

Overview

CMSC 436/636

Data Visualization

Penny Rheingans

University of Maryland Baltimore County

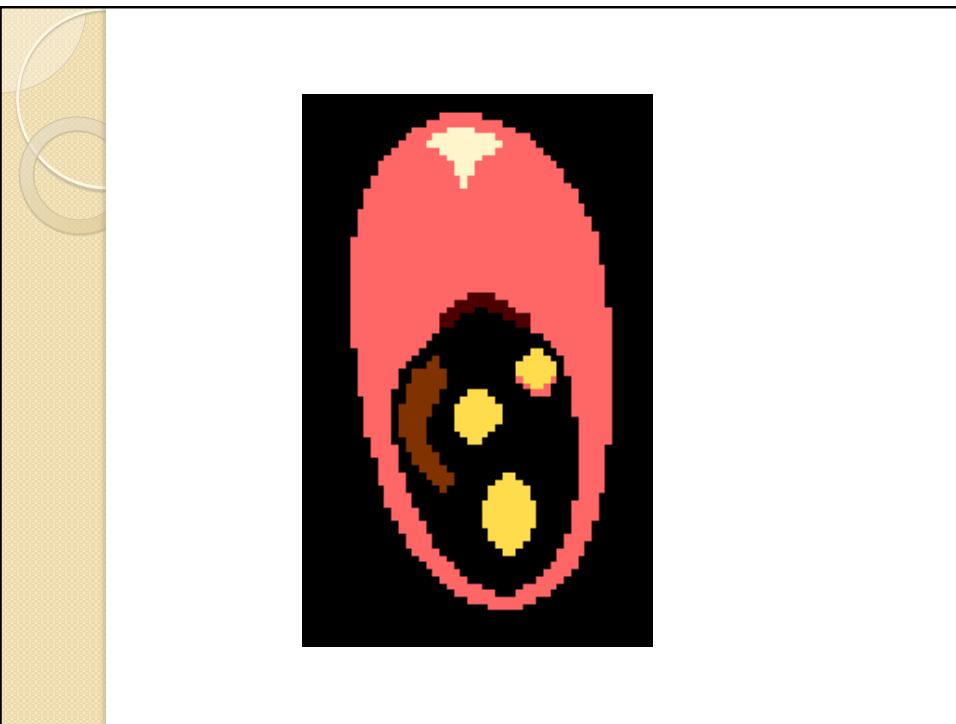
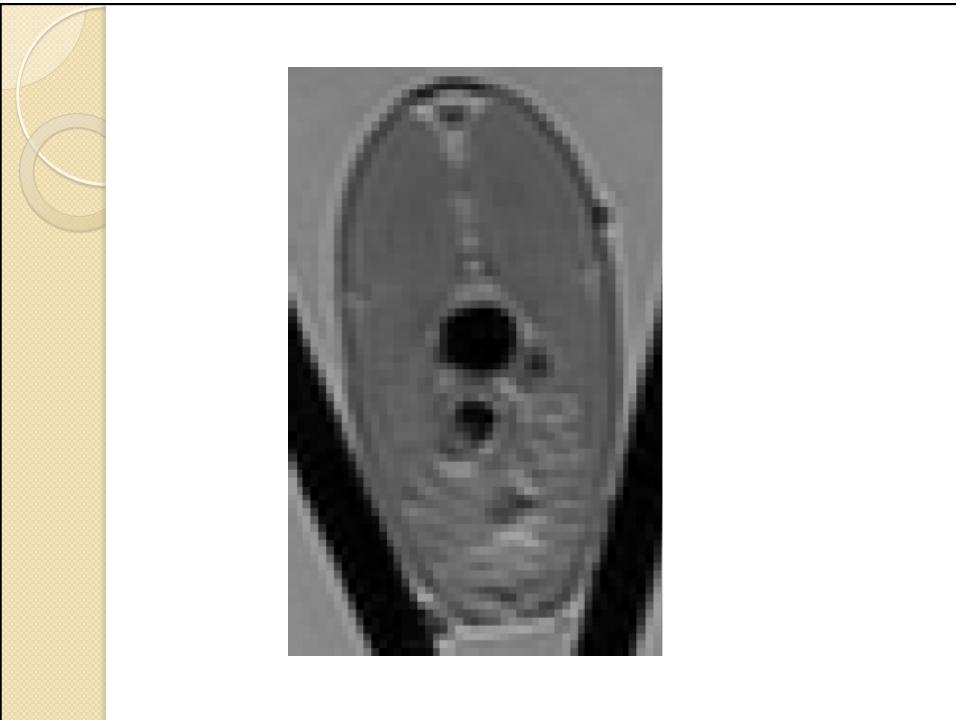
The purpose of computing is insight,
not numbers.

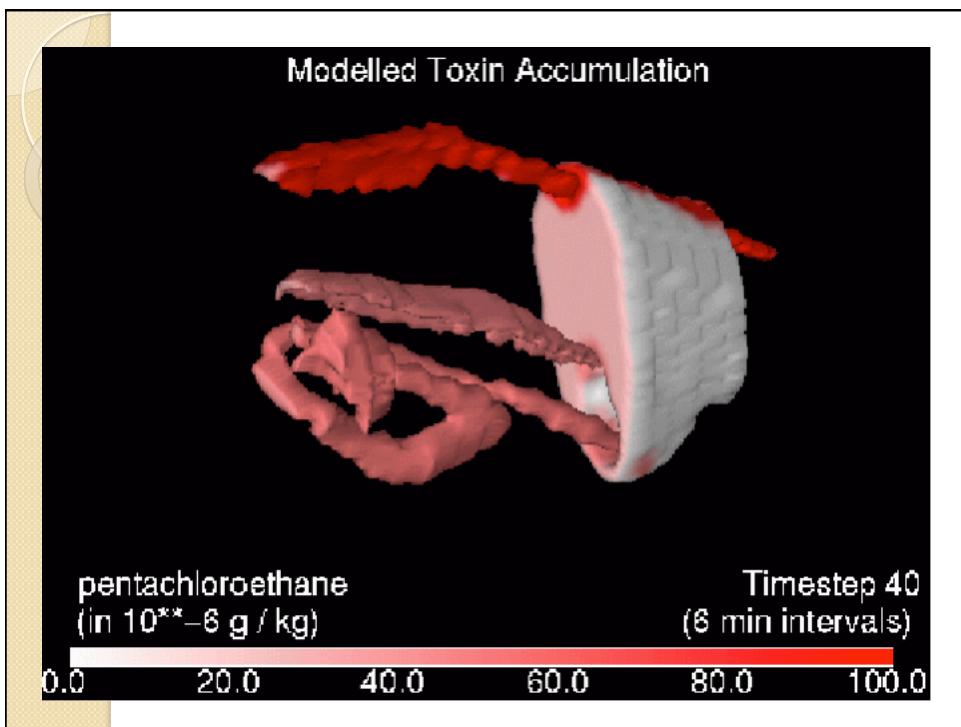
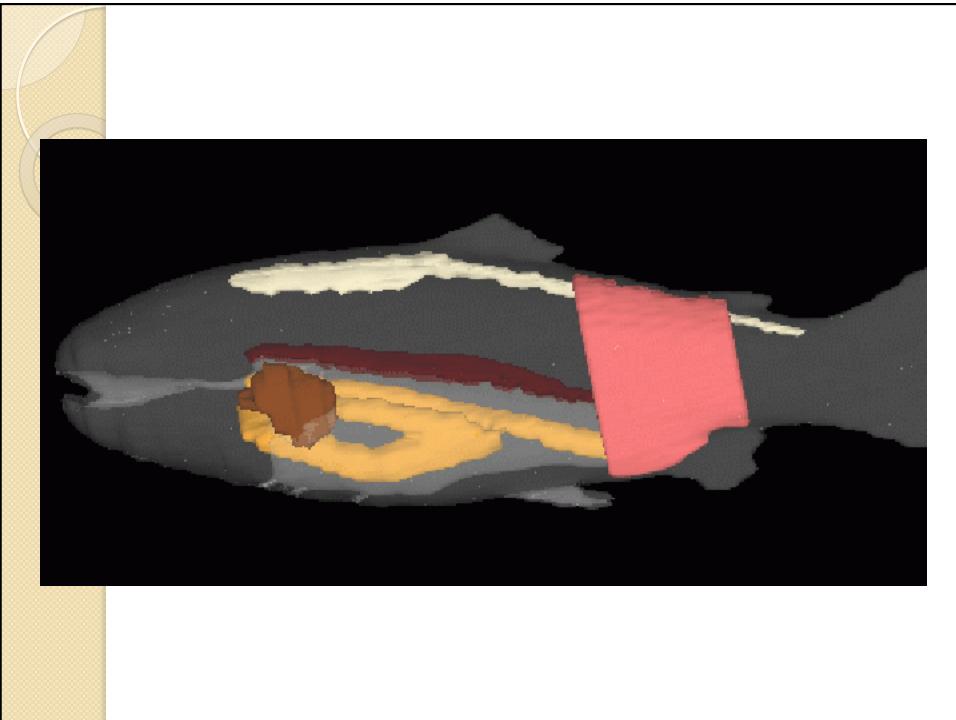
Richard Hamming

