A Warped Perspective on Computer Graphics: Psychorealism and More

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9 February 2004

Nonlinear Perspective for CG

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Psychorealism and *Ryan*

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Overview

- Perspective in Art and Science
- Nonlinear Projection of Animated Scenes
- Ryan
- Psychorealism and *Ryan*
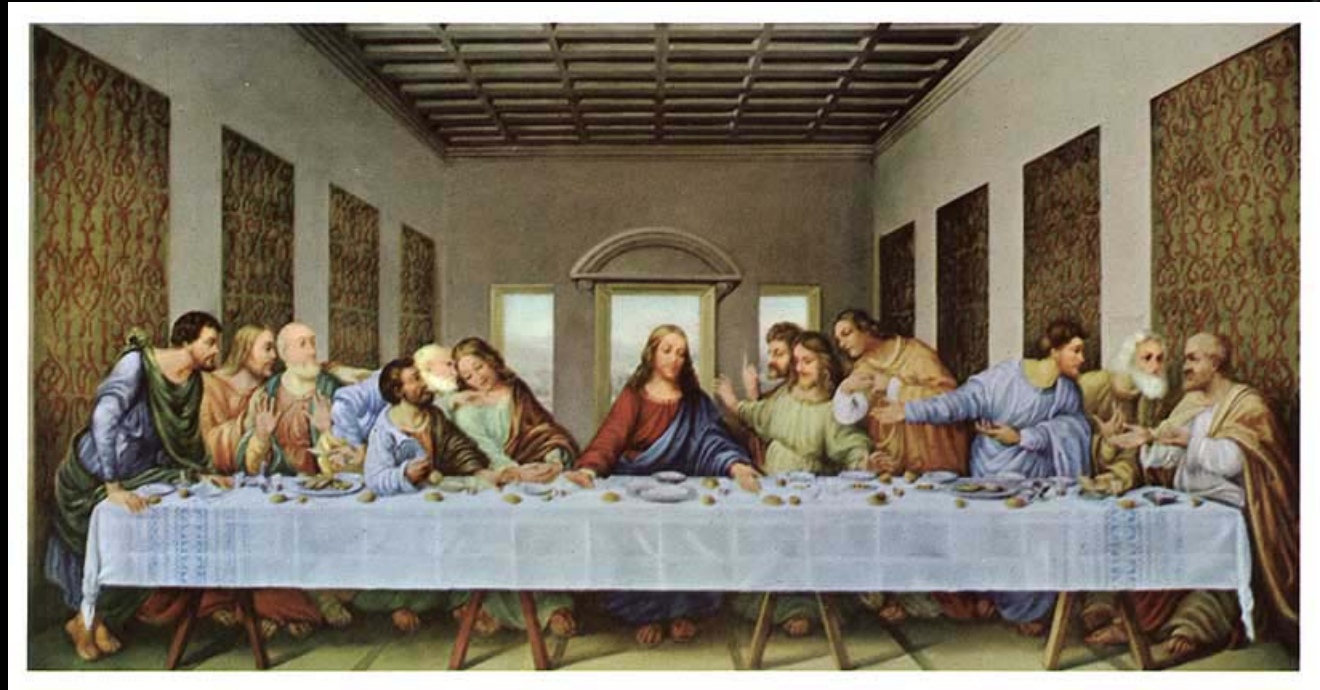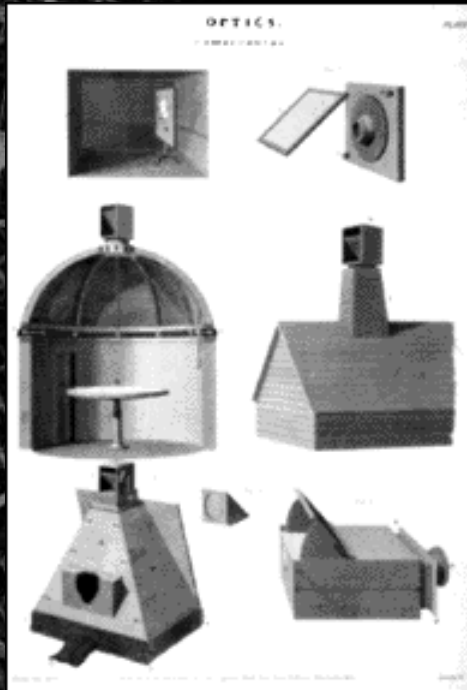
Projection

