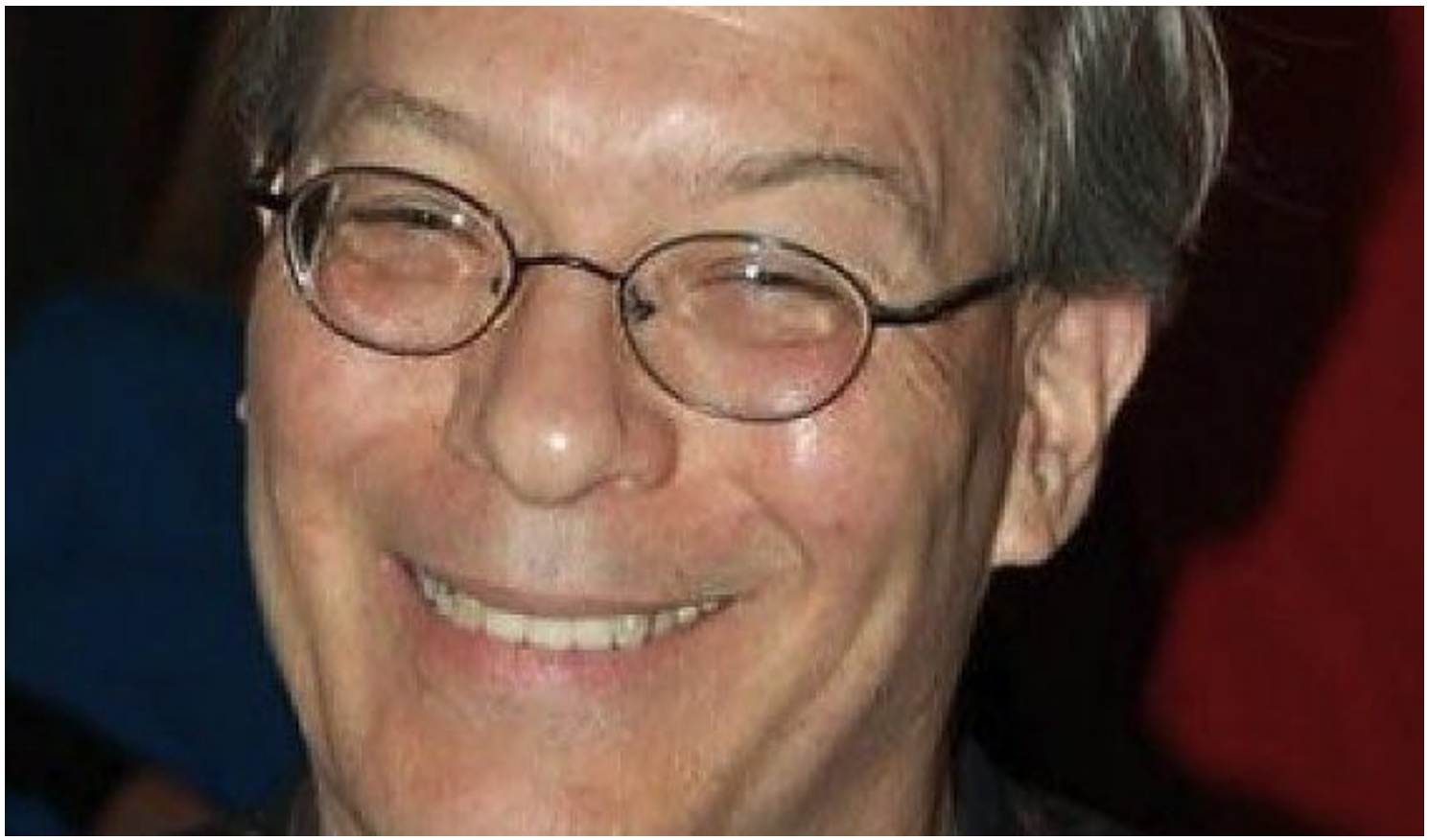
Lance J. Williams

The man and his legacy

In Memoriam



(September 25, 1949 – August 20, 2017)

L. Velho - 06/09/2017

Education

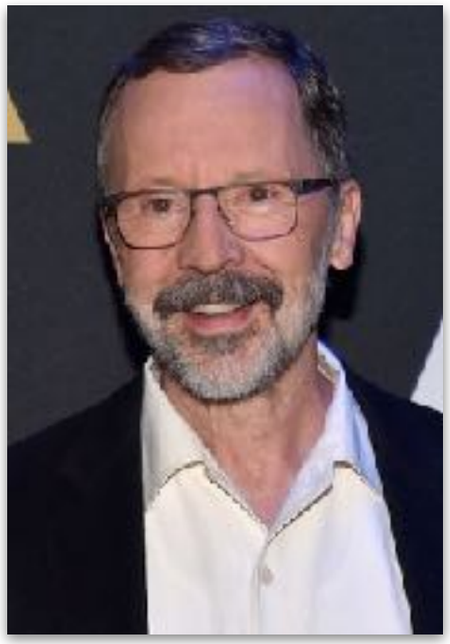
- 1967 - English and Asian Studies, University of Kansas (with honors)
- 1972 - Computer Science, University of Utah
- 1974 - Graphics, New York Institute of Technology

Mentors

- Robert Haralick - University of Kansas
- Jef Raskin - University of Utah
- Ivan Sutherland, Steven Coons - University of Utah
- Ed Catmull, Jim Clark - NYIT

