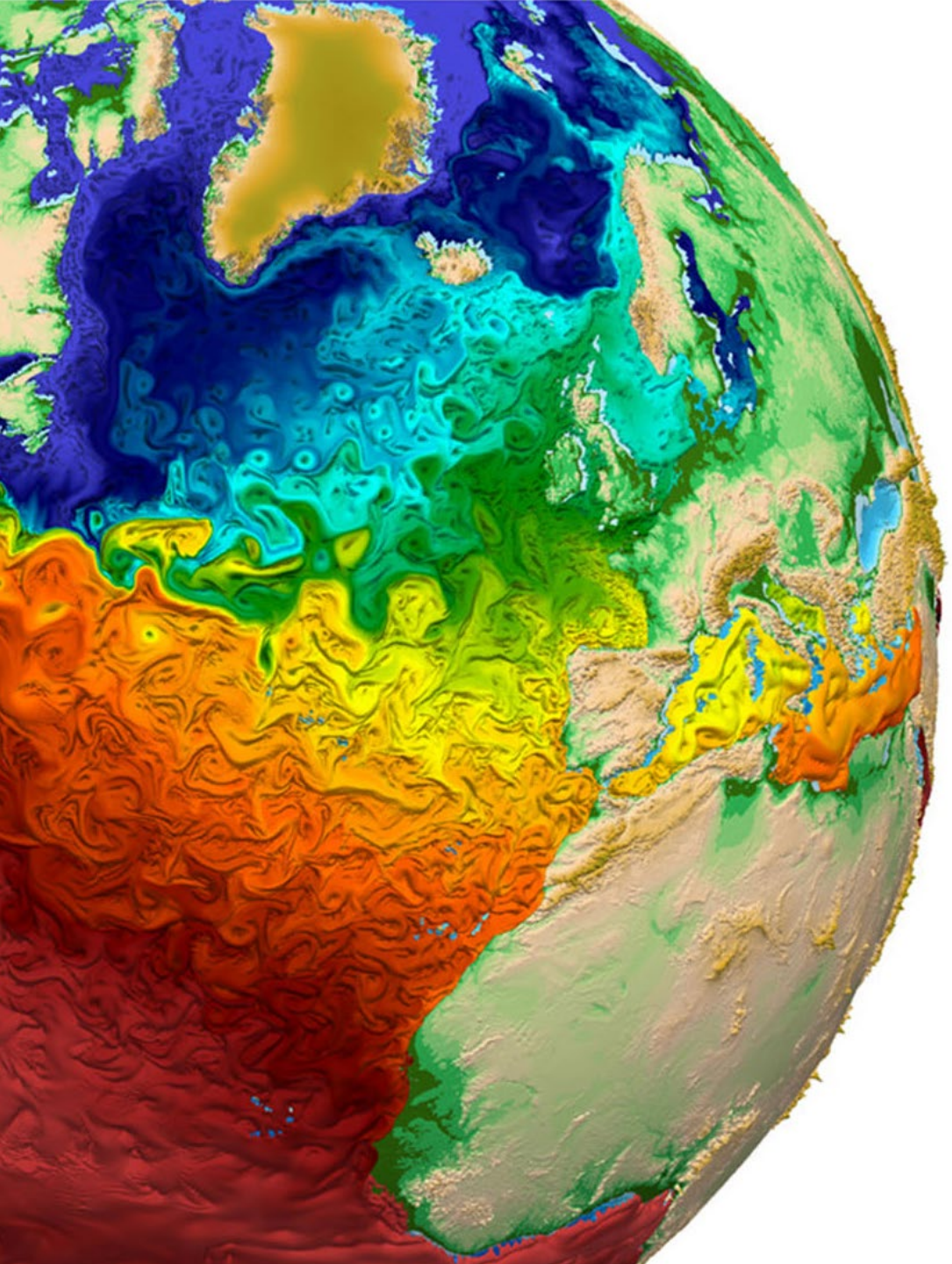
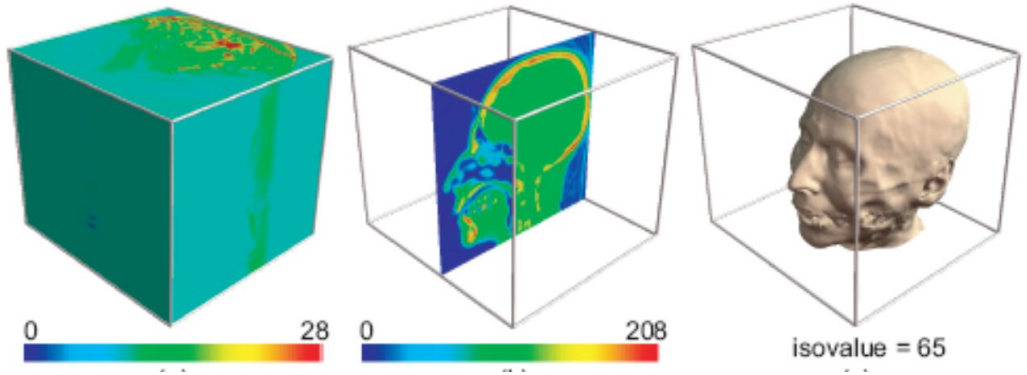


