Science, Data, & Art in the Imax Film “Hubble 3D”

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H3D Scientific Visualizations

- STScI – Baltimore, MD
  - Summers, Bacon, Frattare, Levay
- NCSA – Champaign, IL
  - Donna Cox & team
- SSC – Pasadena, CA
  - Robert Hurt
- Imax – Toronto, ON, Canada
  - Toni Myers, director
Imax 3D

• Large format film
  – 23 million pixels/frame
  – Left and right eye
  – 24 frames/sec
  – 66 billion pixels/min

• Imax considerations
  – visual immersion
  – slow movement
  – low sweet spot
H3D Scientific Visualizations

- Milky Way to Virgo Cluster to HUDF to Cosmic Web
- Servicing Mission 4 Early Release Observations
- Orion Nebula
- Hubble Iconic Images
Milky Way to Virgo Cluster
“Runaway Universe”, PBS NOVA
Highlight Galaxies
Template Galaxies
Hubble Ultra Deep Field
Hubble: Galaxies Across Space and Time

Best Short Film 2004
Large Format Cinema Association
Galaxy Cut-outs

- Source extractor
- Segmentation maps
- Individual galaxy images
- Cleaning
- 3D model
Isolate Galaxies

Galaxy 16999 Cut-out

Segmentation Map

Feathered Cut-out
Galaxy Cleaning
Galaxy Cleaning
Galaxy Cleaning
Data Pipeline

- Hubble Images
- Source Segmentation Map
- Image Source Data
- Redshift Source Data
- Crop, clean, alpha (perl, IRAF, C)
- Culling, cross match (perl)
- Galaxy Images
- Galaxy Data
Data to Visualization

Galaxy Images

Galaxy Data

3D modelling (perl)

MEL Scripts

Maya
Servicing Mission 4
Early Release Observations
Synthetic Stars

- Star database
  - Position, brightness, color, etc
  - Multiple wavelengths
- HST point spread function
- Press release image as reference
- Globular cluster density profile
Orion Nebula
protoplanetary disk
Hubble Iconic Images
Hubble’s Iconic Images