MATRIX

VNS Matrix
(Artists' Collective)
22 Dunks Street - Parkside
Adelaide, S.A. 5063
Australia

WE SAVE YOU MORE MONEY

Taking Stock
Steve Bradley
College of New Rochelle
SAS Dept. of Art
New Rochelle, NY 10805

WINGED YAM

Deborah P. Klotz
Mass. College of Art
51 Morning Street, #4
Portland, ME 04101

X-MAS STORIE

Eran Steinberg
EFI
950 Elm
San Bruno, CA 94066