History of Perspective

Kauffmann Haggadah
late 1300's

Baptistry of San Giovanni
Brunelleschi *1420*

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History of Perspective

Camera Obscura
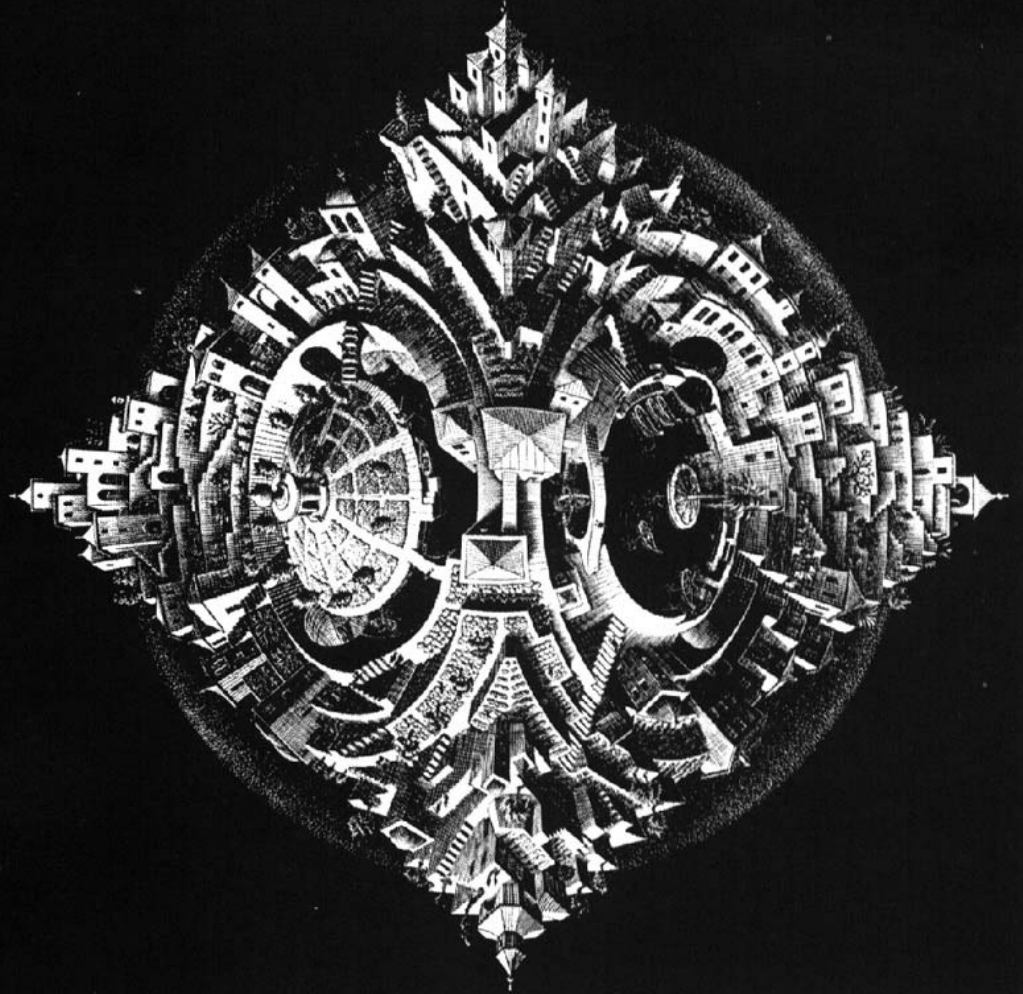
Last Supper

Motivation

Femme nue accroupie
Pablo Picasso,1959

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Motivation

Tetrahedral Planetoid
M. C. Escher

Motivation

Pearblossom Hwy. No. 2
David Hockney, 1986

Linear Perspective

- Good approximation of human visual system
- Conceptually simple and predictable
- Aids depth perception
- Efficient graphics pipelines

Nonlinear Perspective

- Extend visual range
- Avoid disjoint images for complex scenes
- Artistic expression

The Problem…

Allow artists to explore, understand, and subsequently express complex 3D scenes

The Problem…

Linear Perspective

Allow artists to explore, understand, and subsequently express complex 3D scenes

Nonlinear Projection

Nonlinear Projection

Nonlinear Projection Goals

- Interactive and incremental
- Use of common animated camera
- Local linear perspective
- Continuous nonlinear projections
- Artistic control of composition, projection
- Coherent shading, shadows, lighting
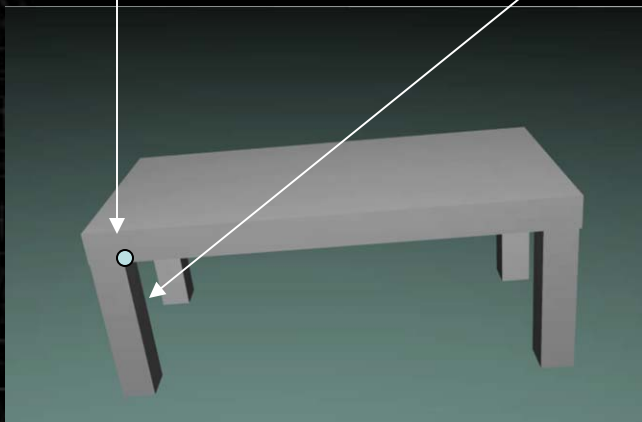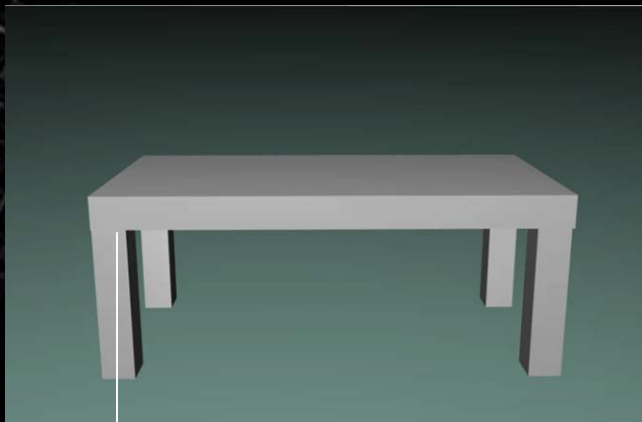- Handle complex scenes

Model of Projection

- Interface

    Let C_1, …, C_n represent world to image space transformations of n linear perspective cameras

- Control

    Let $w_i(\mathbf{p})$ be a per camera spatial weight function
    - Directional
    - Positional
    - Procedural
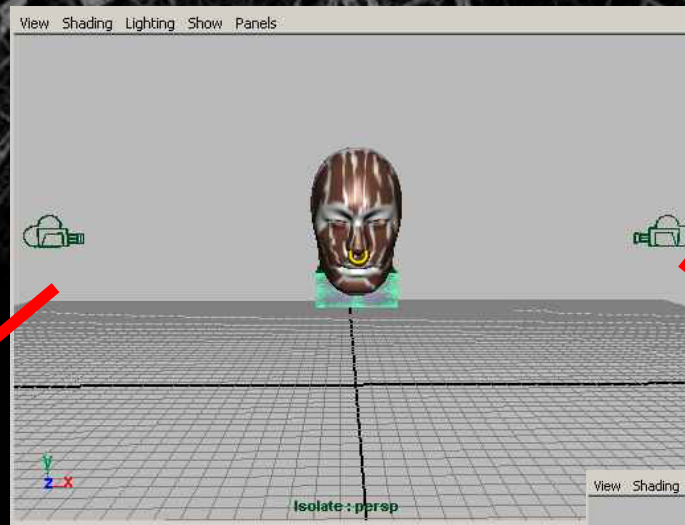   - User-Painted