What is Visualization?

- Def: visual representation of data
 - Connotations:
 - computer generated
 - LOTS of data
 - Transforms the abstract and symbolic into the geometric
 - Harnesses the human visual perception system

Text Representation







Why Visualize?

- Harness power of human visual system
- Presentation
 - communicate concept to peer, student, policy-maker
- Exploration
 - rapidly construct and test many informal hypotheses

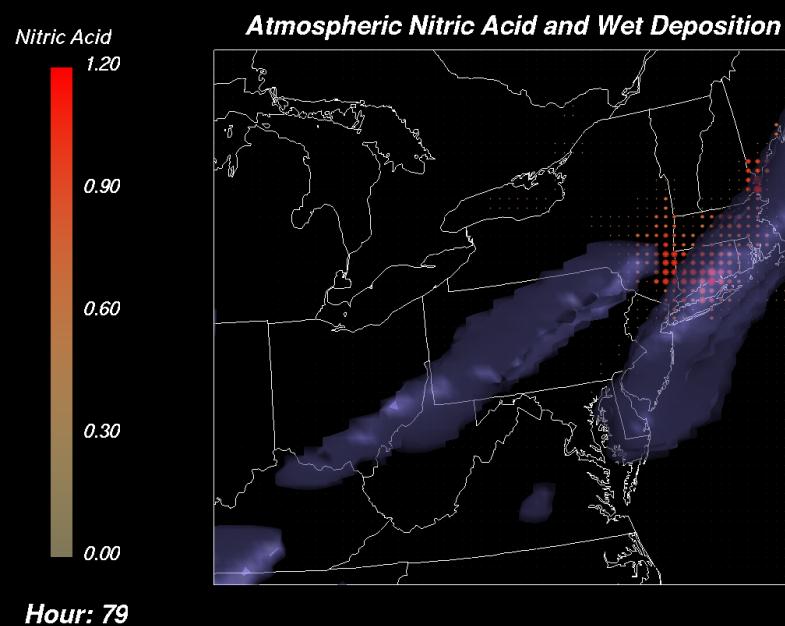


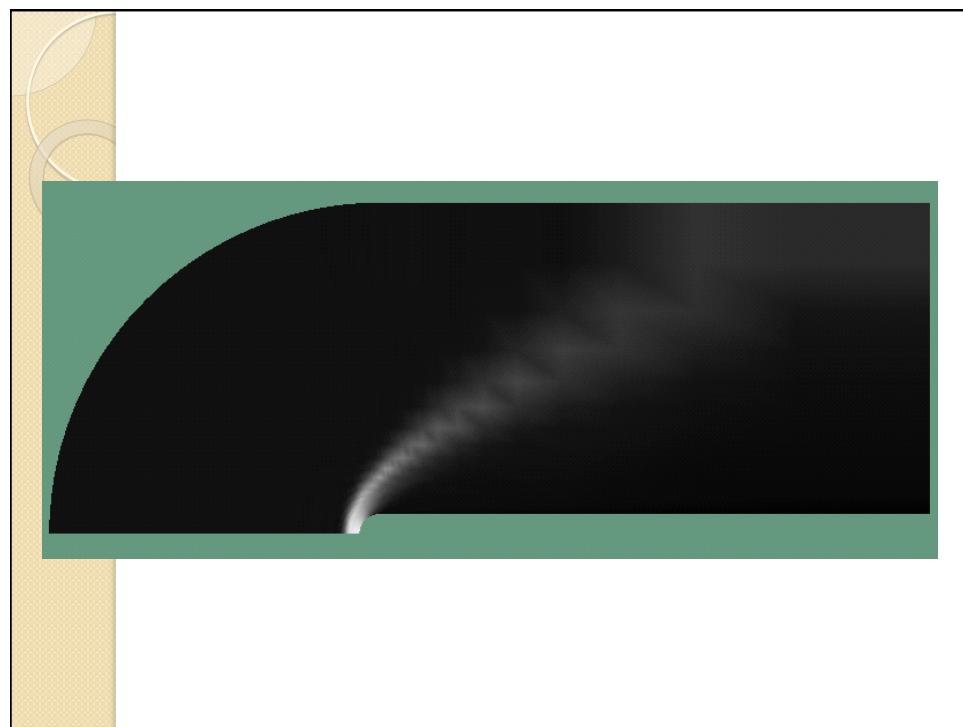
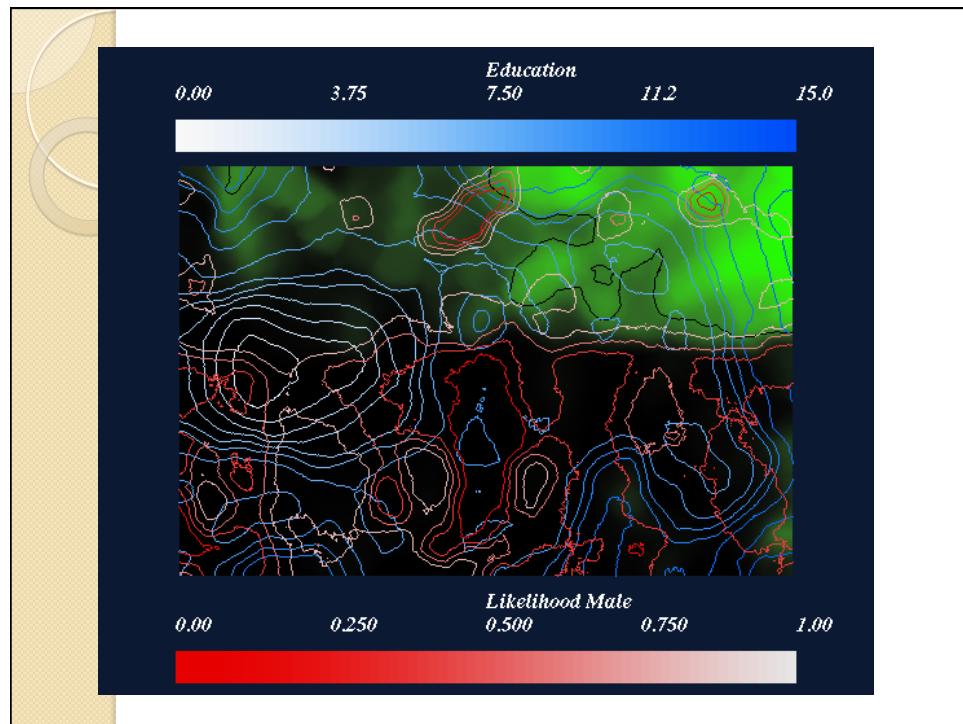
Lots of Numbers

