

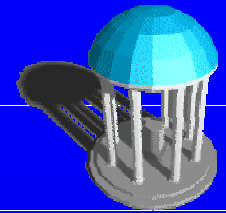
# All the Triangles in the World

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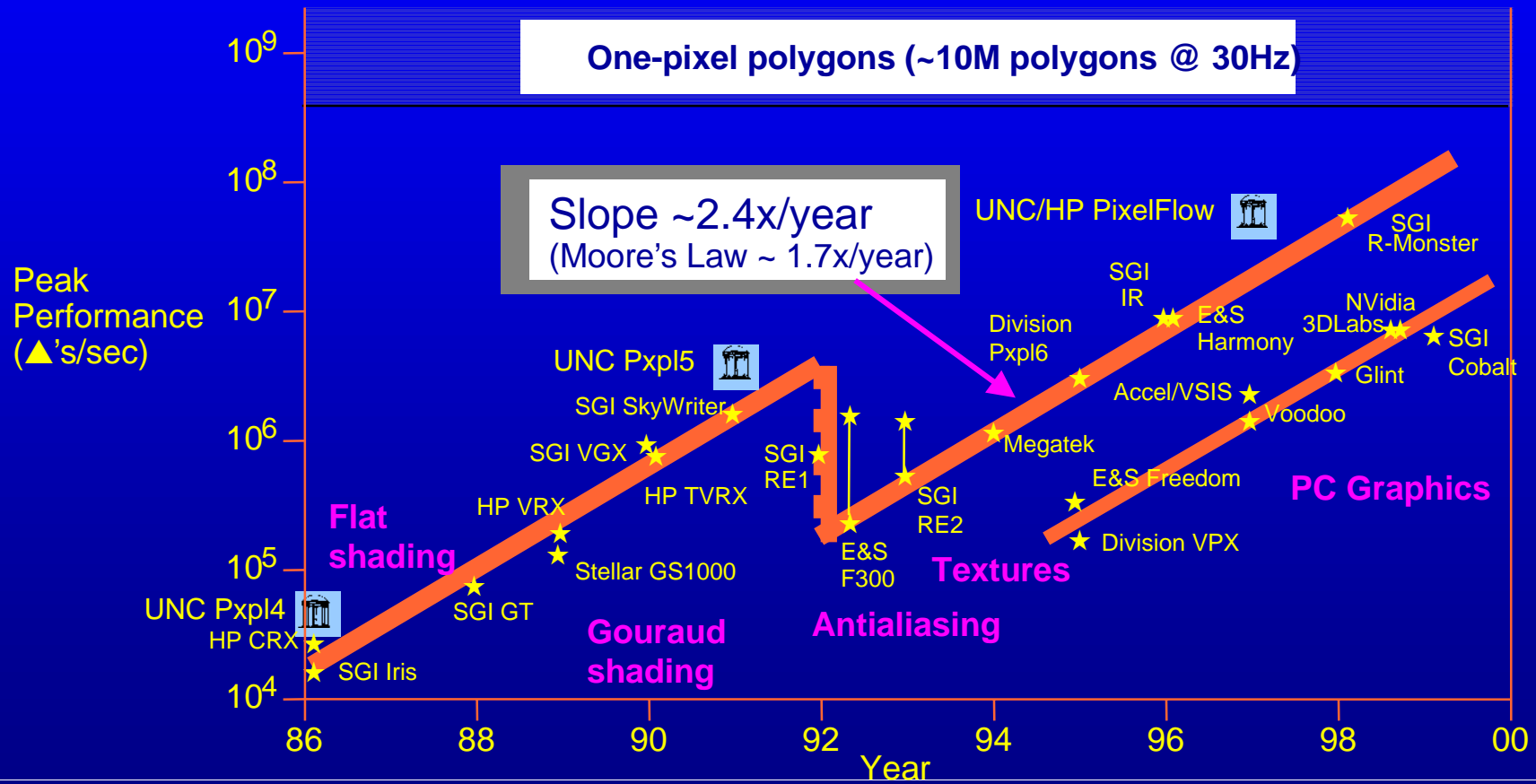
Anselmo Lastra  
University of North Carolina  
Chapel Hill