Conceptual Model

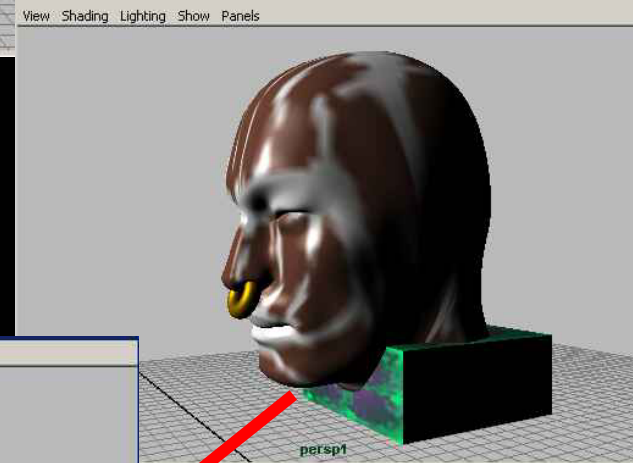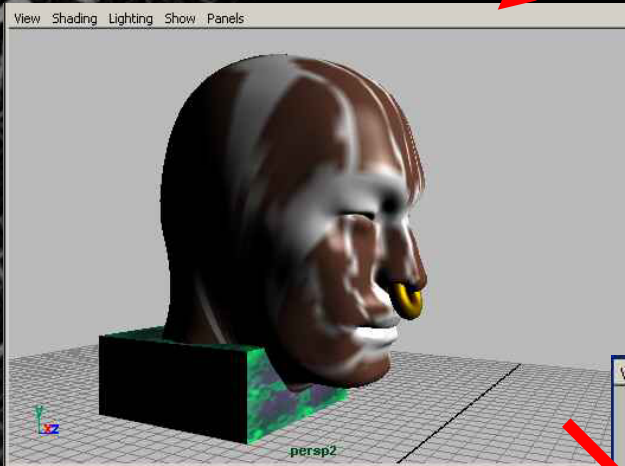$$P' = \left[\sum_{i=1}^{n} w_i(\mathbf{p}) \mathbf{C_i} \right] \mathbf{P}$$

User Interface

- Animate the *boss* camera as a normal CG camera

- Incrementally add *lackey* cameras to locally manipulate perspective
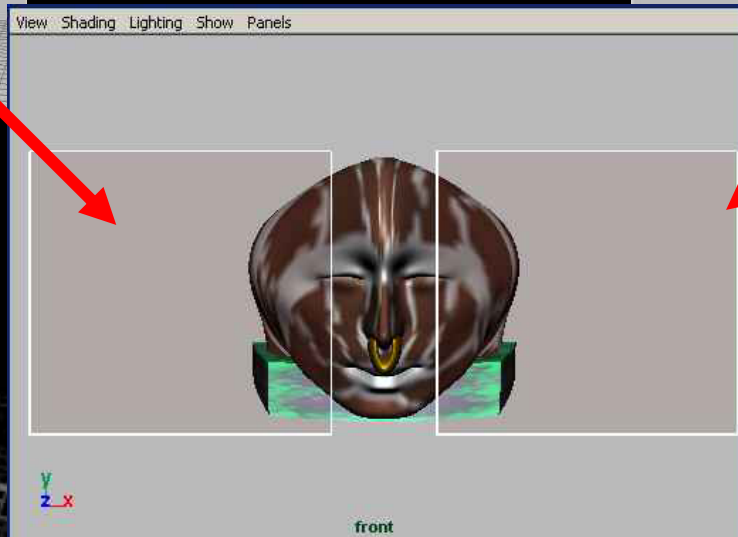
- Add composition constraints as desired
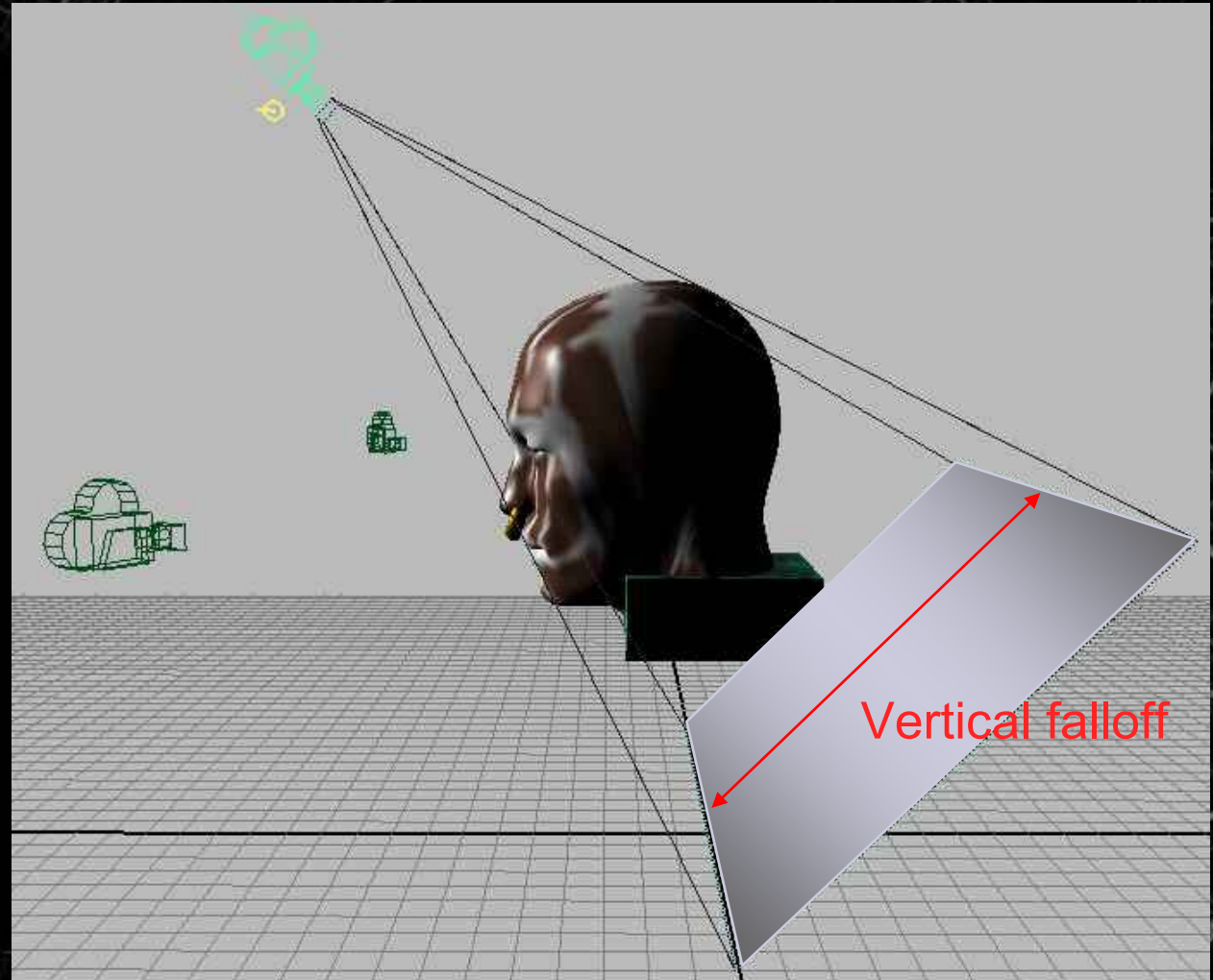
Interface

