Equipe Associée – Associated Group
CRISP

Creating, Rendering and Interacting with images based on the Study of Perception

(note: unpublished projects presented at workshop have been removed from these slides)

INRIA

The People

- UC Berkeley:
  - Maneesh Agrawala (Computer Science/Graphics & Interaction)
  - Ravi Ramamoorthi (Computer Science/Graphics)
  - Marty Banks (Vision Science)
- INRIA (REVES Inria Sophia-Antipolis Méditérranée)
  - George Drettakis (Graphics)
  - Adrien Bousseau (Graphics) – past postdoc at UCB
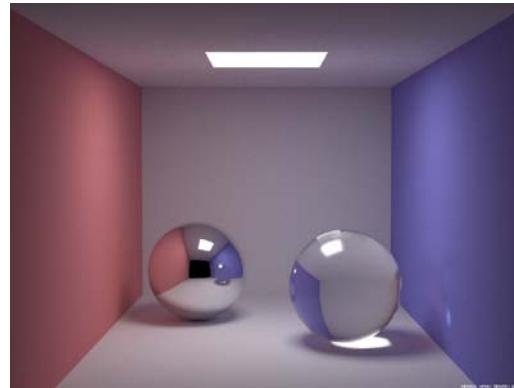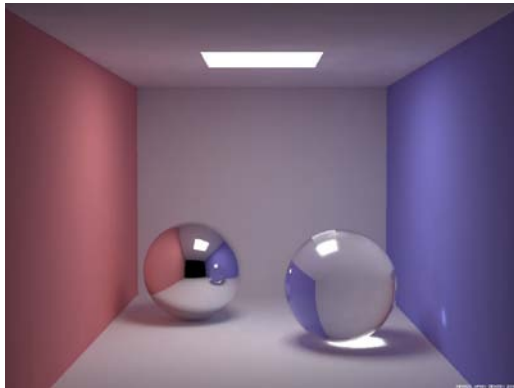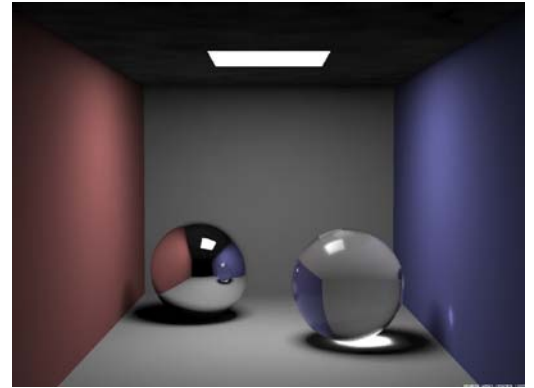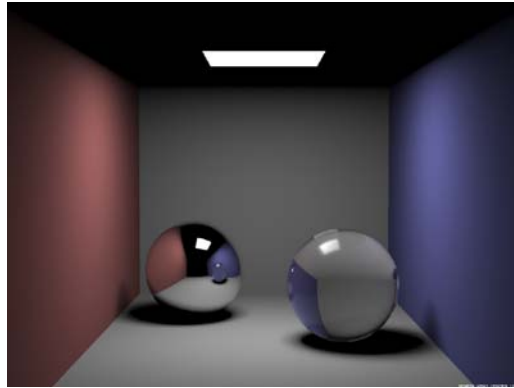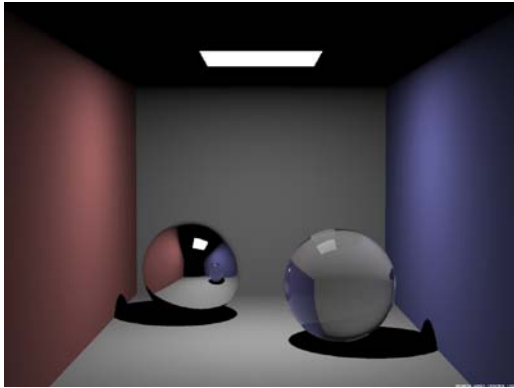- 4-6 Ph.D. students and 2-3 Postdocs potentially involved