Ivan Sutherland
father of CG

Robert Haralick
Computer Vision



Ed Catmull
PIXAR

Steven Coons
Sutherland's Advisor

Jef Raskin
Apple Macintosh

Jim Clark
Silicon Graphics

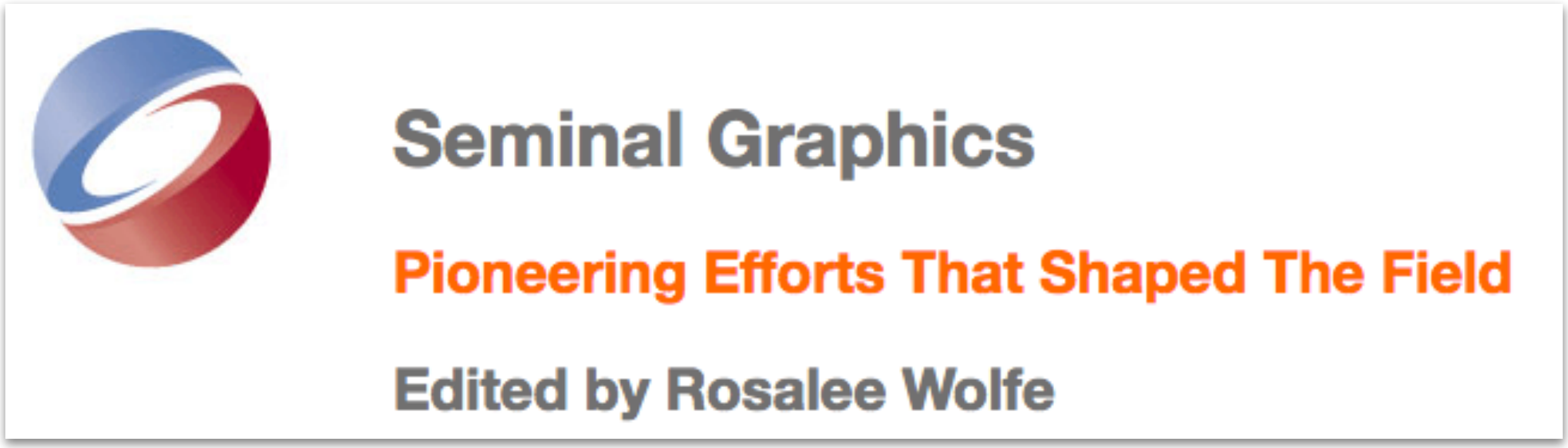
Thesis

"*Brute Force in Image-Space*”

Lance left Utah (without completing his degree) in 1974 to join NYIT.

He was later awarded his doctorate from Utah based on a rule allowing someone who published three seminal papers in his field to bind them together as his thesis.

Foundational Work



ACM SIGGRAPH, 1998

A juried collection of the forty-eight most important papers in computer graphics

Awards

- 2001- ACM SIGGRAPH Coons Award for Outstanding Contributions to Computer Graphics.

- 2002 - Technical Achievement Award by the Academy of Motion Picture Arts and Sciences.

- 2002 - honorary Doctorate of Fine Arts from Columbus College of Art and Design

Professional Career

- 1986 - Henson Associates *
- 1987 - TV Globo *
- 1988 - Apple Advanced Technology Group
- 1997 - DreamWorks SKG
- 2002 - Walt Disney Animation Studios
- 2004 - Applied Minds
- 2006 - Google Research
- 2008 - Nokia Research
- 2012 - NVIDIA Research

Technical Contributions

✴ Shadow Mapping
"*Casting Curved Shadows on Curved Surfaces*", 1978

✴ MIP Mapping
"*Pyramidal Parametrics*", 1983

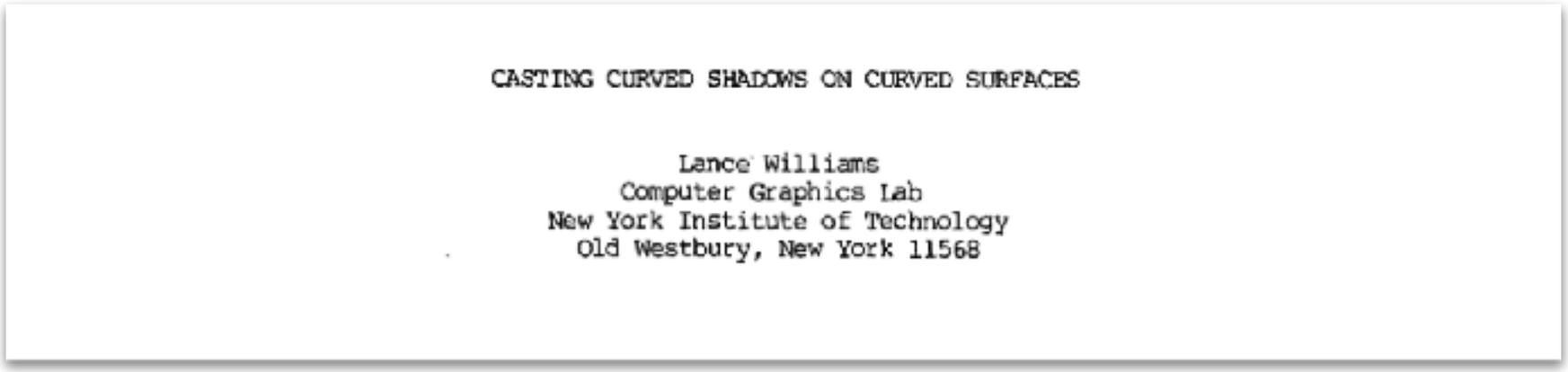
- Face Animation / Mocap
"*Performance Driven Facial Animation*", 1990

✴ Image-Based Rendering
"*View Interpolation for Image Synthesis*", 1993

- Warping and Morphing
"*Animating Images with Drawings*", 1994

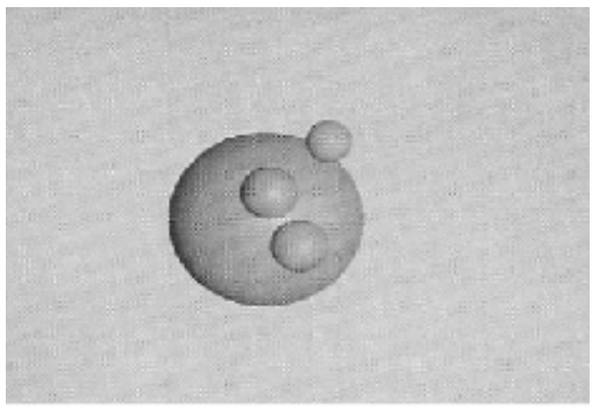
- *Virtual Reality*
"QuickTime VR: an image-based approach to virtual environment navigation", 1995

Shadow Mapping

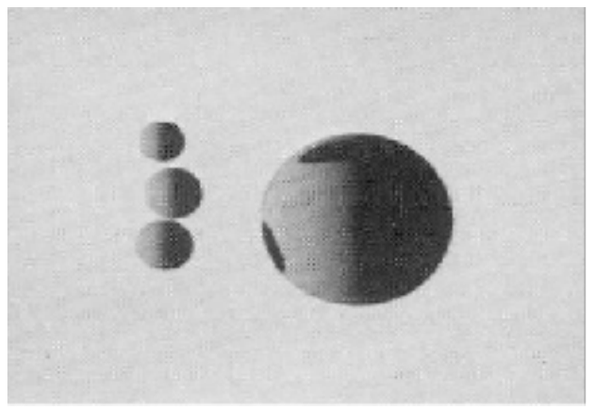


CASTING CURVED SHADOWS ON CURVED SURFACES

Lance Williams
Computer Graphics Lab
New York Institute of Technology
Old Westbury, New York 11568