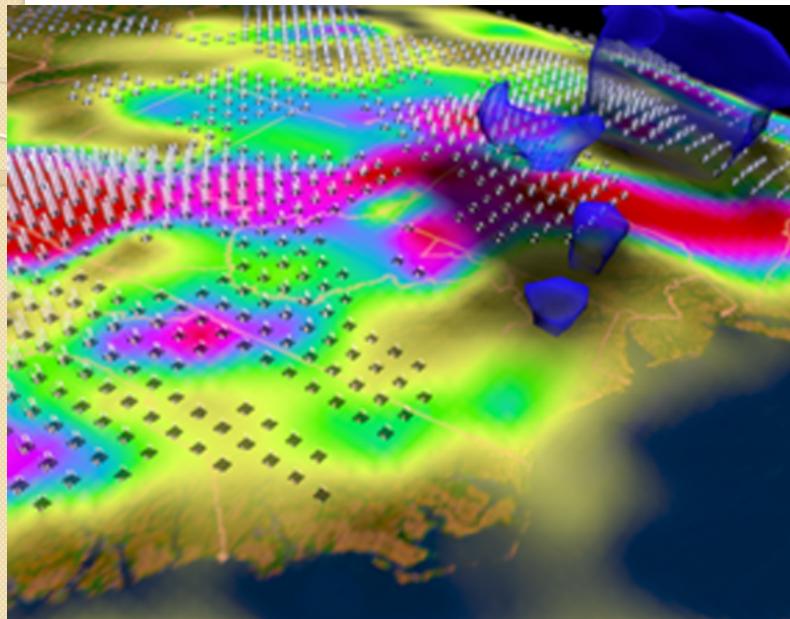
- Sensors
- Scanners
- Surveys
- Simulations
- Equations

Visualization Tasks

- See values
 - extrema
 - anomalies
 - boundaries/thresholds
 - distribution / structure
- See multiple variables
 - relationships
- See flow/change
- Understand process

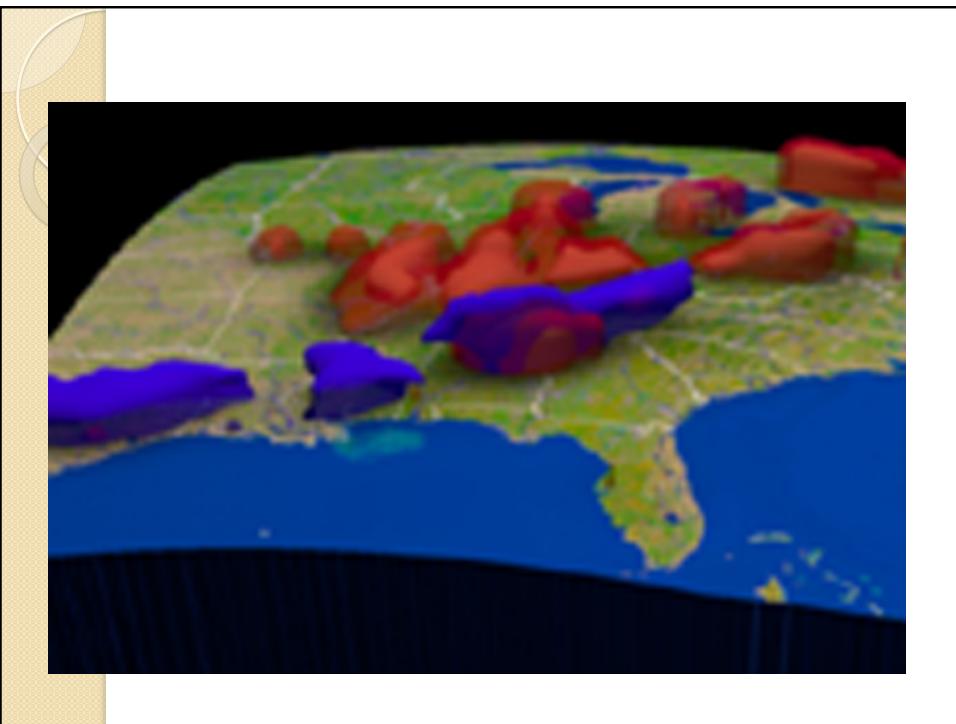
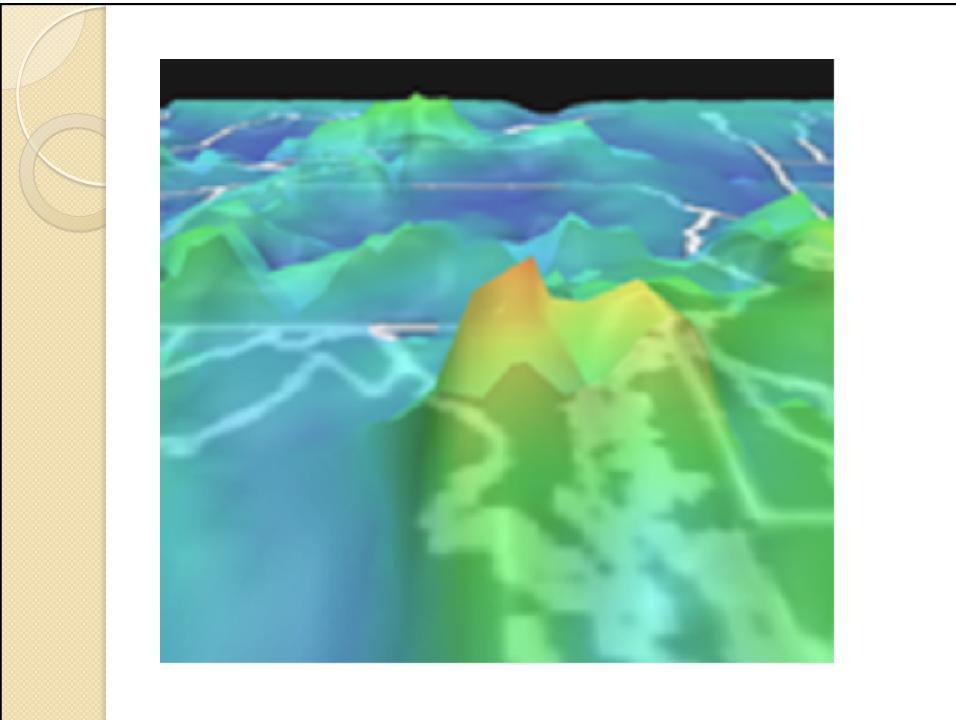