C_1

C_2

Exploratory View

C_1 **Linear Perspective**

Nonlinear Projection

C_2 **Linear Perspective**
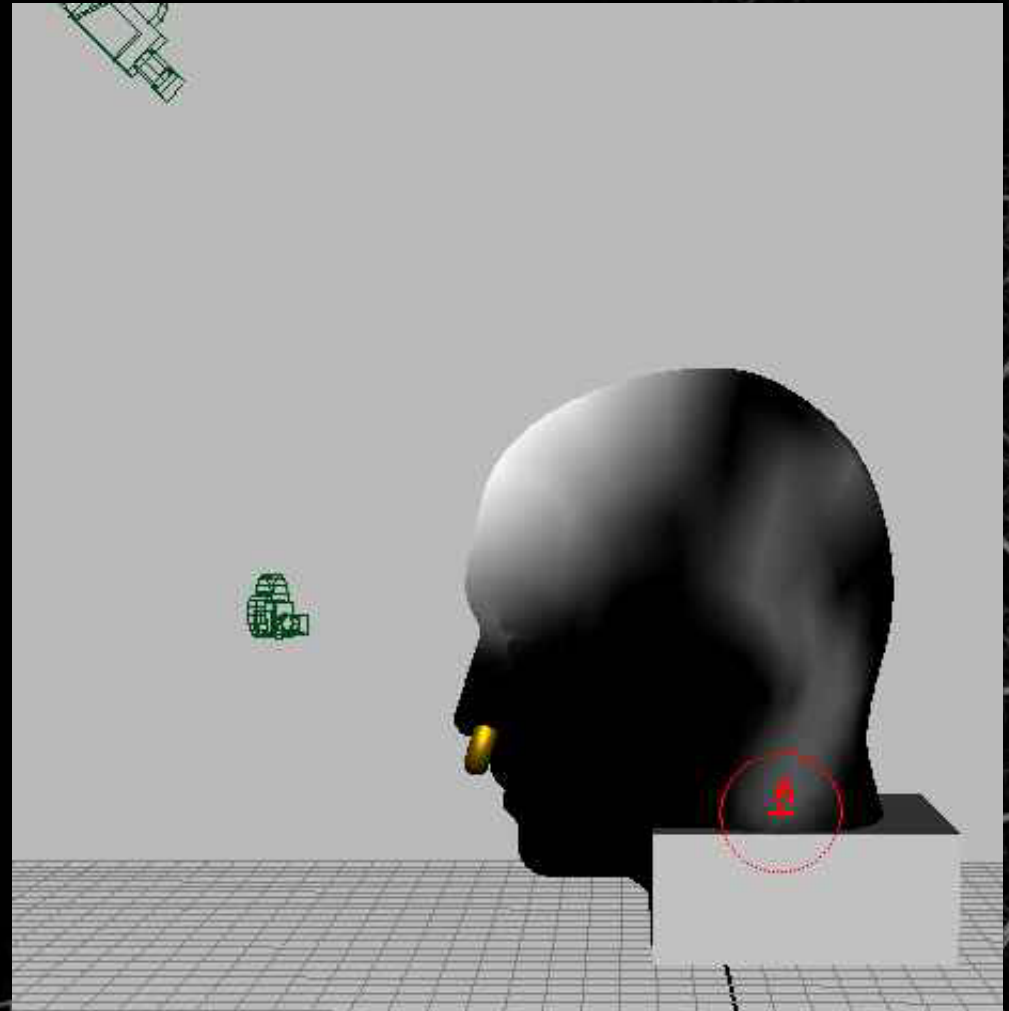
Weighting Projections