Volume Rendering

Fundamentals

Scientific Visualization
Professor Eric Shaffer

Scalar Field Visualization



Tools we have for investigating 3D volumes are limited…

How can we better understand internal structure?

- 2D slices with pseudo-color
- Adjusting isosurface values

Scalar volume: $f : D \subset \mathbb{R}^3 \to \mathbb{R}$

$$(x, y, z) \mapsto f(x, y, z)$$

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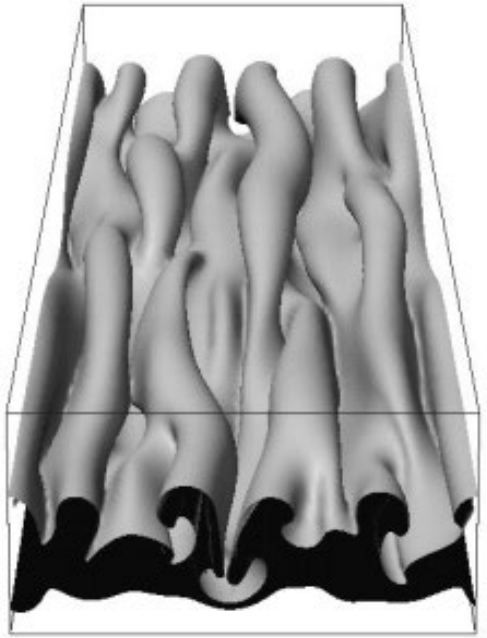
The Problem With Isosurfaces

- Delineate hard boundaries which may not accurately represent data
  - Possibly transitions between values are much smoother

- Using multiple isosurface values to investigate the volume problematic
  - Time consuming
  - Can’t see everything all at once
  - Sampling may miss important features