Realistic and Expressive Rendering

Materials in Computer Graphics
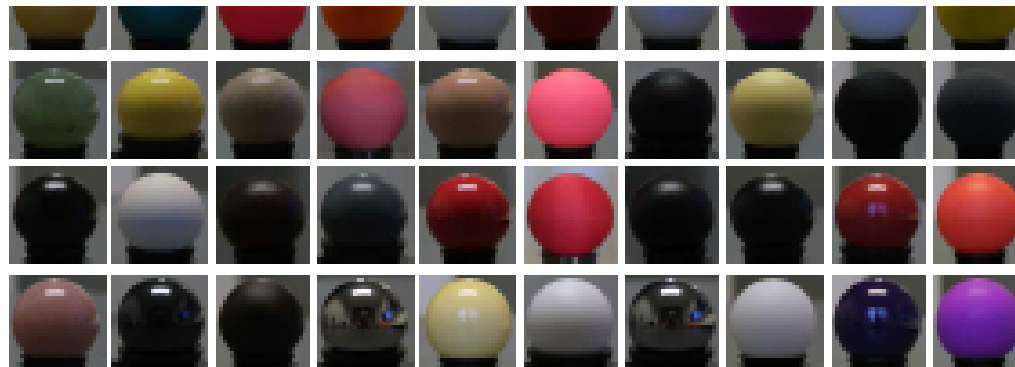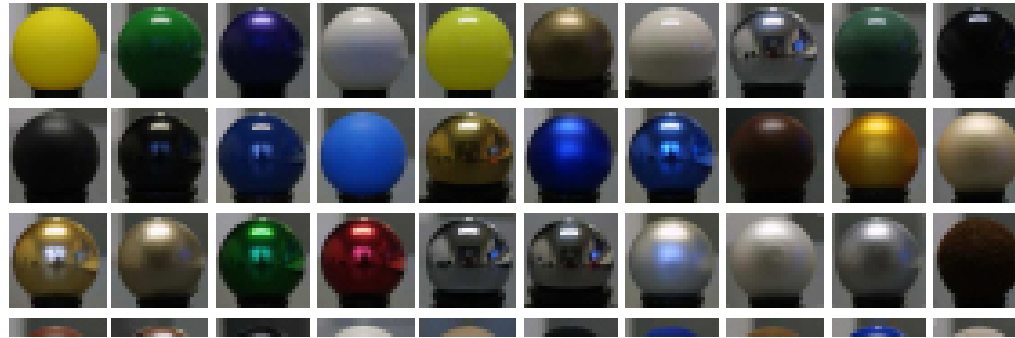
Lighting and Shadows

Main Objectives

- Create, render and interact based on the study of human perception
- Research directions:
  - Perception: how do people perceive images, both realistic and "expressive" ?
  - Rendering: plausible *wrt* to user intent & allocate resources on perceptually important visual effects
  - Interaction: Facilitate content creation via novel user interfaces for novice and professional users.

Scientific goals

- Interpreting images

- Creating and manipulating images

- Rendering images

Scientific Goals: Interpreting images

- Study how people perceive lighting, material and geometry in an image

- Important both for drawings and illustrations and for rendering

- Allow the development of novel drawing interfaces and efficient rendering algorithms

Interpreting Images

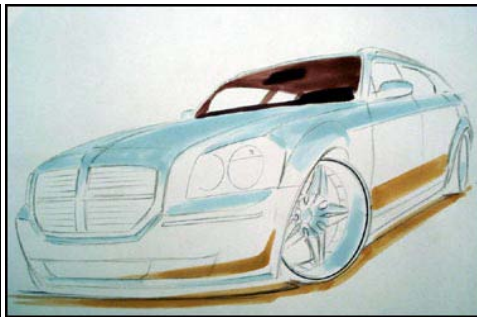- Perception and illustration of materials

Glossy plastic

Glass

Chrome

Scientific Goals: Creating and manipulating images

- Complex interactions between *geometry, material* and *lighting* parameters result in interfaces that are hard-to-use

- Identify which image components are perceptually important

- Propose novel interaction paradigms and image creation/manipulation algorithms based on these results