Light View



Camera View

- Established Image-Space Photorealistic Lighting

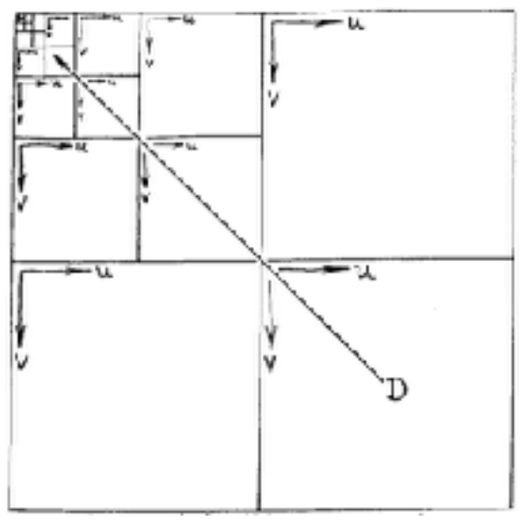
MIP Mapping

Computer Graphics Volume 17, Number 3 July 1983

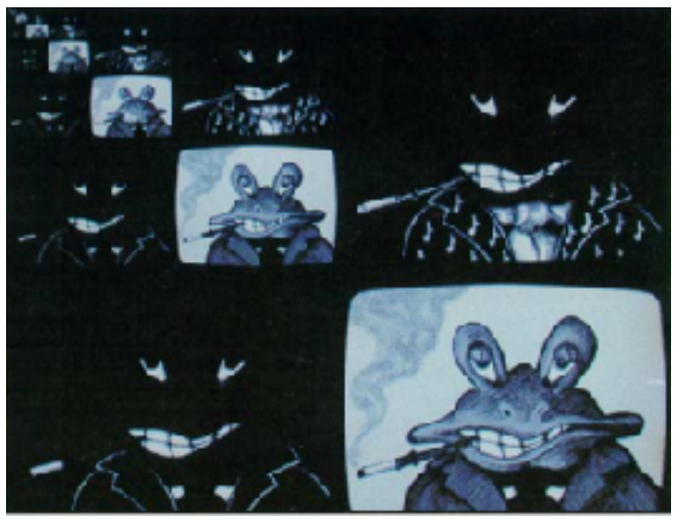
Pyramidal Parametrics

Lance Williams

Computer Graphics Laboratory
New York Institute of Technology
Old Westbury, New York



Multiresolution Map



RGB Image Pyramid

- Introduced Multiresolution Analysis to Graphics

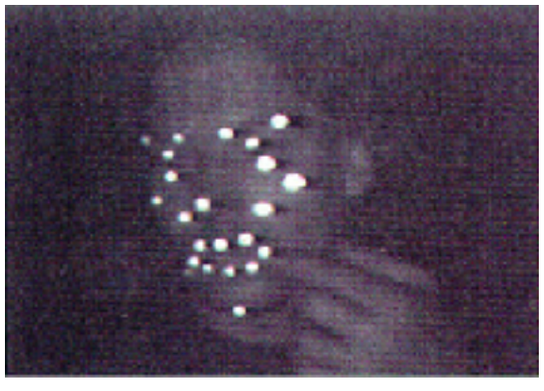
Face Animation

Computer Graphics, Volume 24, Number 4, August 1990

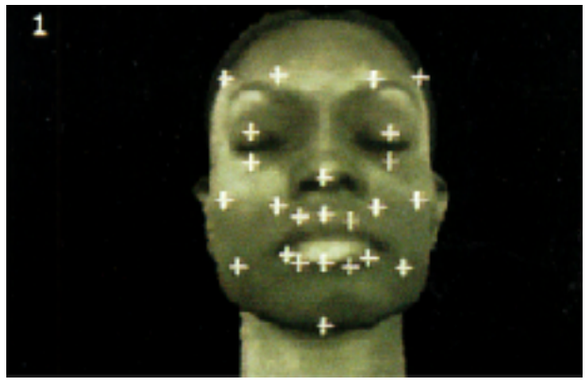
Performance-Driven Facial Animation

Lance Williams

Advanced Technology Group
Apple Computer, Inc.
20705 Valley Green Drive
Cupertino, CA 95014



Actor Marker Capture



CG Model Animation

- Pioneered Motion Capture of Expressions

Image-Based Rendering

View Interpolation for Image Synthesis

Shenchang Eric Chen, Lance Williams

Apple Computer, Inc.

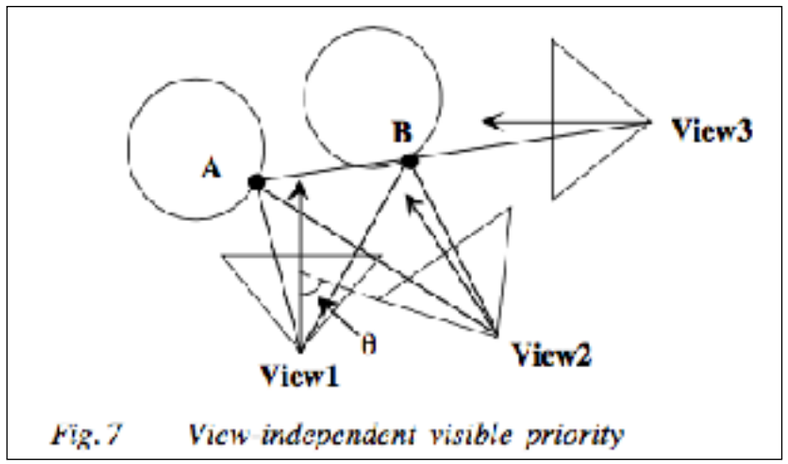


Fig. 7 View independent visible priority

- Precursor of Light Field / Plenoptic Imagery

Warping and Morphing

Animating Images with Drawings

Peter Litwinowicz†
Lance Williams†
Apple Computer, Inc.