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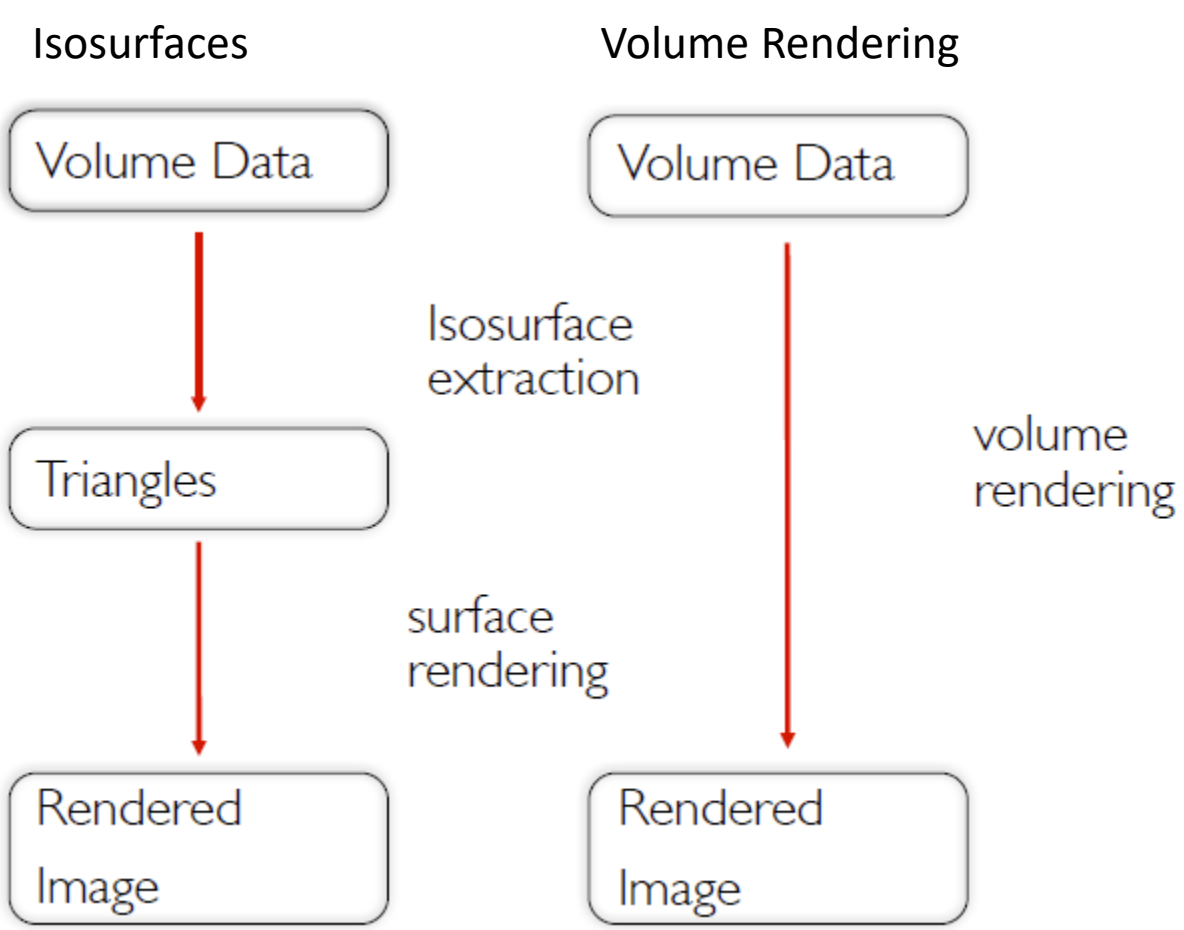
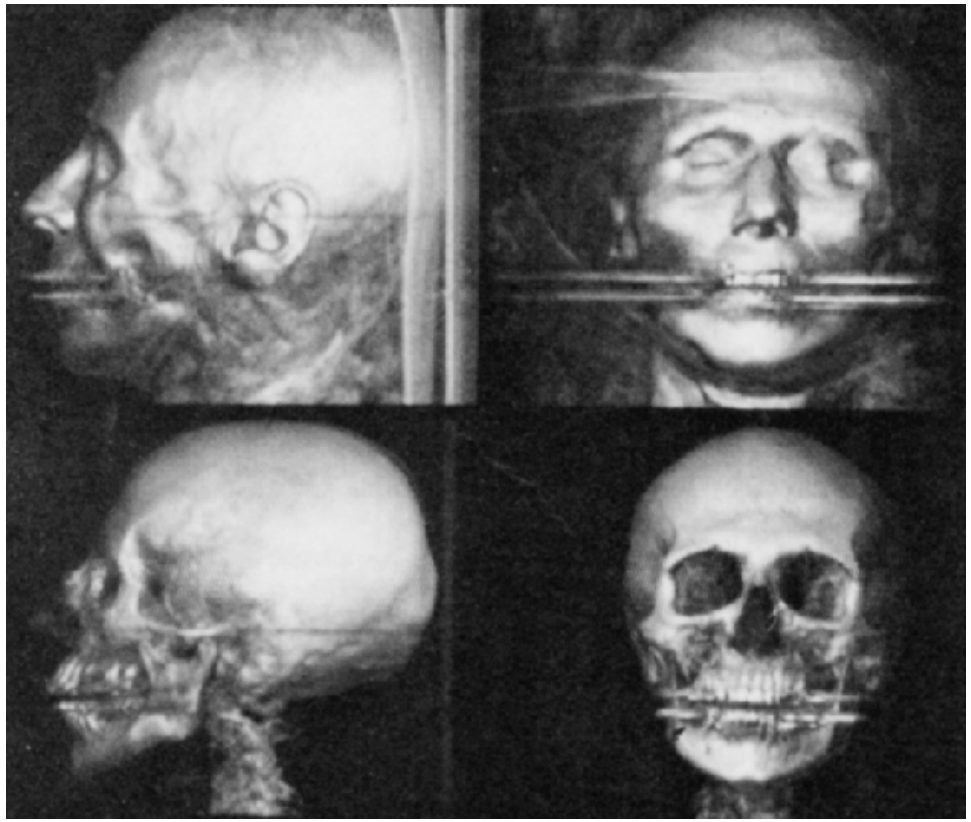
Volume Rendering