Directional

Vertical falloff

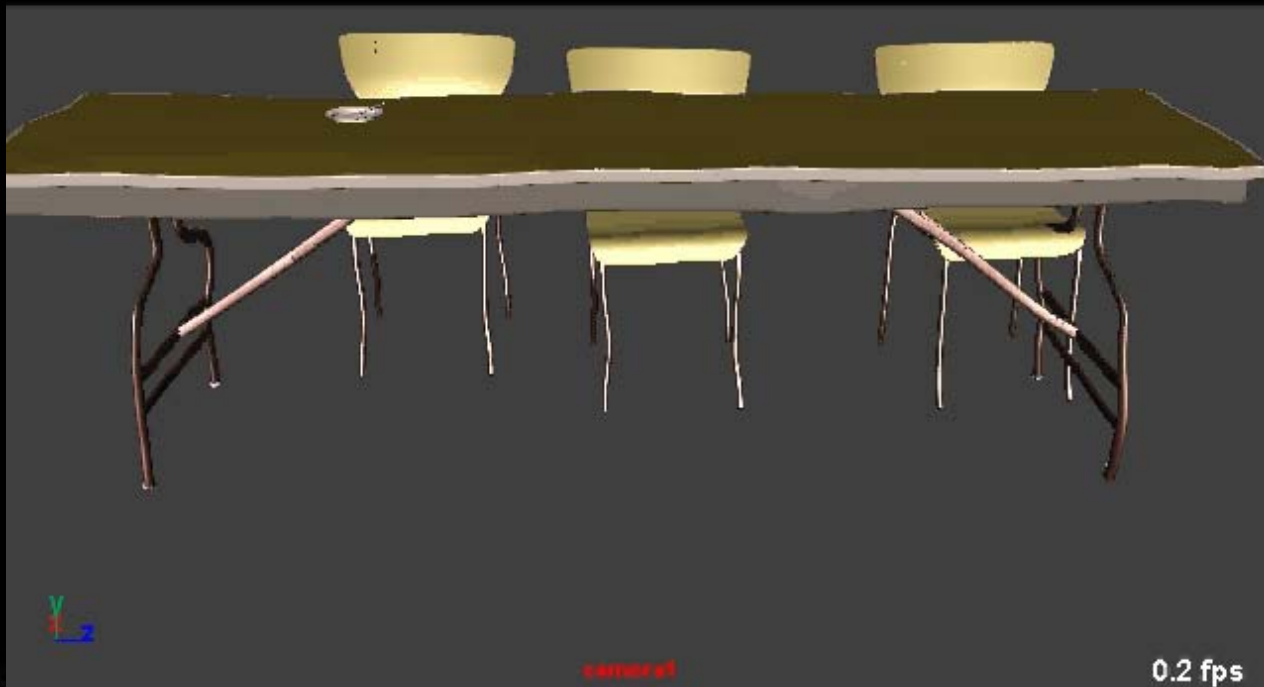# Weighting Projections

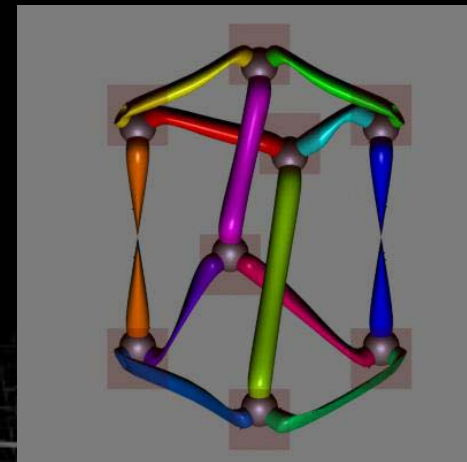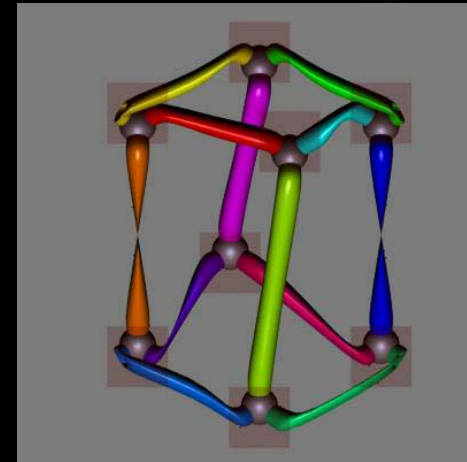Positional
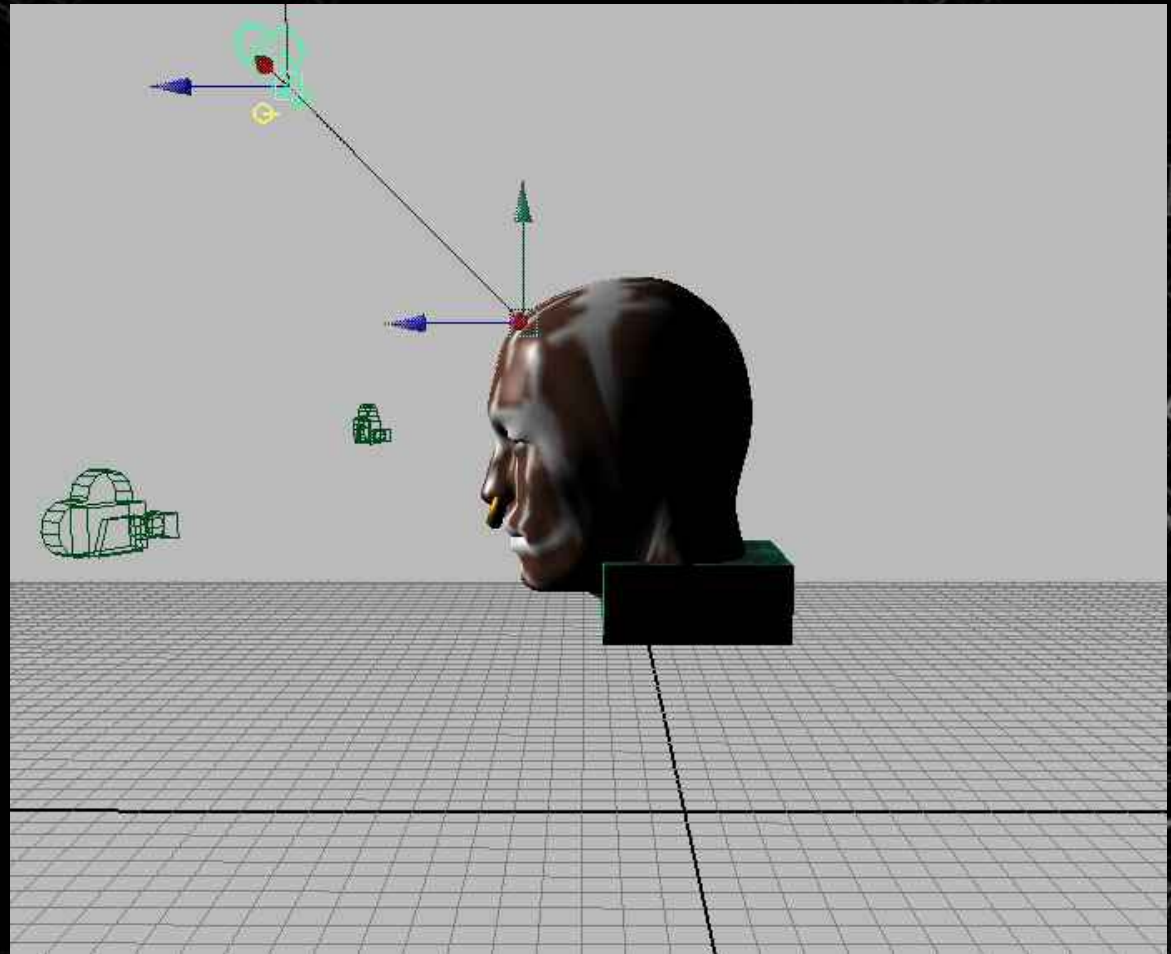
Weighting Projections