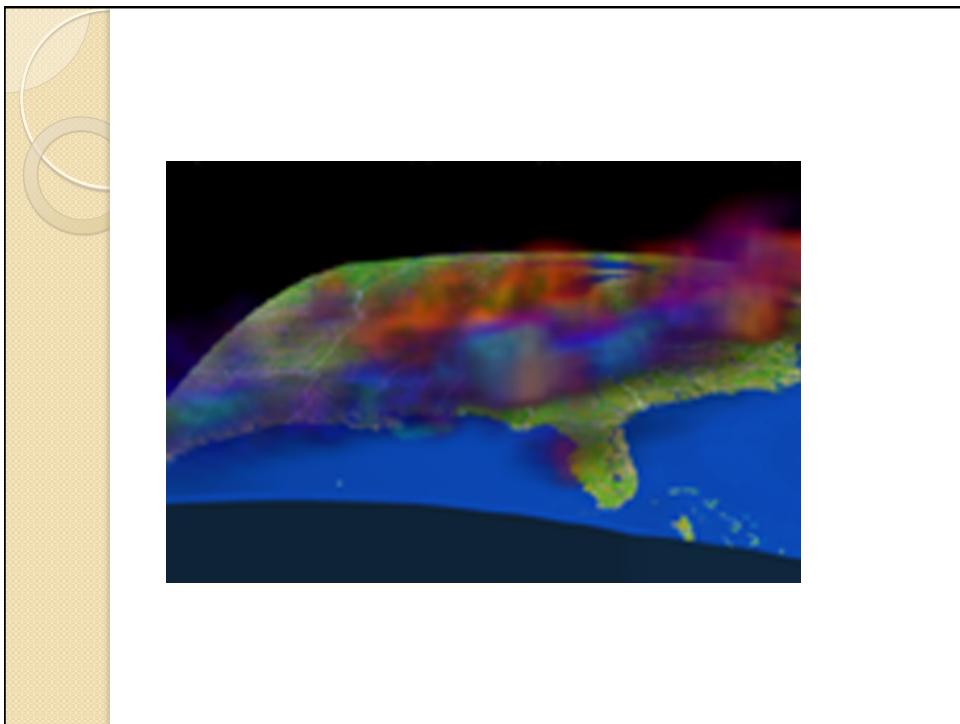
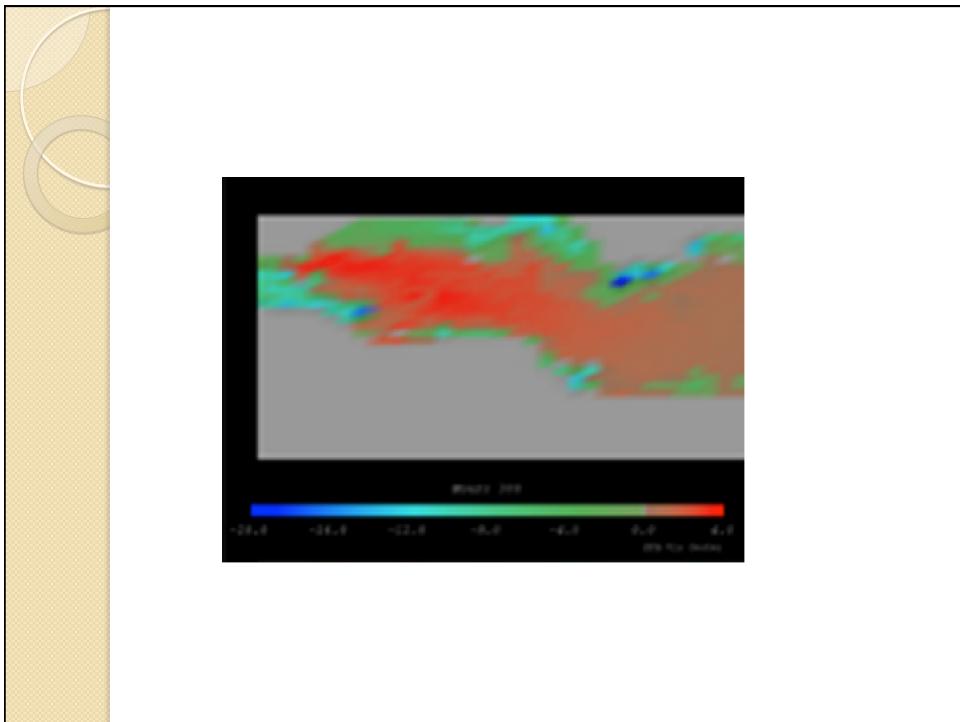


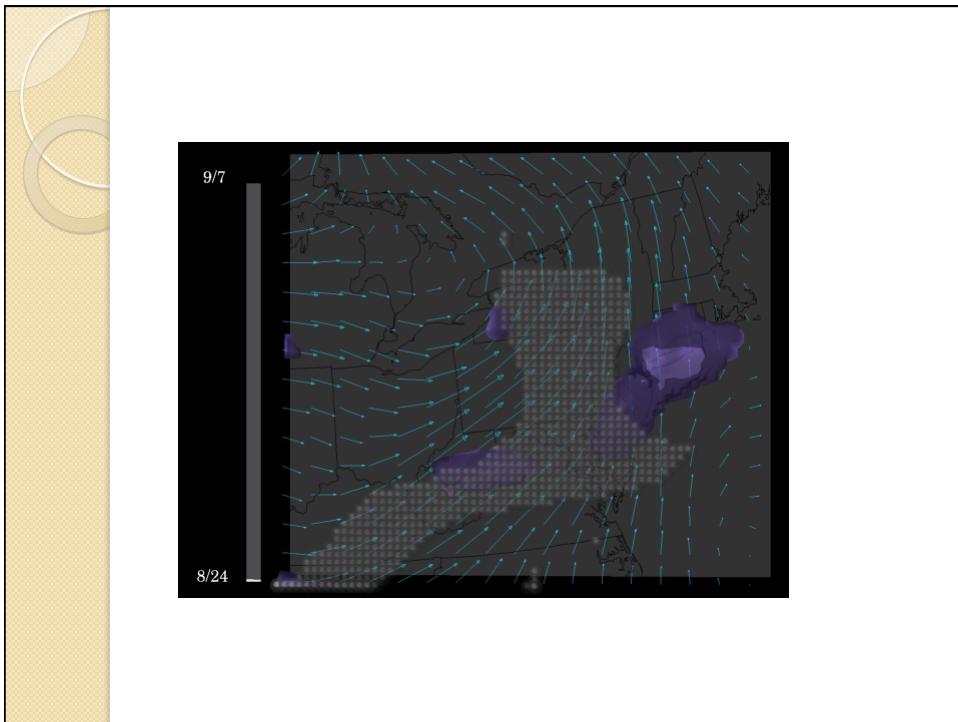


Visual Vocabulary

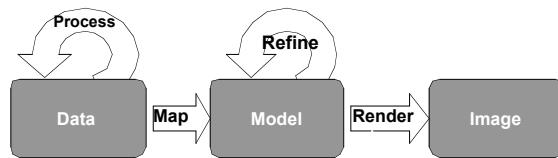
- Position
- Shape
- Color
- Density
- Glyphs
- Motion
- Interaction