# Interfaces for Content Creation
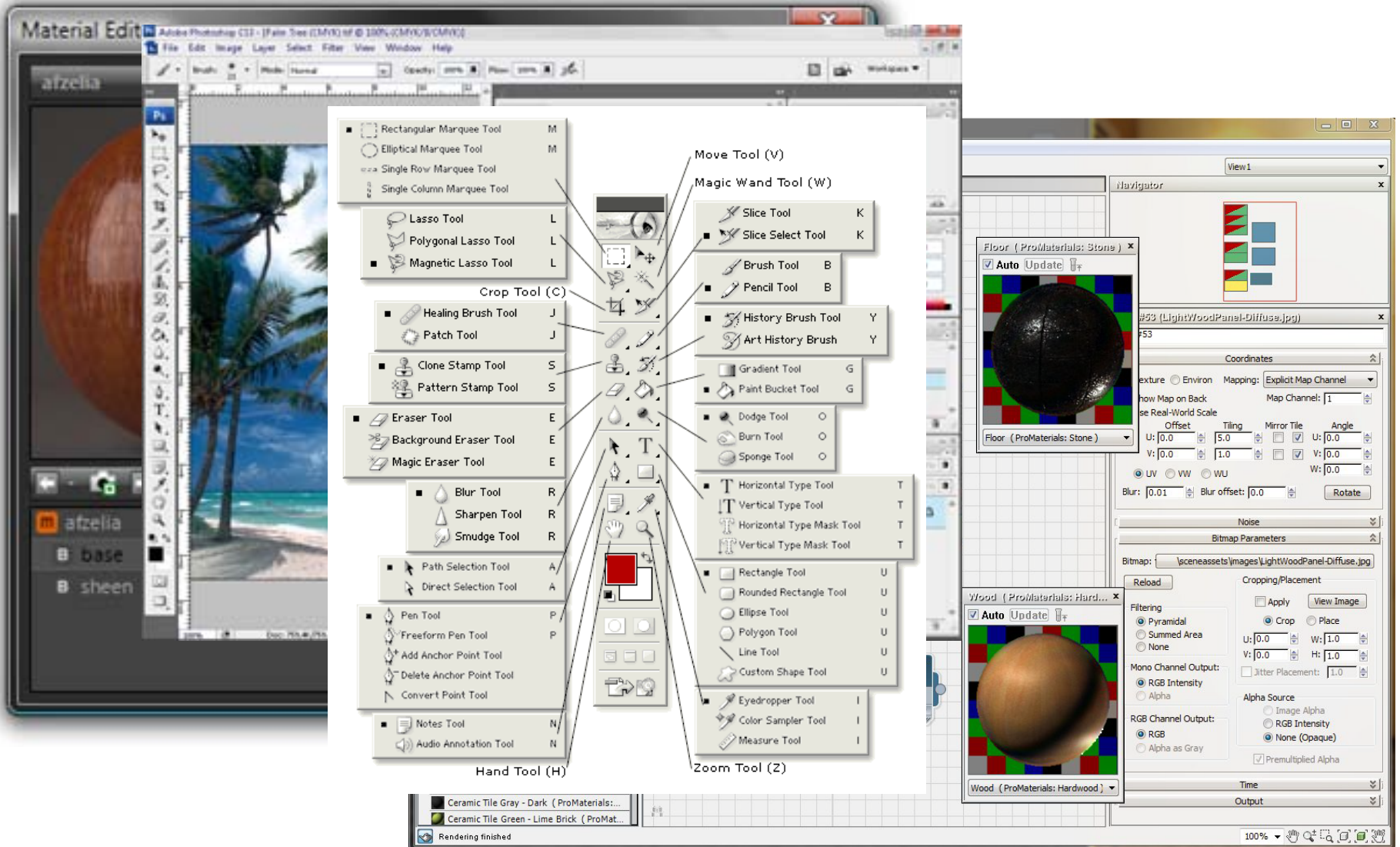
Scientific Goals: Rendering Images

- Identify which approximations users tolerate well

- Develop new, more efficient algorithms exploiting perceptually "appropriate" approximations

- Enhance the depiction of geometry, materials and lighting without degrading quality

Rendering images

- Which approximation is more tolerable ?
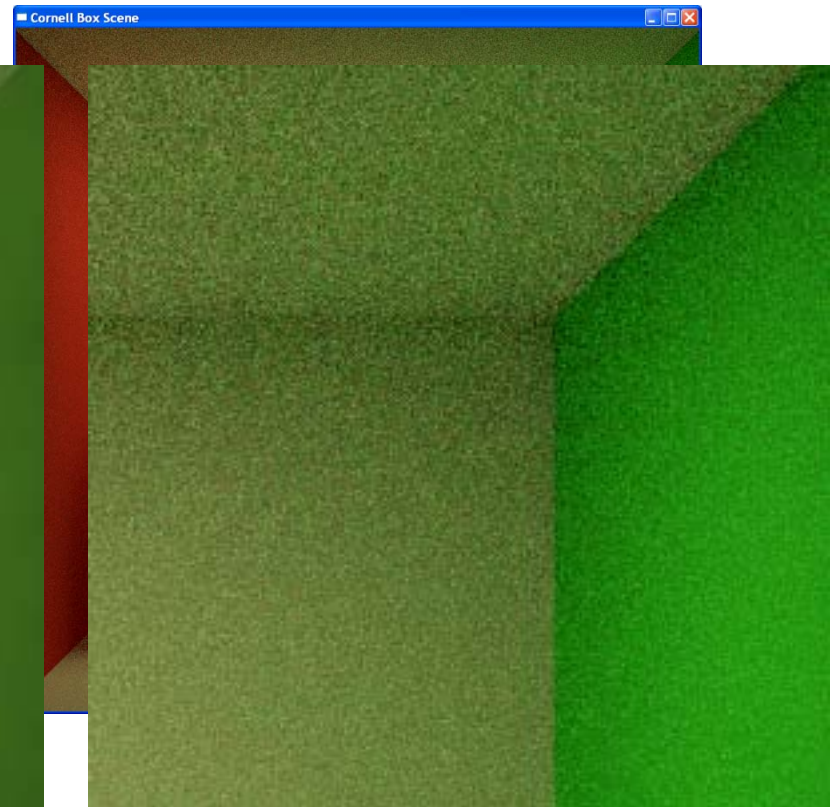
Talk Overview