User Painted

Example

Constraints Conceptualized

Compose scene independently of projection

– Often only an image space translation

– Manipulate depth ordering

Constraints Example

No Constraints

With Constraints
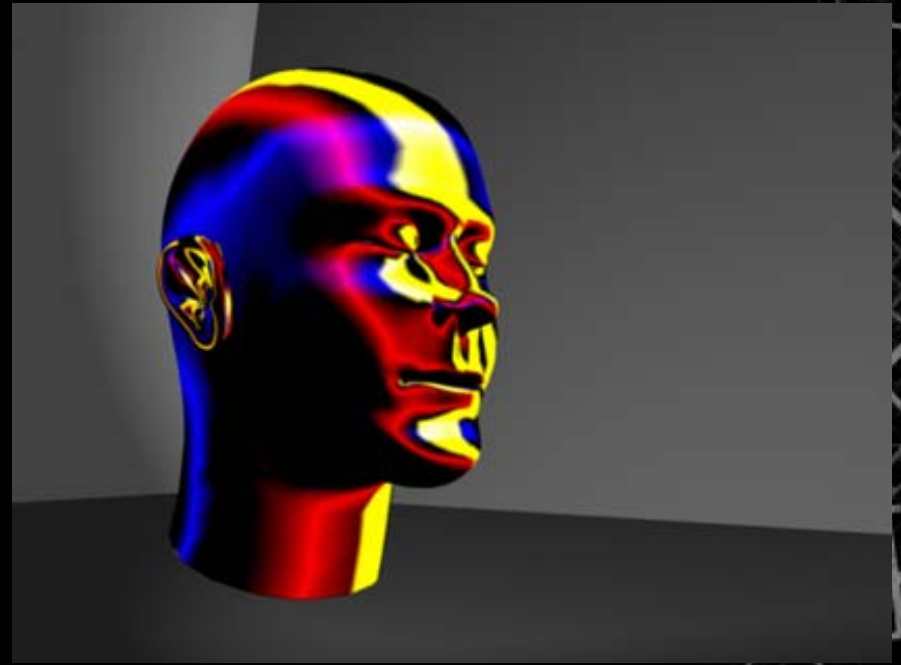
Multiview Illumination
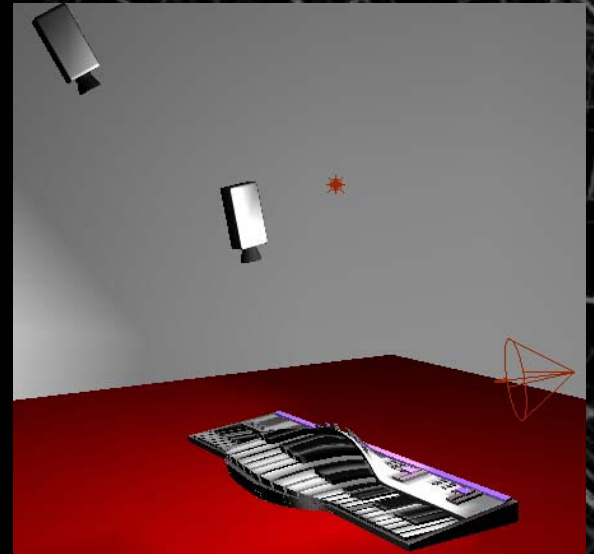