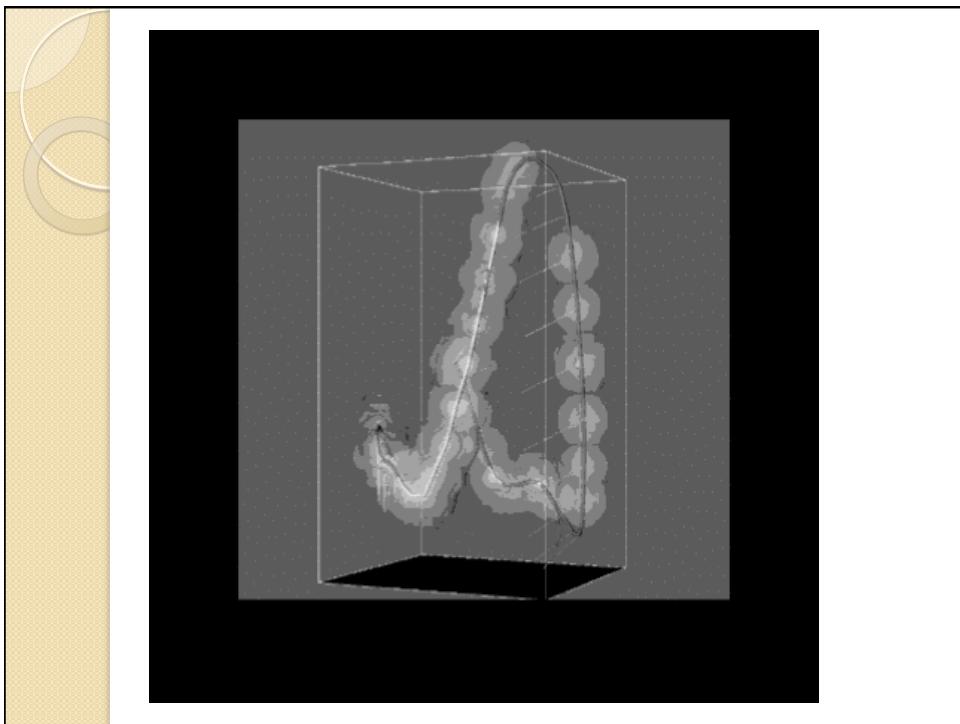
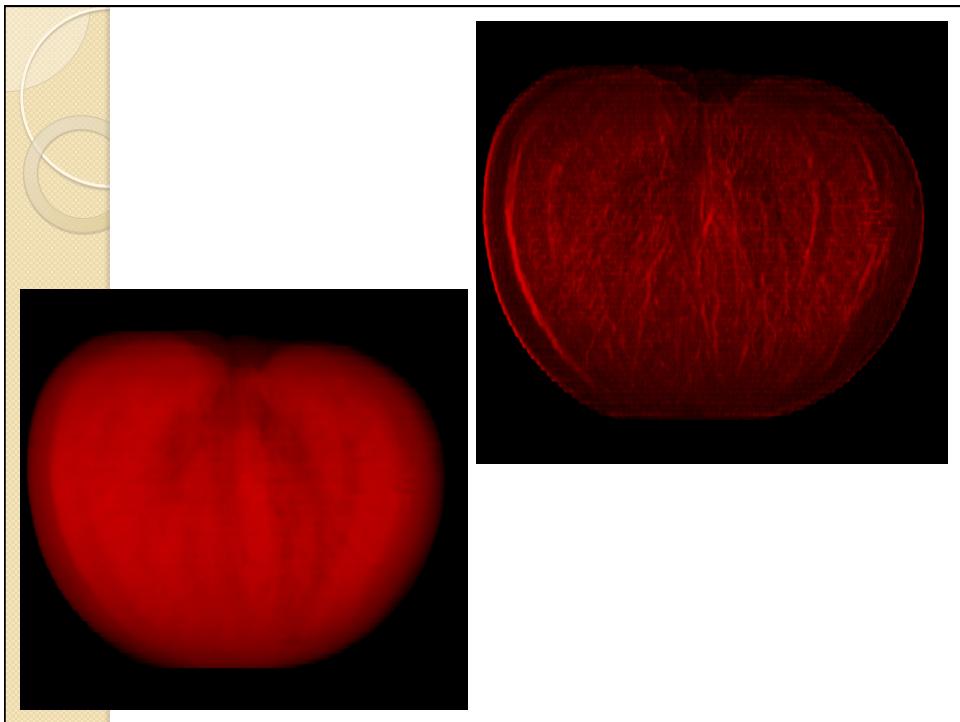
The Visualization Process

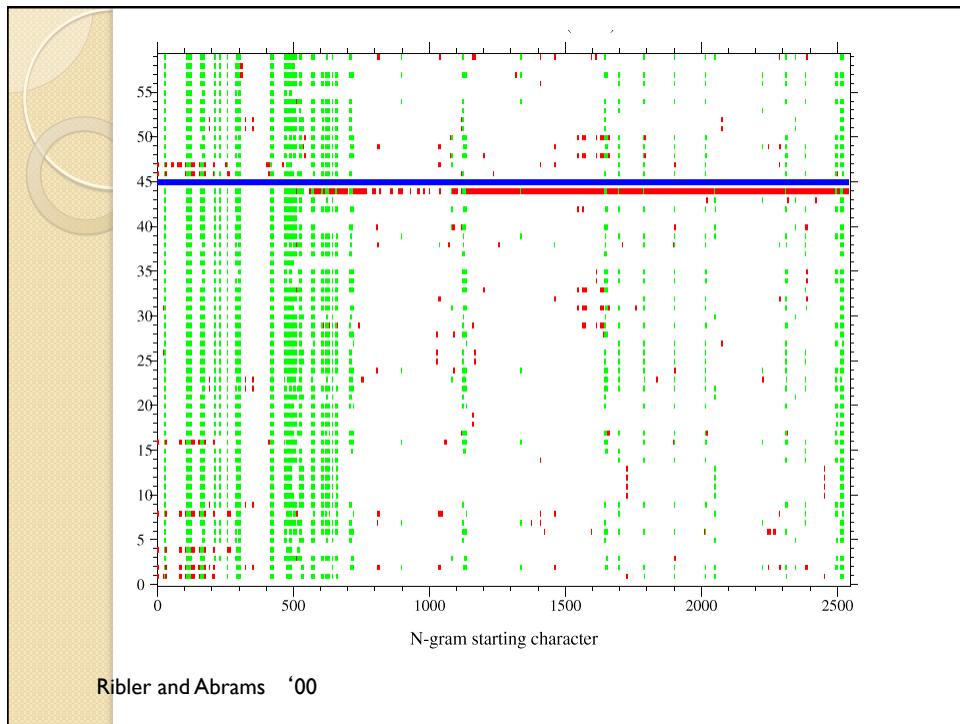
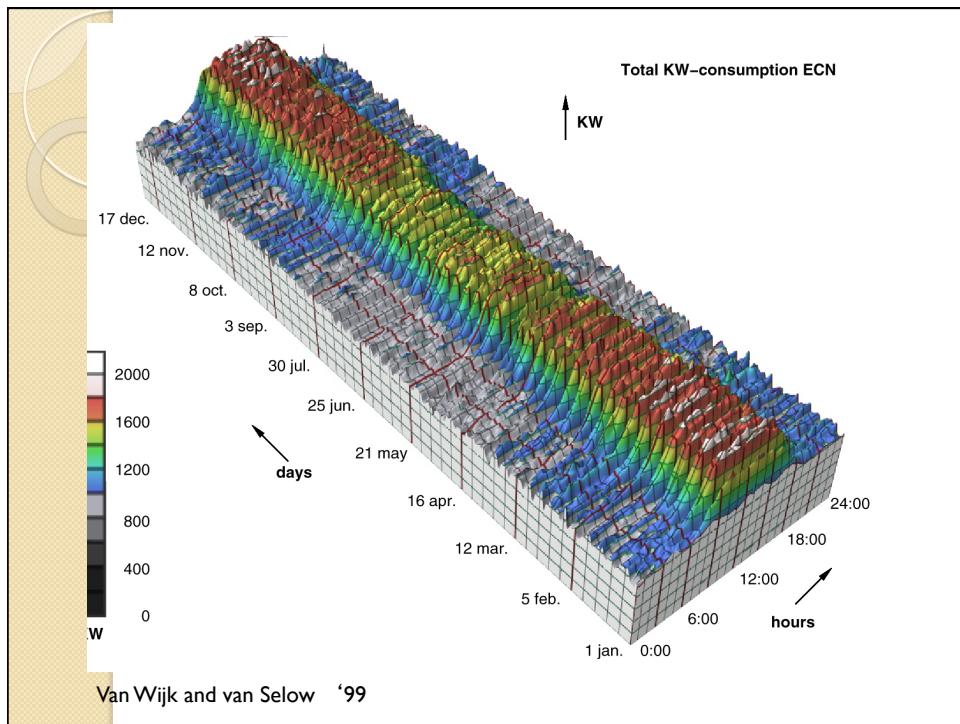