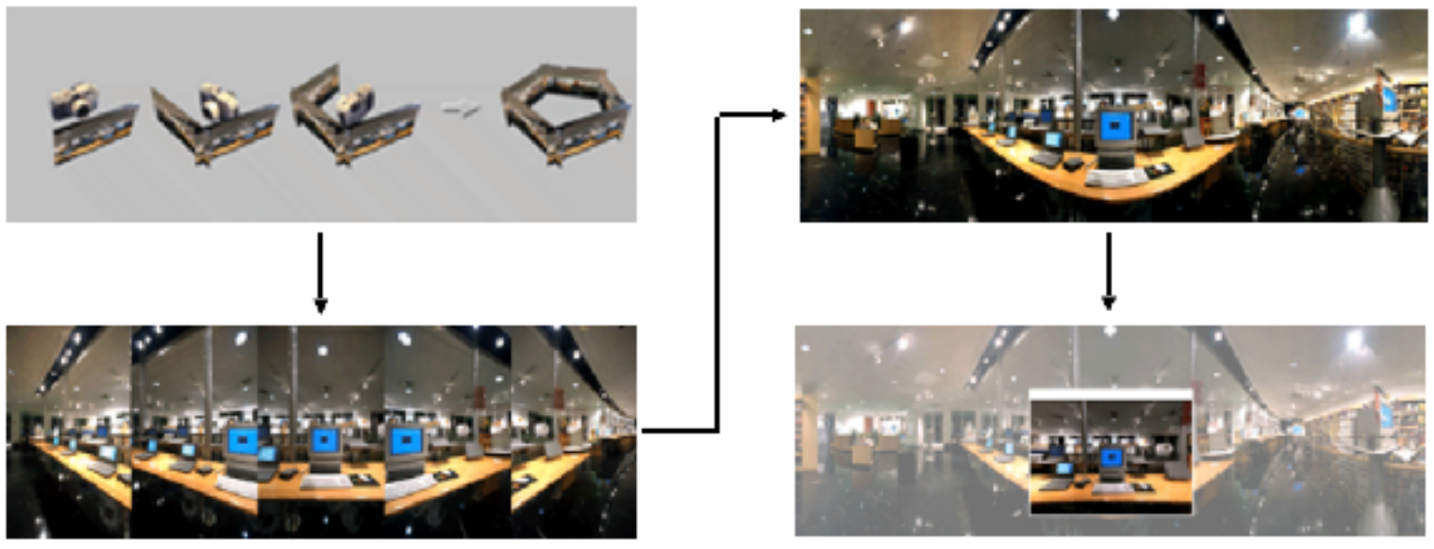
- Key Contribution to Feature-Based Metamorphosis

Virtual Reality

QuickTime® VR – An Image-Based Approach to Virtual Environment Navigation

Shenchang Eric Chen

Apple Computer, Inc.



- Early Development of 360 Panoramas

Artistic Contributions

- Sunstone - NYIT, 1979
- The Works - NYIT, 1980
- The Virtual Museum - Apple, 1992

Sunstone

Early pioneering animated art video created by Ed Emshwiller with help from Alvy Ray Smith, Lance Williams and Garland Stern.

Sunstone is a landmark film. Symbolic and poetic, it is a pivotal work in the development of an electronic language to articulate three-dimensional space. The opening image is an iconic face, which appears to be electronically "carved" from stone. A mystical third eye, brilliantly crafted from a digital palette, radiates with vibrant transformations of color and texture. Sculpting electronically, the archetypal "sunstone" is revealed to be one facet of an open, revolving cube, each side of which holds a simultaneously visible, moving video image.

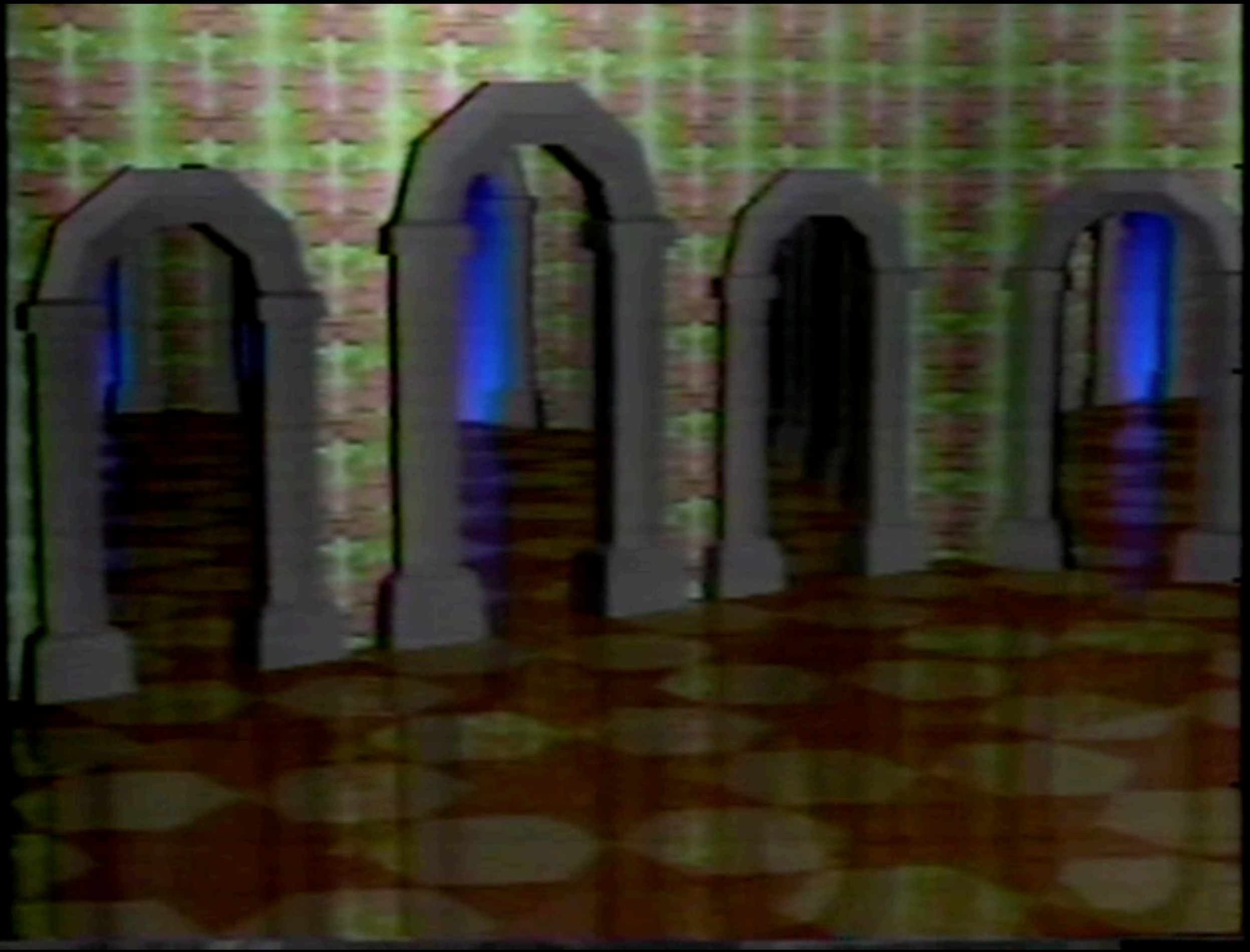
L. Velho - 06/09/2017

SUNSTONE

The Works

The Works was a pioneering effort by the artists and research scientists to produce the first feature length computer generated film.