Boss camera shading   Virtual camera shading   Blended shading

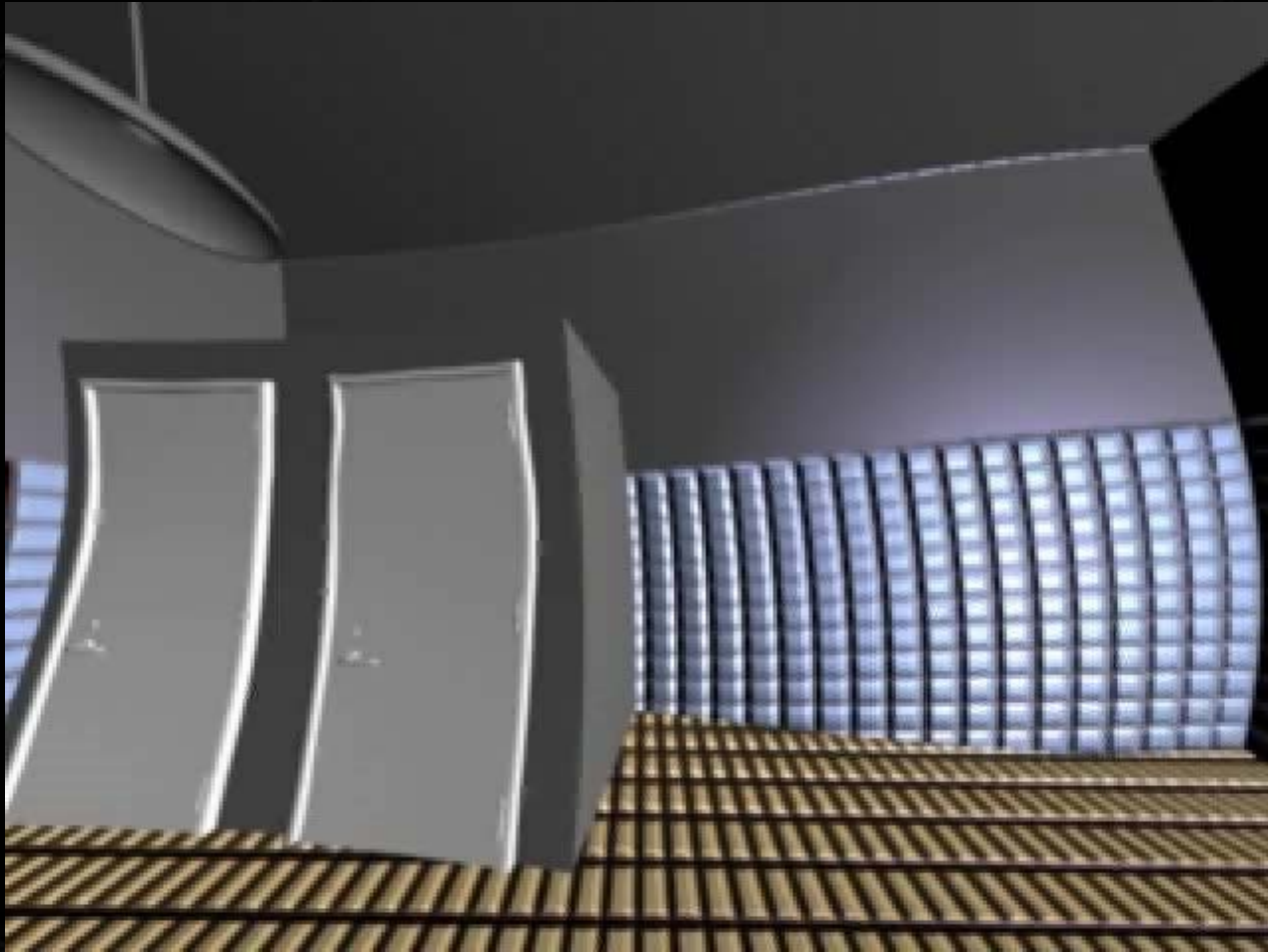# Stylized Multiview Shading

Shadows

Wrong shadows   **Corrected shadows**

Ryan Test

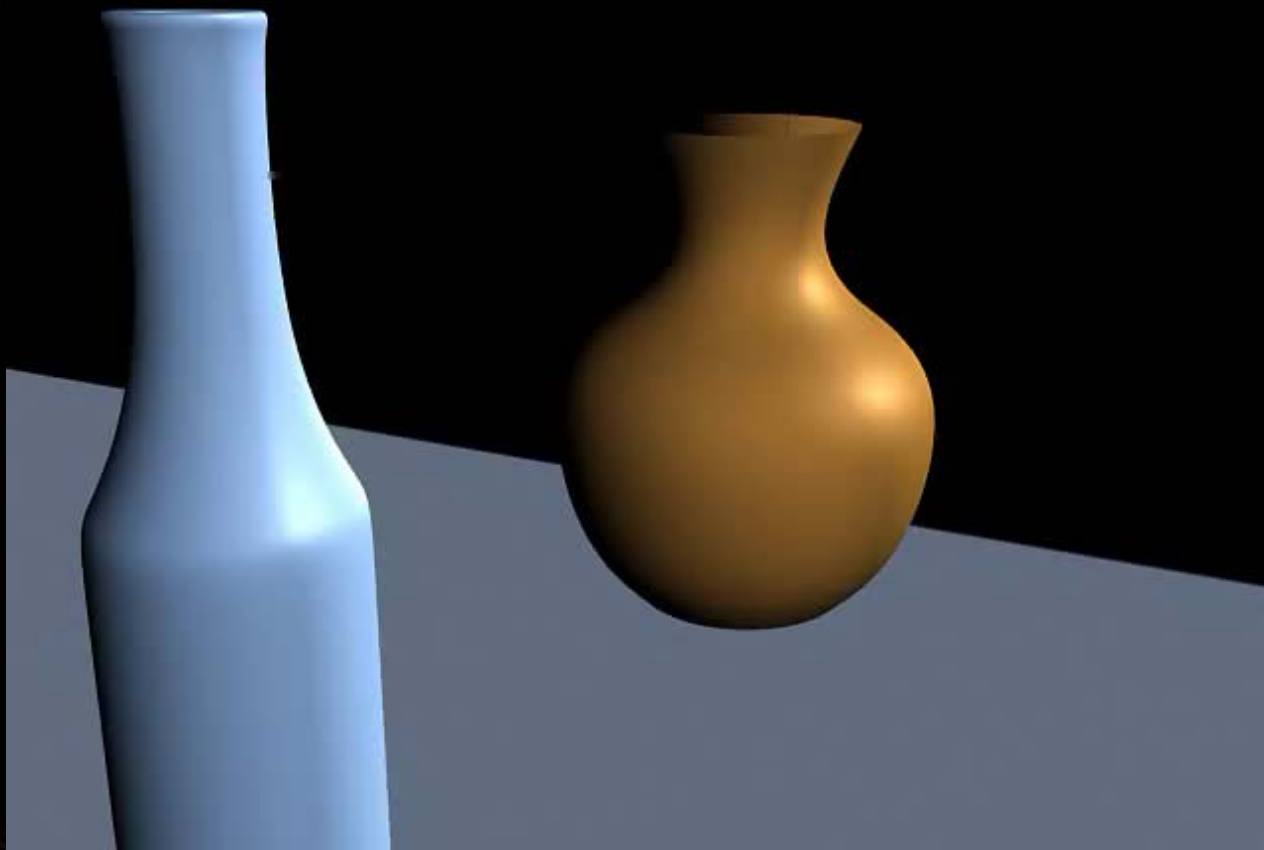# Another *Ryan* Test

Procedural Weighting

Automotive Visualization

Stylized Camera Motion

Ryan Larkin

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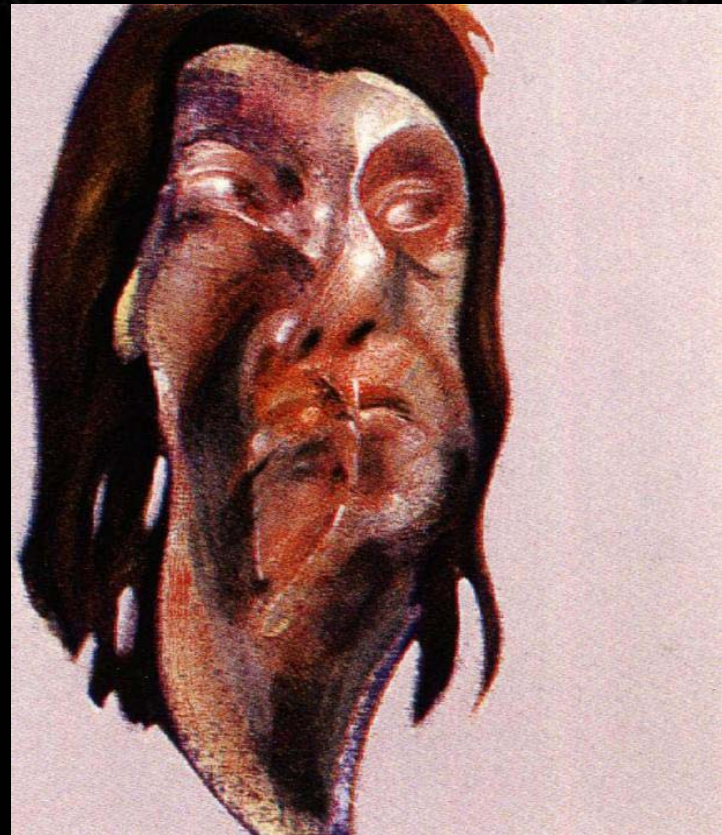# Ryan Larkin
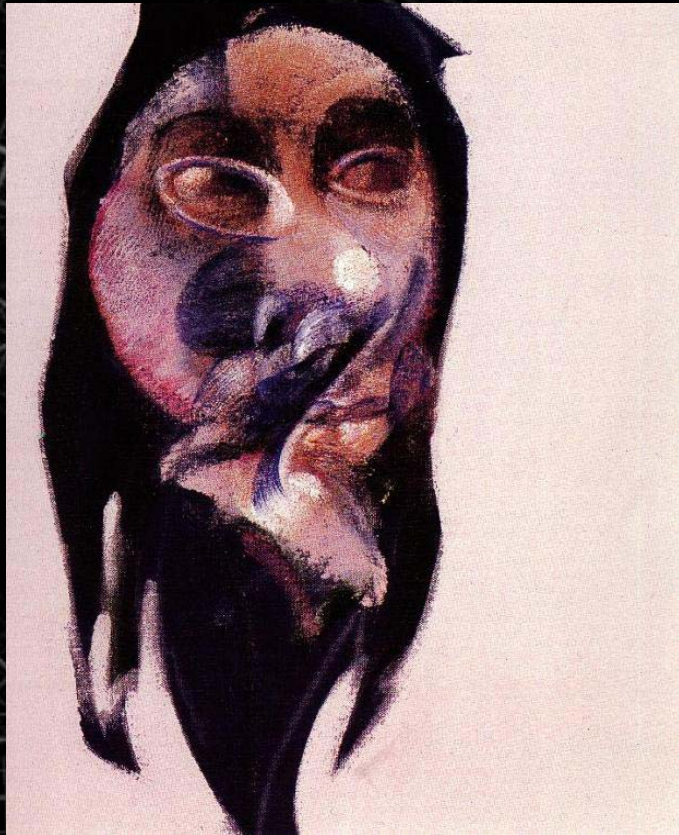

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Psychorealism

Realism of the human psyche,
expressed through art and animation.

Psychorealism in Art

Guernica. Pablo Picasso, 1937