<http://www.cs.unc.edu/~lastra>

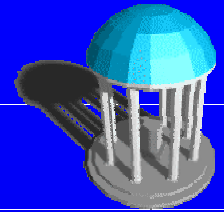
[lastra@cs.unc.edu](mailto:lastra@cs.unc.edu)



G r a p h i c s P e r f o r m a n c e



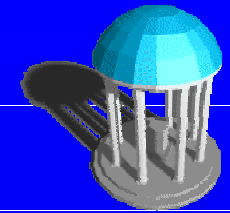
Graph courtesy of Professor John Poulton



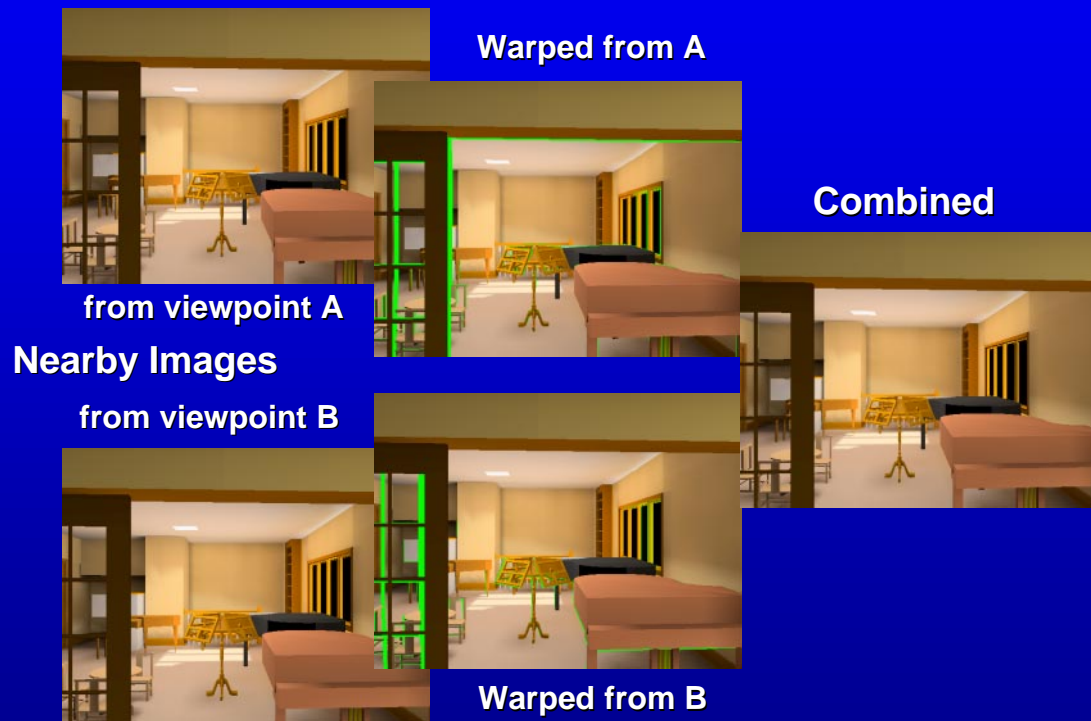
# Images with Depth

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- ◆ Assist conventional rendering
  - Multiply frame rates
  - Guarantee performance
  - Add global effects
- ◆ Image-based rendering
  - Image-based objects
  - Hierarchical representation
  - Rendering of the real world
- ◆ Hardware

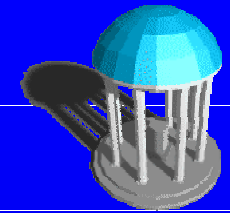


# Post-Rendering 3D Warping



**William R. Mark**, Leonard McMillan, Gary Bishop, "Post Rendering 3D Warping", Proceedings of 1997 Symposium on Interactive 3D Graphics (Providence, Rhode Island, April 27-30, 1997), pp. 7-16.