Original story and direction by Lance Williams. Produced at the Computer Graphics Lab / New York Institute of Technology.



The Virtual Museum

Released as a CD-ROM in 1992, and distributed free worldwide to 1000 schools, universities and museums, The Virtual Museum was an interactive, electronic museum where users moved from room to room, and selected any exhibit for more detailed examination. The exhibits in the museum were educational, encompassing topics such as medicine, plant growth, the environment, and space.

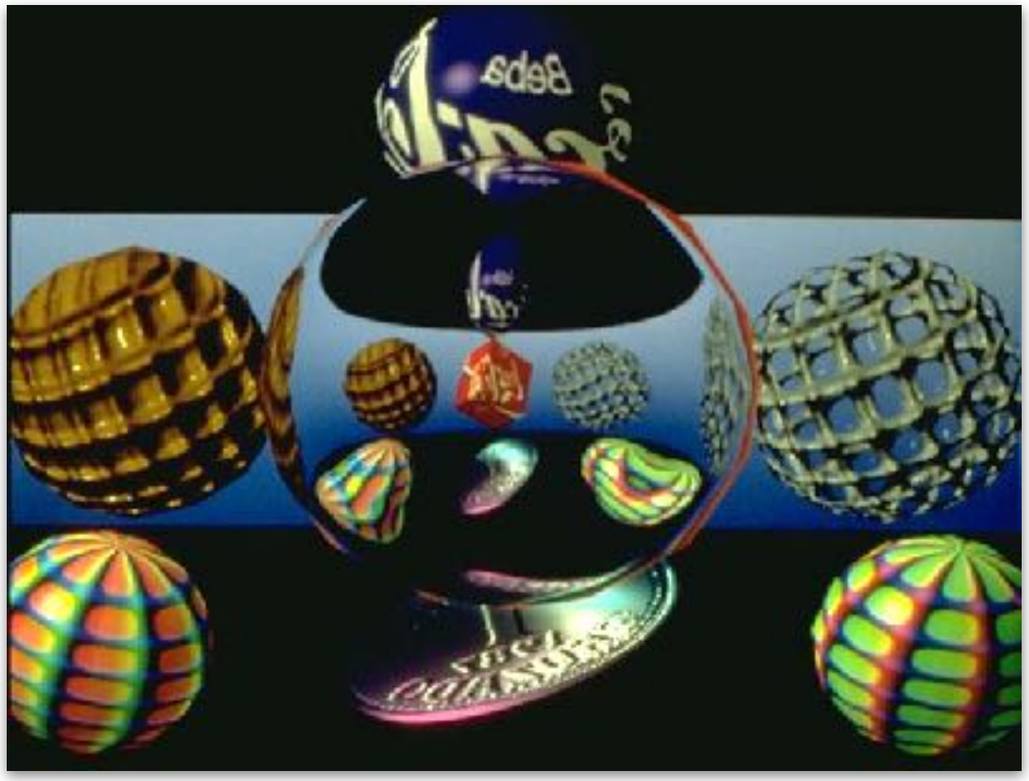
This was designed to showcase new techniques in computer graphics at the time, particularly to push the envelope of what QuickTime was capable of, and it was the grandfather of QuickTime VR. The Virtual Museum was developed by Apple's 3D graphics group under the leadership of Frank Crow

The Virtual Museum Interior

Brazil

- Globograph
- SIBGRAPI 92
- Luiz Velho
- Fernando de Goes
- Leo Carvalho

globograph



Images from an early version of the Pacific Data Images renderer, to which Lance Williams added texture, bump, transparency, and reflection mapping circa 1986.

L. Velho - 06/09/2017

SIBGRAPI 1992

- Contributions to C.G. Animation Festival
  - The Tempest
  - Jaguar Moon


ADVANCED TECHNOLOGY

Luiz Velho

- Ph.D. Thesis inspired Lance's Research:
  - "*3D Rendering Effects for 2D Animation*" , SIGGRAPH 1999
  - Patent N.: 6,317,139 B1 , USPTO 2001

3D Rendering Effects for 2D Animation

Lance Williams
Galen Gornowicz
DreamWorks SKG
lwilliams@dreamworks.com

Absence of shading and texture is a problem of traditionally animated film. It inspired soul-searching and strenuous effort well before shaded, textured 3D computer animation arose. An interesting approach to this problem is to use the 2D shapes drawn by the animator to define 3D surfaces, which can be rendered by conventional 3D graphics algorithms. This method was outlined in a previous paper,[1] which describes an "inflation" algorithm for creating smooth 3D surfaces from 2D shapes.

These "inflations" are a necessary component of the automatic airbrushing, specular ornaments, and gobo shadow effects to be described. It is worth noting, though outside the scope of this presentation, that such surfaces arise in many contexts. Implicitization of a 2D matte can be performed using the signed distance function, but smoother implicitizations are possible in 2D and 3D.[2] Interiors of such functions are smooth "inflations" of the shapes. These surfaces, derived from drawings, are very useful for achieving a wide range of continuous-tone animated effects. They are not, however, accurate models of the characters the drawings depict.

To achieve the fidelity to the props and characters required for such effects as texture mapping, accurate 3D models are necessary. Previous efforts in this direction[3] require animators both to draw a sequence and animate a corresponding sequence in 3D. By tracking drawings and conforming models to them, we eliminate the 3D animation step. Instead, the 3D animation defined by the model and the drawings can be further edited in 3D after the tracking is performed.