- Projects in progress
- Future projects
- Conclusions

Ongoing Projects

- Interpreting images:
  - Perception of materials with stereo and parallax
  - Perception of materials in "expressive" renderings
- Creating and manipulating images:
  - Lighting design for material depiction
- Perception:
  - Crowdsourcing for perceptual studies

Lighting Design for Material Depiction

Adrien Bousseau, Emmanuelle Chapoulie
REVES – INRIA Sophia Antipolis

Ravi Ramamoorthi, Maneesh Agrawala
UC Berkeley

To be presented at Eurographics Symposium on Rendering 2011

Lighting affects material appearance
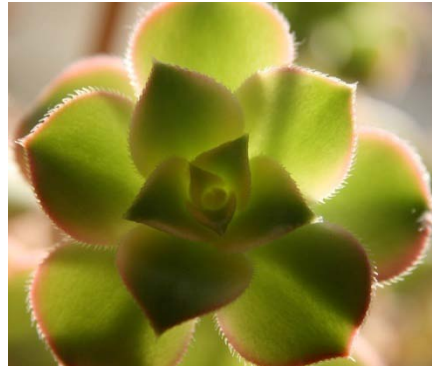

Our optimized lighting
emphasizes materials

Poor lighting
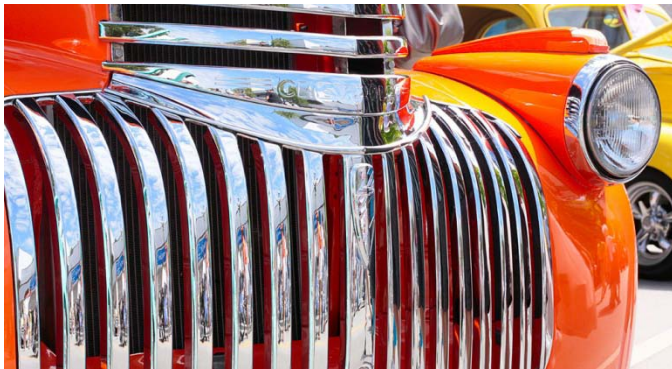de-emphasizes materials

Lighting design principles

Transparent (glass, ice)
High contrast at
contours

**Subsurface scattering
(wax, marble, organic)**
Thin parts brighter

Asperity (velvet, fur)
High contrast highlights
at grazing angle

Shiny (metal, plastic, chrome)
High contrast edges in reflections

Fresnel (glass, plastic, varnish)
High contrast reflections
at grazing angle

Optimal lighting

Transparent (glass, ice)
High contrast at
contours

**Subsurface scattering
(wax, marble, organic)**
Thin parts brighter

Asperity (velvet, fur)
High contrast highlights
at grazing angle

Shiny (metal, plastic, chrome)
High contrast edges in reflections

Fresnel (glass, plastic, varnish)
High contrast reflections
at grazing angle

Best orientation of real lighting
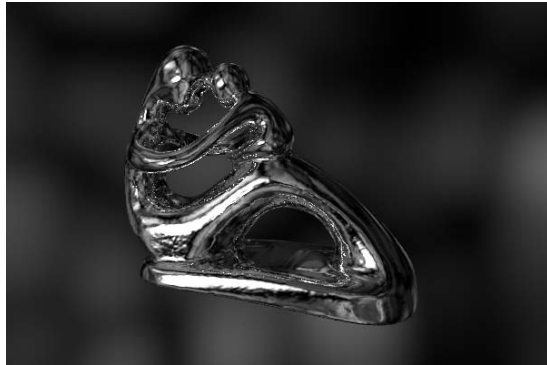
Best orientation of real lighting