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Psychorealism in Art

Isabel Rawsthorne. Francis Bacon, 1965-1966

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Psychorealism in *Ryan*

Nonlinear Projection

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Psychorealism in *Ryan*

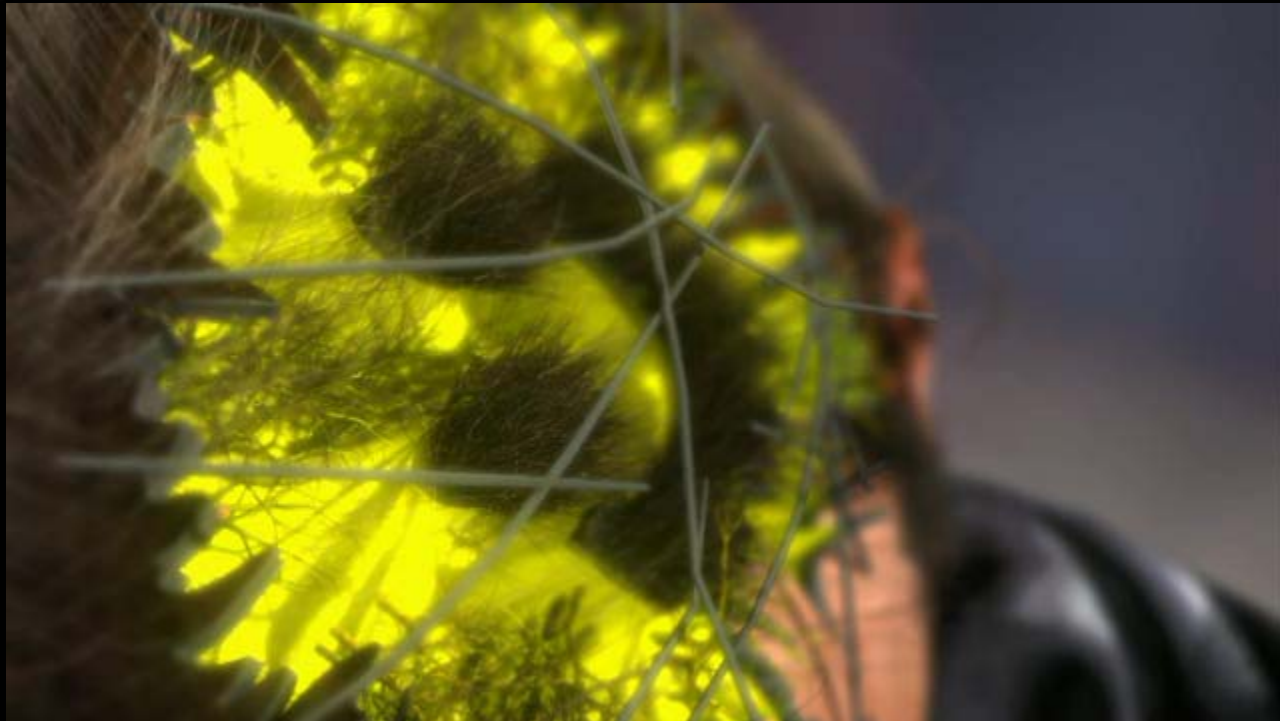# Psychorealistic Shader

Psychorealistic Shader

Psychorealistic Shader

Psychorealism in *Ryan*

Tying up the Animators

Tying up the Animators

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Tying up the Animators

Ryan: A (very) Short Teaser

Acknowledgements

Karan Singh

Chris Landreth

Alias, Pixar