Specular reflections on the ornaments are a reflection mapping of the torch flame (from "Prince of Egypt").

References

1. Lance Williams. Shading in Two Dimensions, Graphics Interface '91, pp.143-151, Morgan-Kaufman Publishers, June 3-7, 1991.
2. Luiz Velho and Jonas Gomes. Approximate Conversion of Parametric to Implicit Surfaces, Computer Graphics Forum, vol. 15, #5, pp. 327-388, Elsevier Science Publishers, 1996.
3. W.T. Correa, R.J. Jensen, C.E. Thayer, and A. Finkelstein. Texture Mapping for Cel Animation, Computer Graphics Proceedings, Annual Conference Series, 1998, ACM SIGGRAPH, pp.435-446.

(12) **United States Patent**
Williams

(10) **Patent No.: US 6,317,139 B1**
(45) **Date of Patent: Nov. 13, 2001**

(54) **METHOD AND APPARATUS FOR RENDERING 3-D SURFACES FROM 2-D FILTERED SILHOUETTES**

(76) Inventor: **Lance Williams**, 4321 Talofa Ave., Toluca Lake, CA (US) 91602

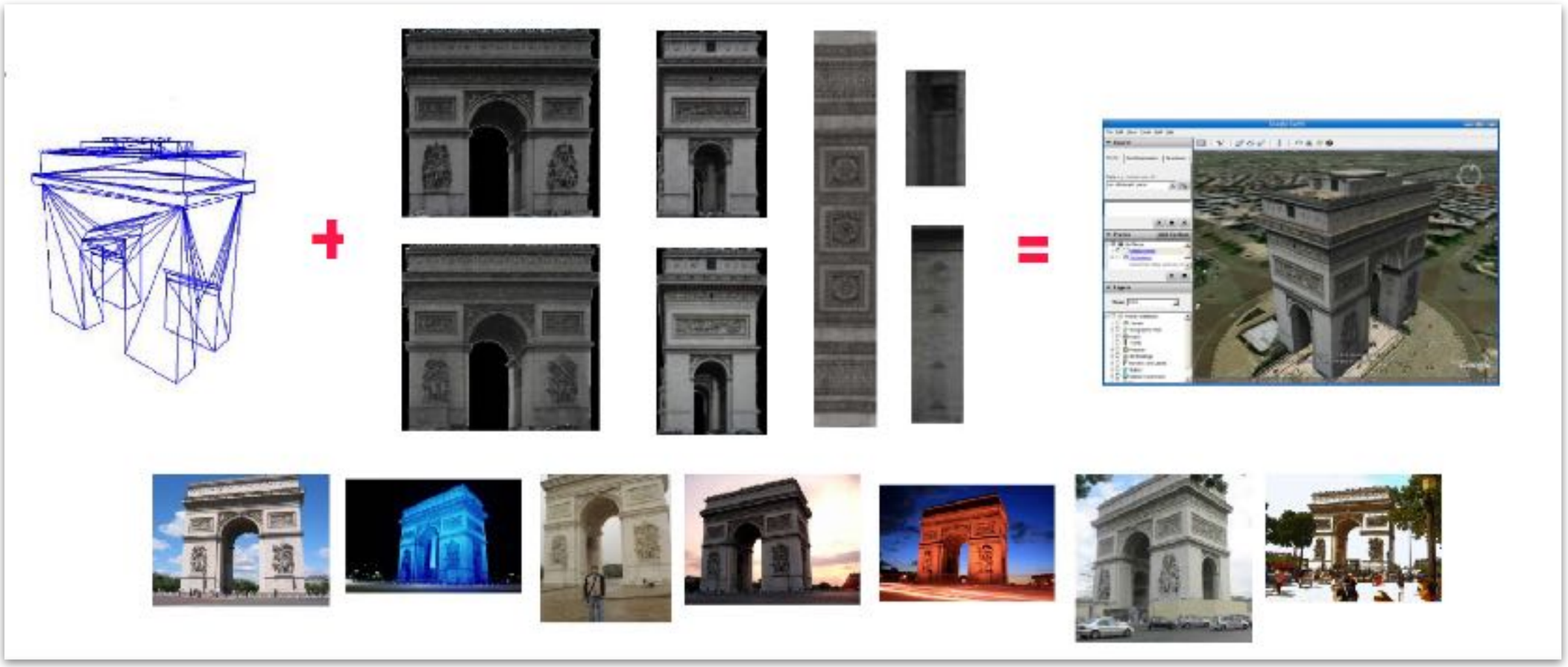
OTHER PUBLICATIONS

From Images to Models (and Beyond): a personal retrospective, Szeliski, May 21, 1997.
Constructing Implicit Shape Models from Boundary Data, Vehlo et al., May 1995.

The binary silhouettes are filtered to produce gradient silhouettes using any of a variety of the filtering techniques. For example a Gaussian filter may be applied to generate a gradient across each binary silhouette. In a particular exemplary embodiment, the binary silhouettes are filtered by calculating the tubular neighborhood in the vicinity of the perimeter of the binary silhouettes. Details regarding one particular technique for calculating the tubular neighborhood of a shape are described in Constructing Implicit Shape Models From Boundary Data, by Luiz Velho et al., Computer Vision and Image Processing, Volume 57, No. 3, May 1995, pages 220-234.

