Hot3D panel: The Future of Graphics

- Peter N. Glaskowsky
  - Principal Architect (in principle), Microsoft
- Mike Mantor
  - Senior Fellow, AMD
- Mike Houston
  - Fellow, AMD
- David Luebke
  - Director of Research, NVIDIA
- Bill Mark
  - Senior Research Scientist, Intel

The Future of Graphics

Peter N. Glaskowsky

High Performance Graphics 2011

Unsolved Problems of the Past

Sutherland, 1966

- Cheap machines with basic capability
- Basic interaction techniques
- Coupling simulations to their display
- Describing motion
- Continuous tone displays
- Making structure of drawings explicit
- Hidden line removal
- Program instrumentation and visualization
- Automatic placement of elements in network diagrams
- Working with abstractions (scientific visualization)

Newell and Blinn, 1977

- Increasing scene complexity
- Fuzzy objects (hair, clouds)
- Transparency and refraction
- Extended light sources
- Antialiasing
- Systems integration

Heckbert, 1987

- Parameterizing implicit models
- High quality texture filtering
- Antialiasing
- Shadows without ray tracing
- Practical ray tracing
- Practical radiosity
- Frame-to-frame coherence
- Automated model culling
- Smooth model transitions
- Affordable real-time rendering hardware

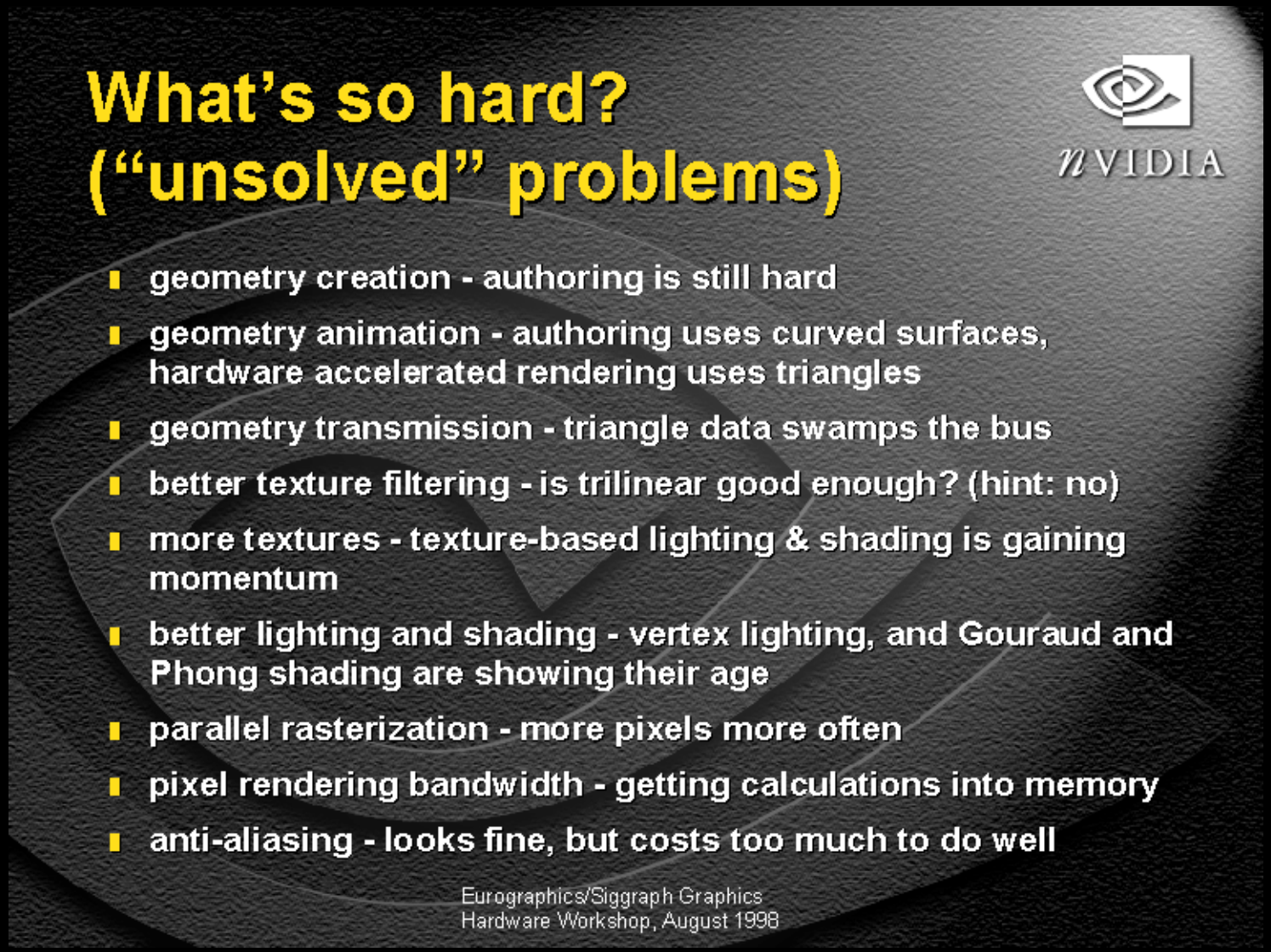
Siggraph panel, 1991

- Barr: managing scene complexity
- Brooks: programming tools
- Card: large-scale user interfaces
- Clark: multimedia
- Feiner: automatic design
- Forrest: robust geometric algorithms
- Hanrahan: light transport algorithms
- van Dam: standards

Blinn, 1998

- Novelty
- Education
- Systems integration
- Simplicity
- Pixel arithmetic theory
- Legacy compatibility
- Arithmetic sloppiness
- Antialiasing
- Modeling/rendering/animating spaghetti
- Finding a use for real-time 3D

Kirk, 1998


What's so hard?
("unsolved" problems)
NVIDIA
geometry creation - authoring is still hard
geometry animation - authoring uses curved surfaces, hardware accelerated rendering uses triangles
geometry transmission - triangle data swamps the bus
better texture filtering - is trilinear good enough? (hint: no)
more textures - texture-based lighting & shading is gaining momentum
better lighting and shading - vertex lighting, and Gouraud and Phong shading are showing their age
parallel rasterization - more pixels more often
pixel rendering bandwidth - getting calculations into memory
anti-aliasing - looks fine, but costs too much to do well
Eurographics/Siggraph Graphics Hardware Workshop, August 1998

Levoy, 1998

- Modeling complex environments
- Modeling nature
- Smoothly varying level of detail under extreme scale changes
- Tools for extemporaneous data analysis
- Useful virtual reality

Andersson, 2010

- Cinematic image quality
  - Aliasing, motion blur, depth of field, transparency, geometry
- Illumination
  - Global illumination, shadows, reflections, surfaces
- Programmability
- Production costs
- Scaling up

Conclusion:

No solved problems

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