Transparent (glass, ice)
High contrast at
contours

**Subsurface scattering
(wax, marble, organic)**
Thin parts brighter

Asperity (velvet, fur)
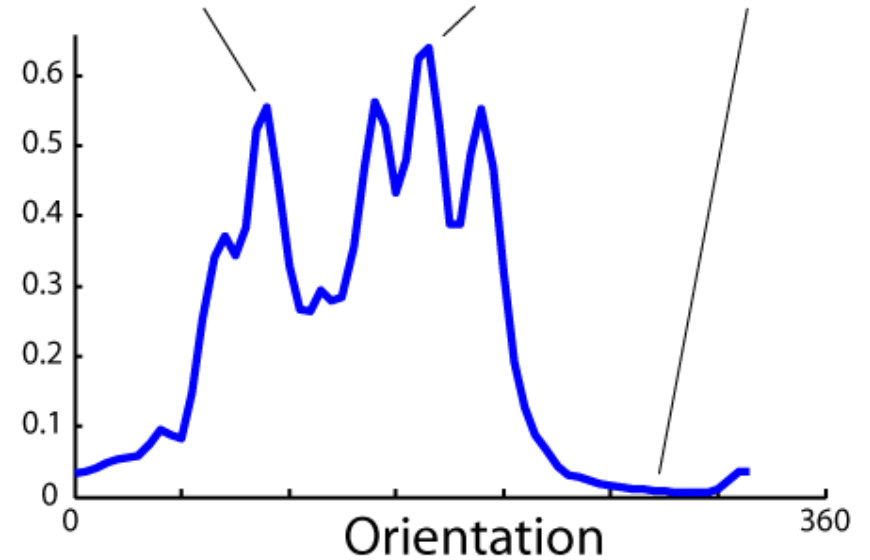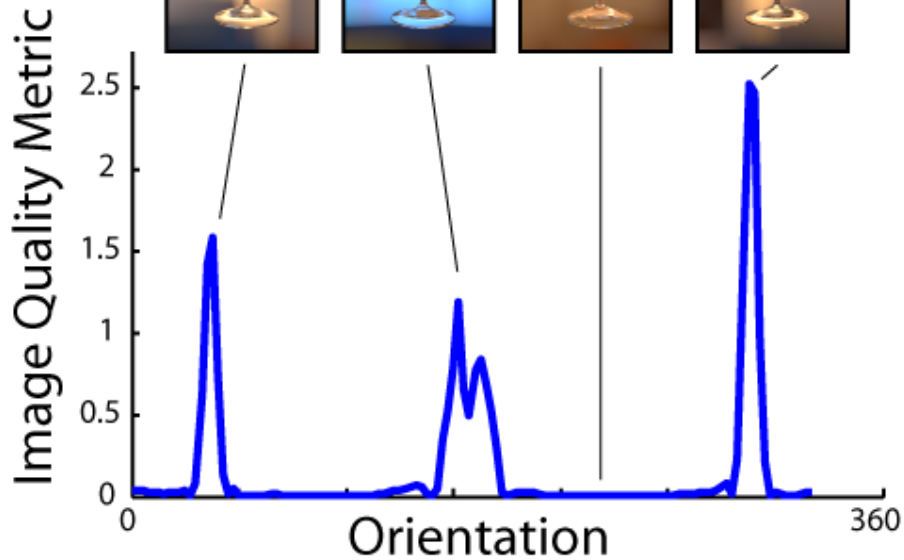High contrast highlights
at grazing angle

Shiny (metal, plastic, chrome)
High contrast edges in reflections

Fresnel (glass, plastic, varnish)
High contrast reflections
at grazing angle

Worst orientation of real lighting

Transparent (glass, ice)
High contrast at
contours

**Subsurface scattering
(wax, marble, organic)**
Thin parts brighter

Asperity (velvet, fur)
High contrast highlights
at grazing angle

Shiny (metal, plastic, chrome)
High contrast edges in reflections

Fresnel (glass, plastic, varnish)
High contrast reflections
at grazing angle

Conclusions

- General orientations
  - Perception-oriented studies which advance understanding: true multidisciplinary research
  - Advance research in graphics, (human) vision and human-computer interaction
  - Develop new algorithms for rendering and interaction, capitalize on perceptual studies