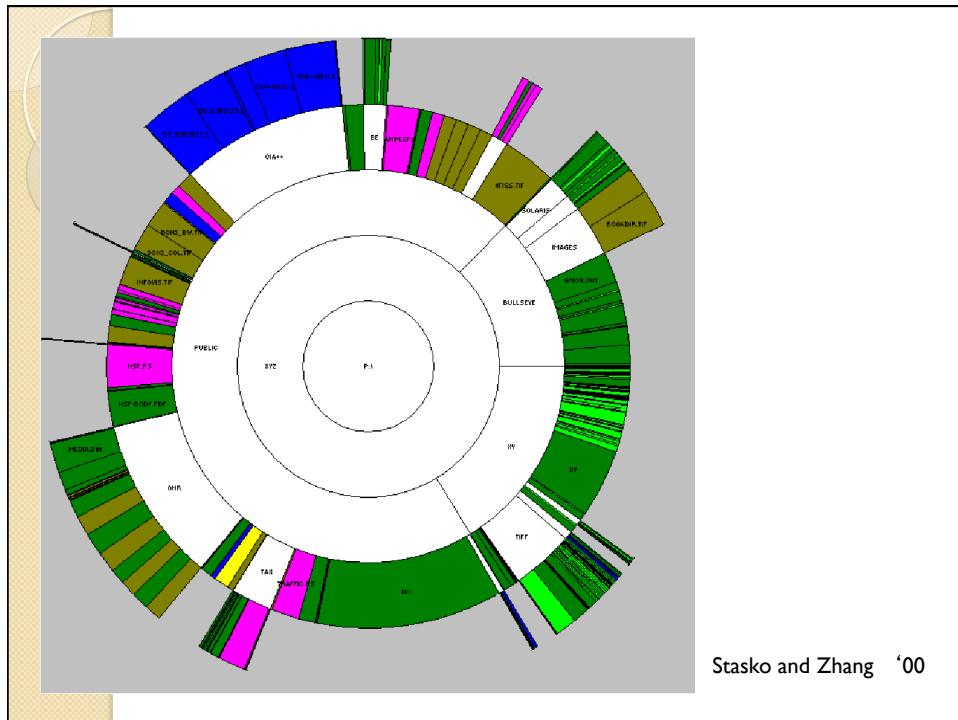
Categories of Visualization

- Data Visualization
 - Spatial
 - 2D / volume
 - scalar / multivariate
 - flow
- Information Visualization
 - non-spatial
 - hD data
 - structures
- Program/Performance Visualization



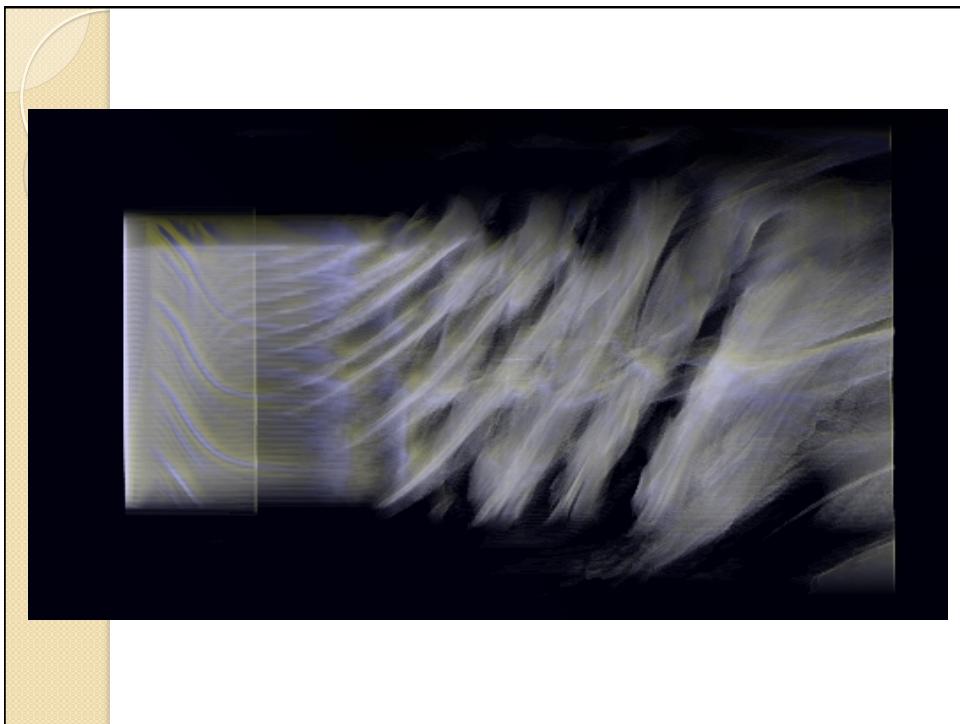
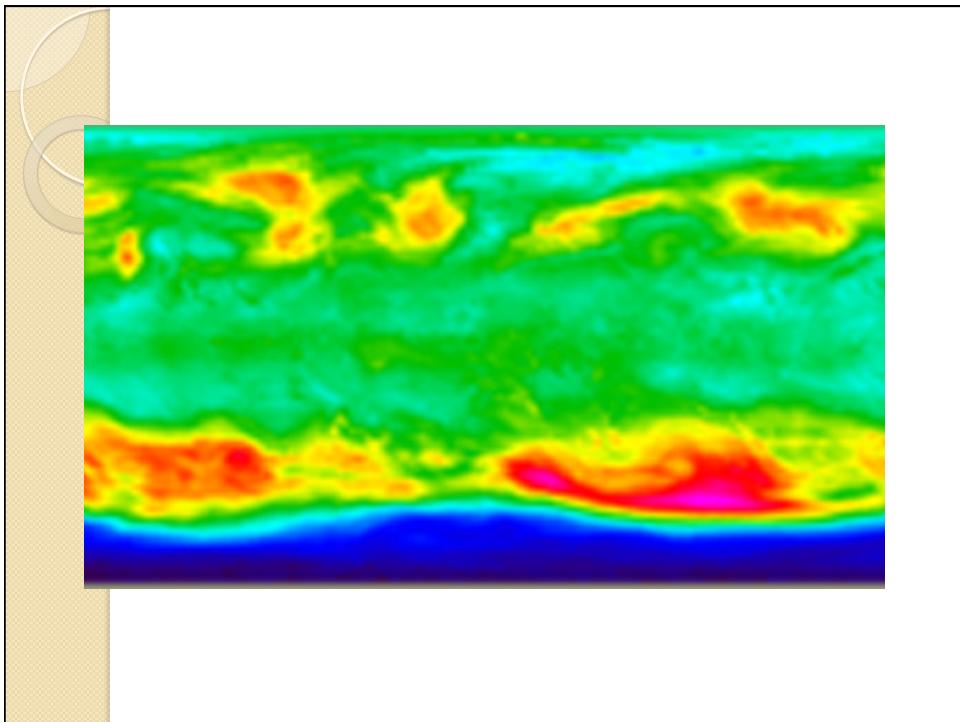