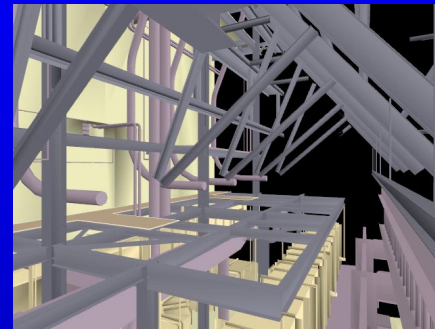
<http://www.cs.unc.edu/~billmark>



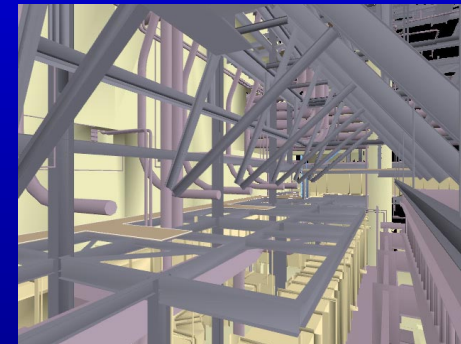
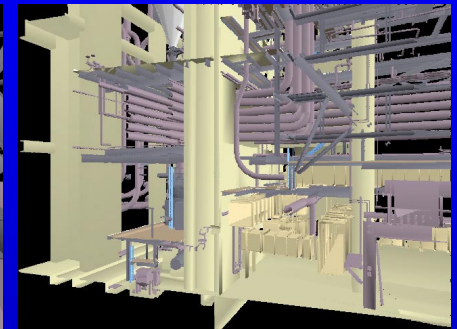
# Guaranteed Frame Rates

- ◆ Bound amount of geometry per frame
- ◆ Replace distant geometry with layered depth image
- ◆ Cell based
- ◆ Precompute LDIs

Near geometry



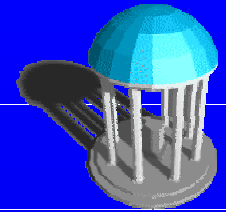
Warped image



Combined

Daniel Aliaga and Anselmo Lastra, "Automatic Image Placement to Provide a Guaranteed Frame Rate",  
to appear in *Proc. Of SIGGRAPH 99*, Los Angeles, August 11-13, 1999.

<http://www.cs.unc.edu/~aliaga>



# Hybrid Glossy Reflections

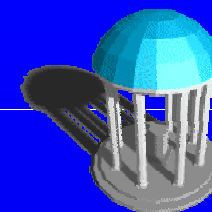
- ◆ View-independent
  - Conventional texture-based radiosity
- ◆ View-dependent
  - Images, with depth, to represent radiance on surfaces -- radiance maps
  - Maps warped to reflected viewpoint
  - Sampled BRDFs



**Rui Bastos**, Kenneth Hoff, William “Chris” Wynn and Anselmo Lastra, “Increased Photorealism for Interactive Architectural Walkthroughs”, *to appear in Proc. of Symposium on Interactive 3D Rendering*, April 26-28, 1999, Atlanta.

<http://www.cs.unc.edu/~bastos>

# Image-Based Objects



R & R - Registration &  
Resampling

R & R

IBO

Rc

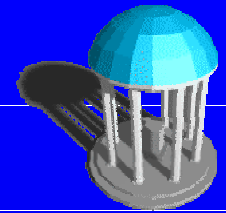
Rc - Reconstruction of  
new views

Reconstructed views from  
arbitrary viewpoints



**Manuel Oliveira**, Gary Bishop, "Image-Based Objects". To appear  
in Proceedings of 1999 ACM Symposium on Interactive 3D  
Graphics.

<http://www.cs.unc.edu/~oliveira>



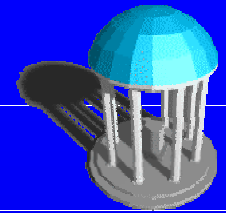
# Hierarchical Representation

- ◆ Resample reference images into octree of layered-depth images
- ◆ Pre-filter
- ◆ At rendering time, fetch samples at the appropriate sampling rate



**Chun-Fa Chang**, Gary Bishop and Anselmo Lastra, "LDI Tree: A Hierarchical Representation for Image-Based Rendering", *to appear in Proc. Of SIGGRAPH 99*, Los Angeles, August 11-13, 1999.