Voxel = volume element…like a grid cell

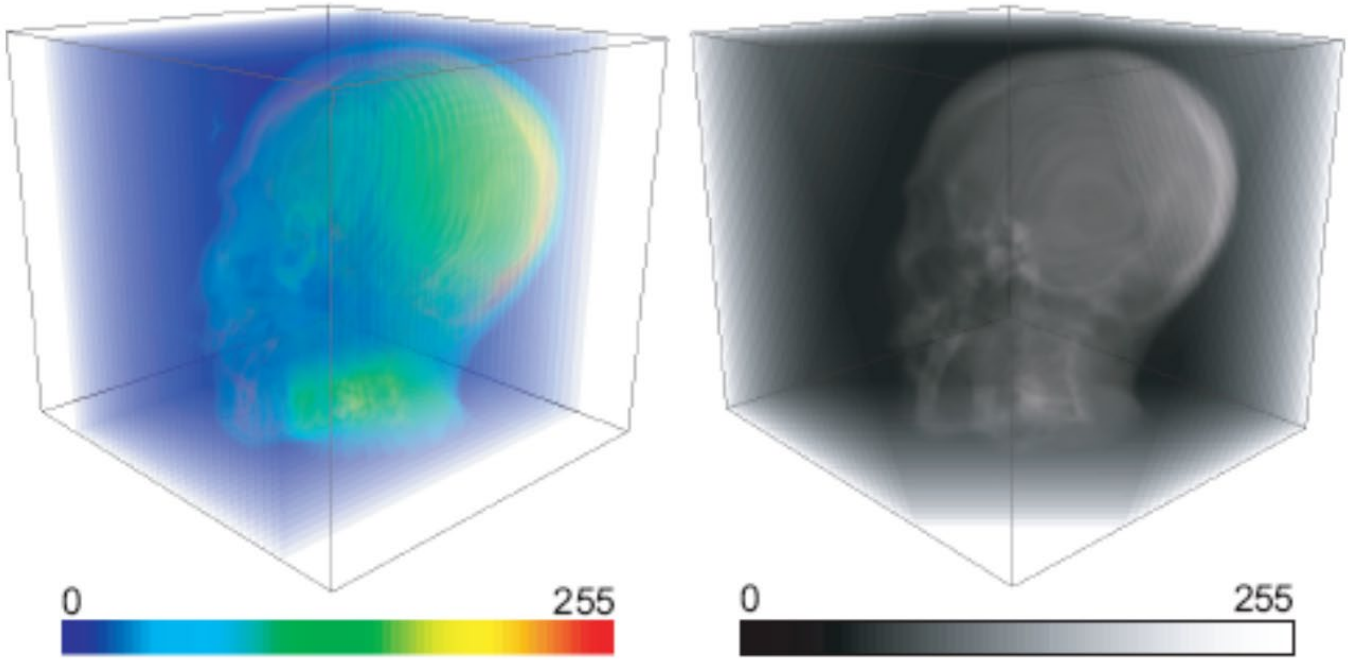
- “Every voxel contributes to image" Marc Levoy, 1988 "*Display of Surfaces from Volume Data*"





What is Volume Rendering

Any rendering process which maps from volume data to an image without introducing binary distinctions / intermediate geometry - Xavier Tricoche



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