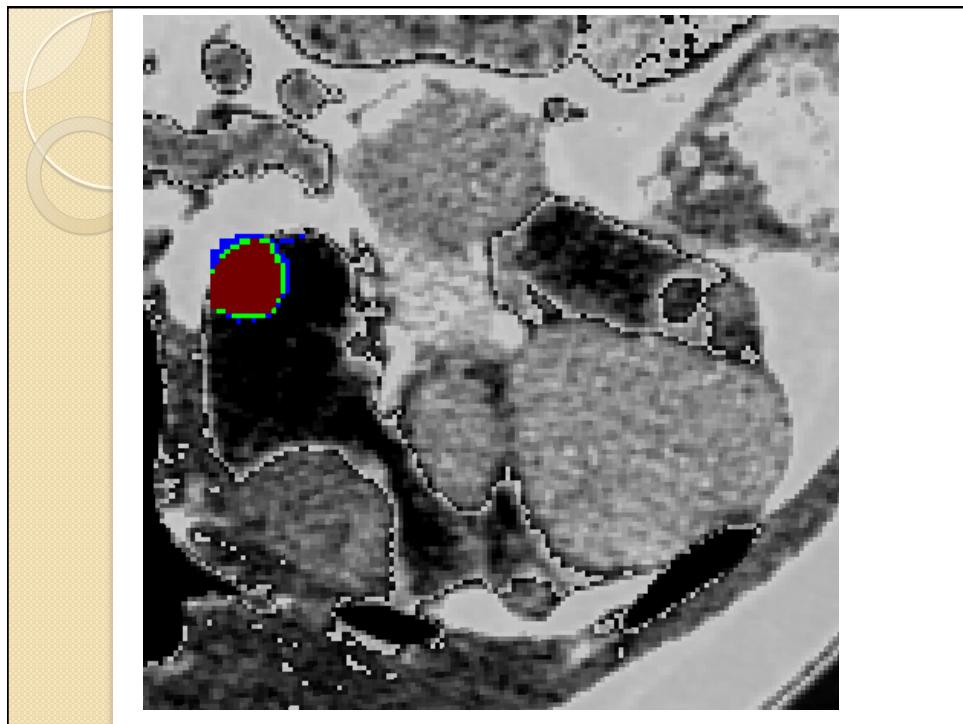
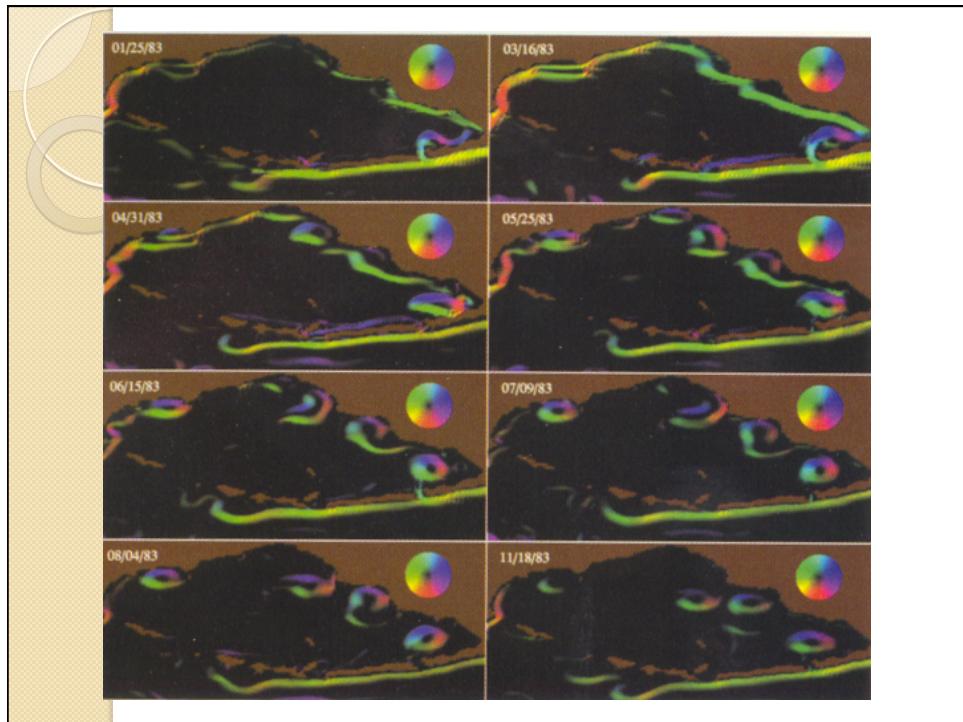


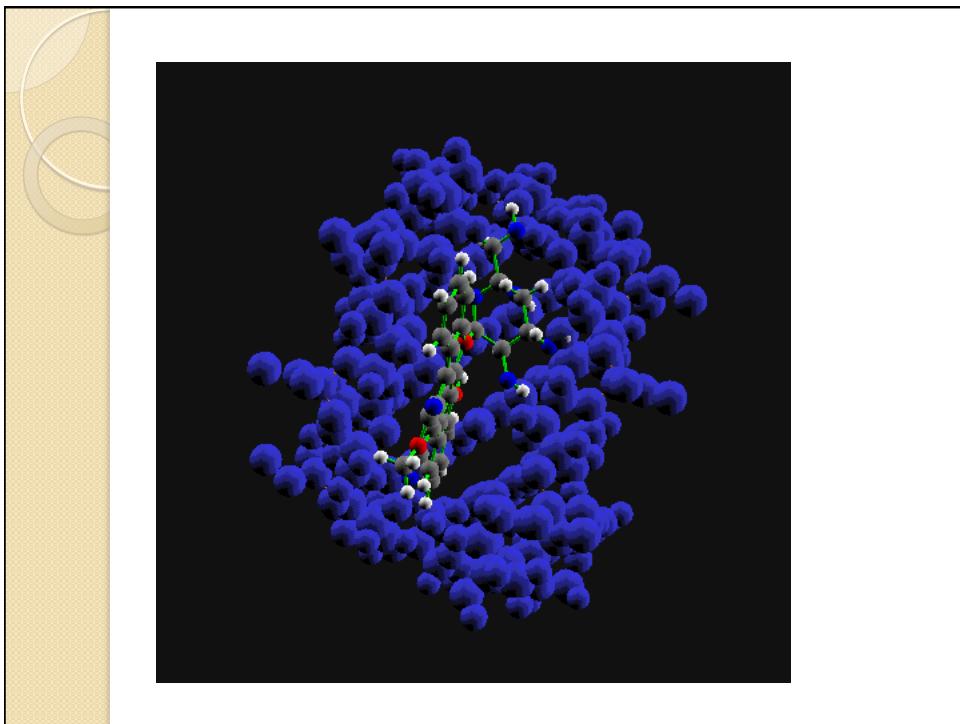
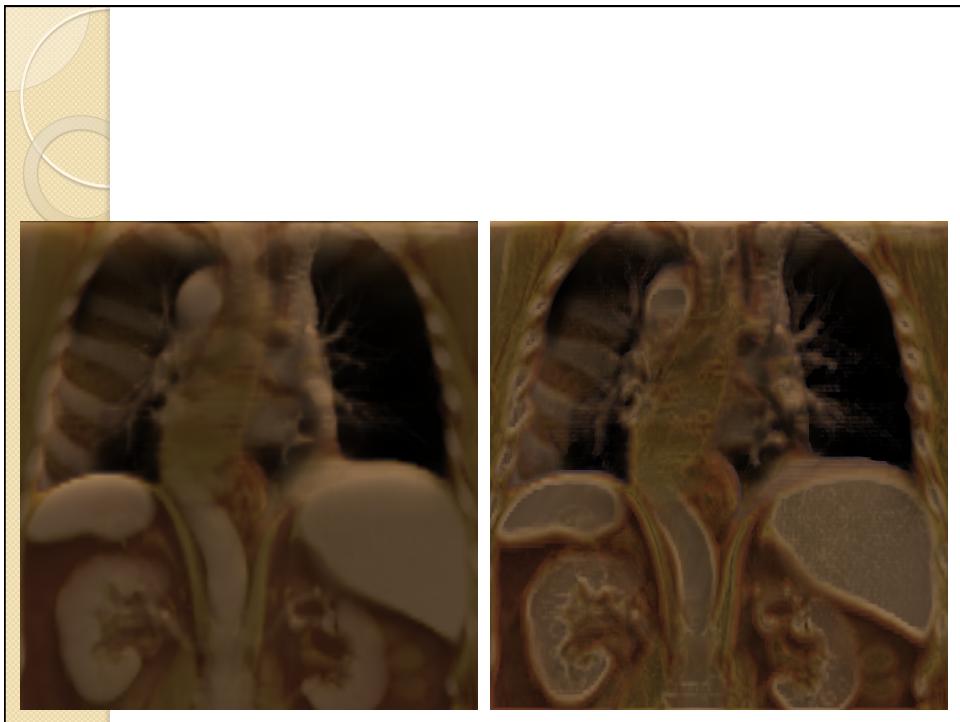