<http://www.cs.unc.edu/~chang>



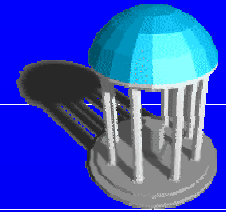
# Real-World Images

- ◆ Interactive rendering
  - Voronoi-type primitive on PixelFlow
  - Confidence
- ◆ Laser rangefinder and digital camera
- ◆ Issues: registration, data selection (compression)

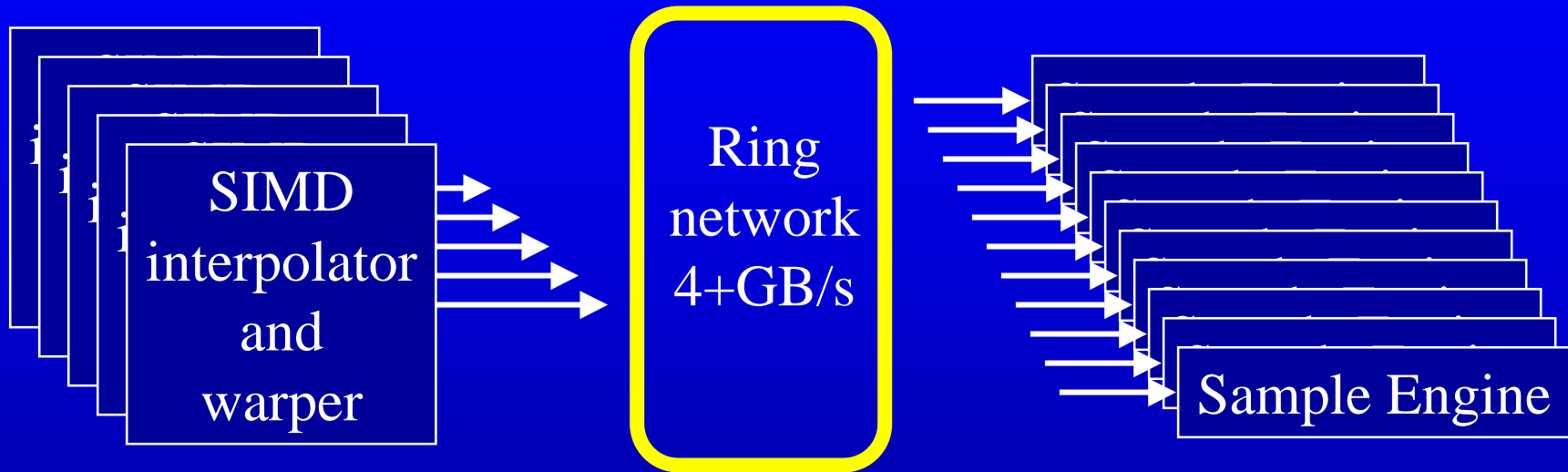


David McAllister, Lars Nyland, Voicu Popescu Chris McCue and Anselmo Lastra, "Real-Time Rendering of Real-World Environments", *UNC-CH Computer Science Technical Report CS TR 99- 019*.

<http://www.cs.unc.edu/~davemc>



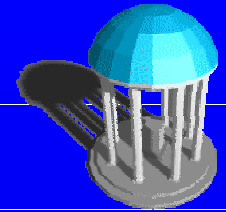
# ImageFlow



- ◆ Take advantage of properties of images
  - Coherence
  - Single samples to back end of pipeline

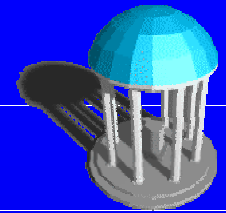
Voicu Popescu and **Anselmo Lastra**, "High-Quality Image-Based Rendering", *UNC-CH Computer Science Technical Report CS TR 99-017*.

<http://www.cs.unc.edu/~popescu>



# Progress in IBR

- ◆ Data Acquisition
  - Sampling and visibility
- ◆ Representations
  - Object centric or space centric?
- ◆ Rendering
  - Polygons, points, or ?
  - Lighting/shading
  - How much advantage, in hardware, does IBR provide us?



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