Fernando de Goes

- Internship at Google, 2008

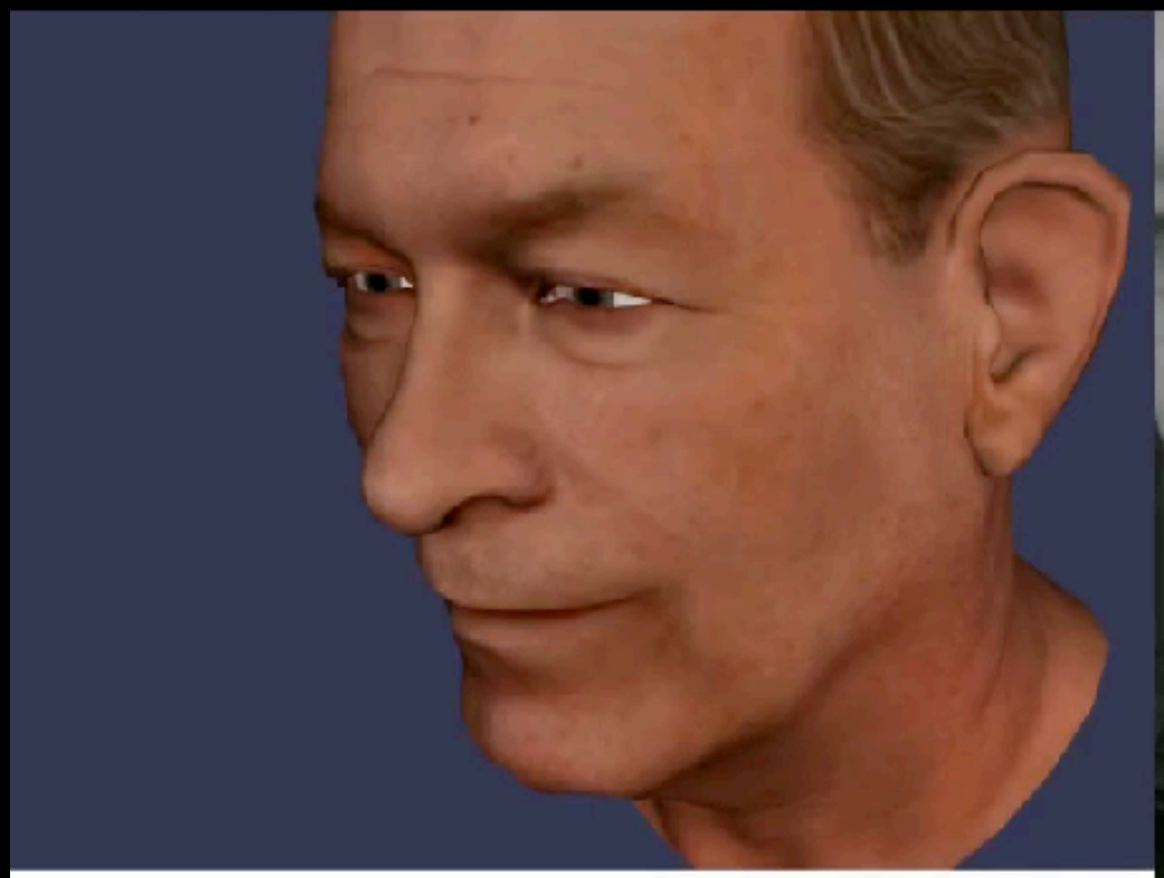


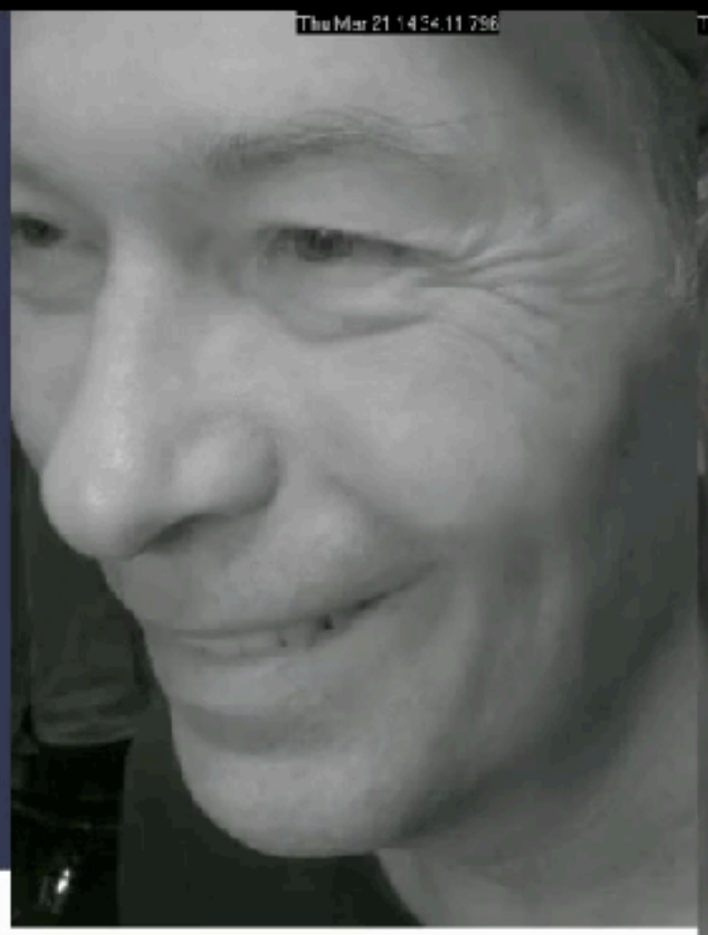
Transferring the Appearance of Pictures to 3D Models

Leo Carvalho

- Internship at NVIDIA, 2013

Real-time Facial Expression Tracking

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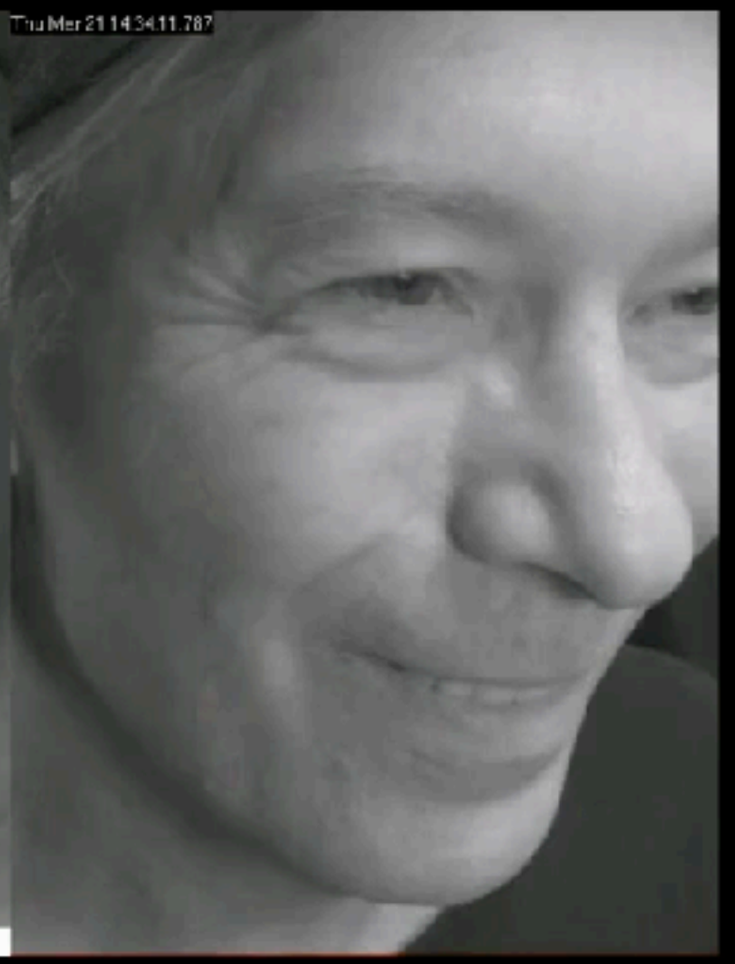
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Memories

- *Utah Graphics in the Bay Area*
  September 27, 1994

- *5D Conference : “Reality and Hyper Reality”*
  April 12, 2008


LANCE WILLIAMS
Scientist, Consultant for Disney,
Apple, DreamWorks, Jim Henson

Selfie with Lance

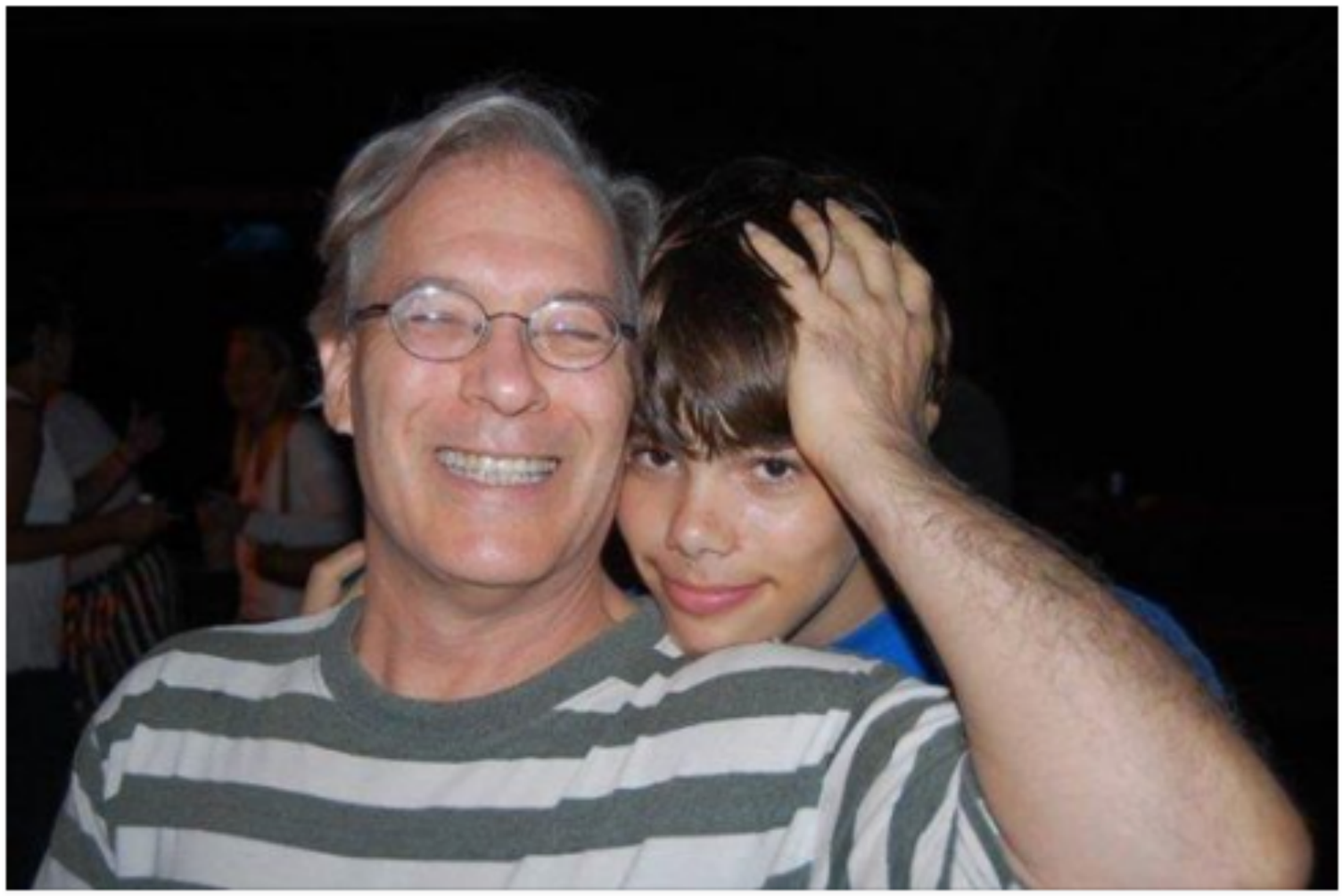
- SIGGRAPH 2016, Los Angeles

Mane Williams with Lance Williams.

21 hrs ·

Early this morning, my father, Lance Joseph Williams, passed away. He was one of the most wise and thoughtful people I know, and I was incredibly lucky to call him my dad. My family and I are devastated by his passing, but will always be comforted by the countless memories we made with him; we know that we share this pain with the many people he has touched with his warmth.

The world is now bereft of yet another gentle soul. Dad, I will love and miss you forever.



L. Velho - 06/09/2017

Lance Williams

It is with profound sadness that I share the loss of our friend and colleague Lance Williams, who passed away on Sunday, Aug. 20, 2017.

Lance joined NVIDIA Research in 2012 to work on VR and human face tracking.

Lance was a giant in computer graphics. He is best known for inventing texture mip-mapping, shadow mapping, and image-based rendering. Every time we watch a movie, play a video game, or use Google Street View, we are benefiting from these deeply foundational inventions.

Over his long, distinguished career, Lance worked with some of the most influential people and companies in our industry - from Jim Henson to Ed Catmull, and from Apple to Disney (where he was chief scientist of Disney Feature Animation from 2002-2004). He received an Academy Award in 2002 for his “pioneering influence in the field of computer-generated animation and effects,” and the ACM SIGGRAPH Coons Award in 2001 for “outstanding creative contributions to creative graphics.”

Those who knew him will remember most his unfailingly polite manner; his gentle, erudite, and wickedly funny sense of humor; his incredibly creative insights on technological problems; and his seemingly encyclopedic knowledge of science, engineering, history, and art.

His brilliant, creative mind will be sorely missed.

Lance is survived by his wife Amber Denker and two sons, Mane and Zeph. Please keep him and his family in your thoughts.

-David Luebke