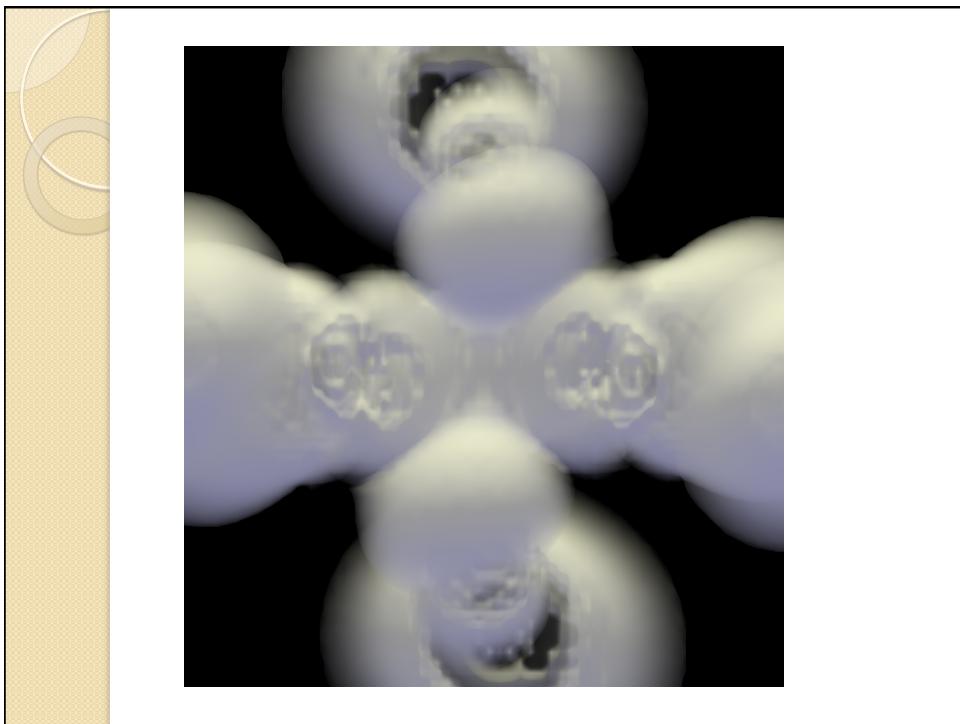
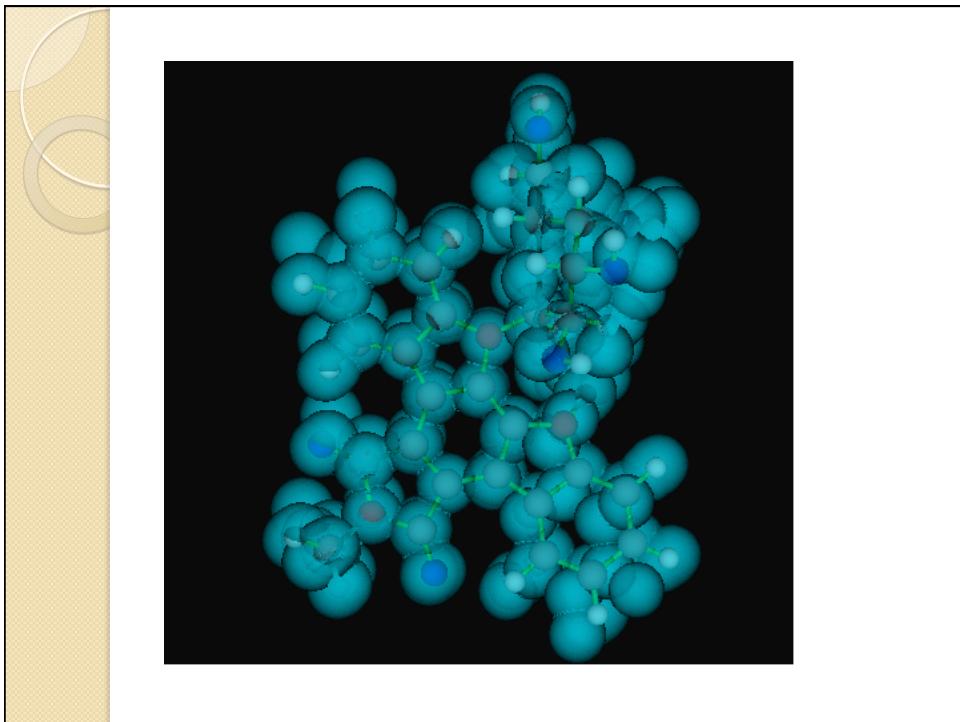
Some Application Areas

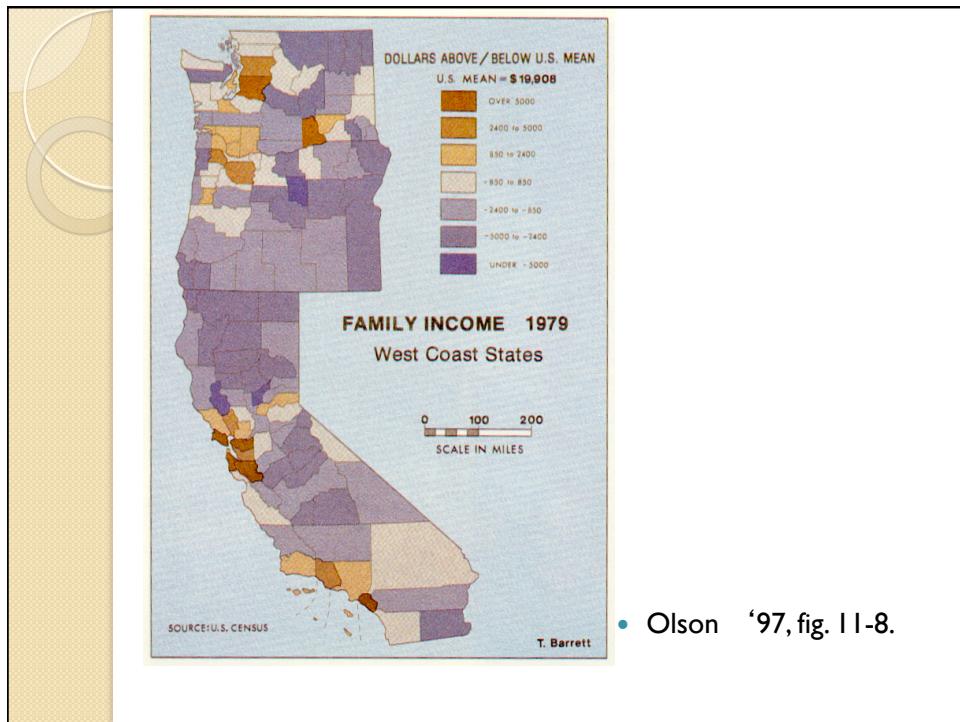
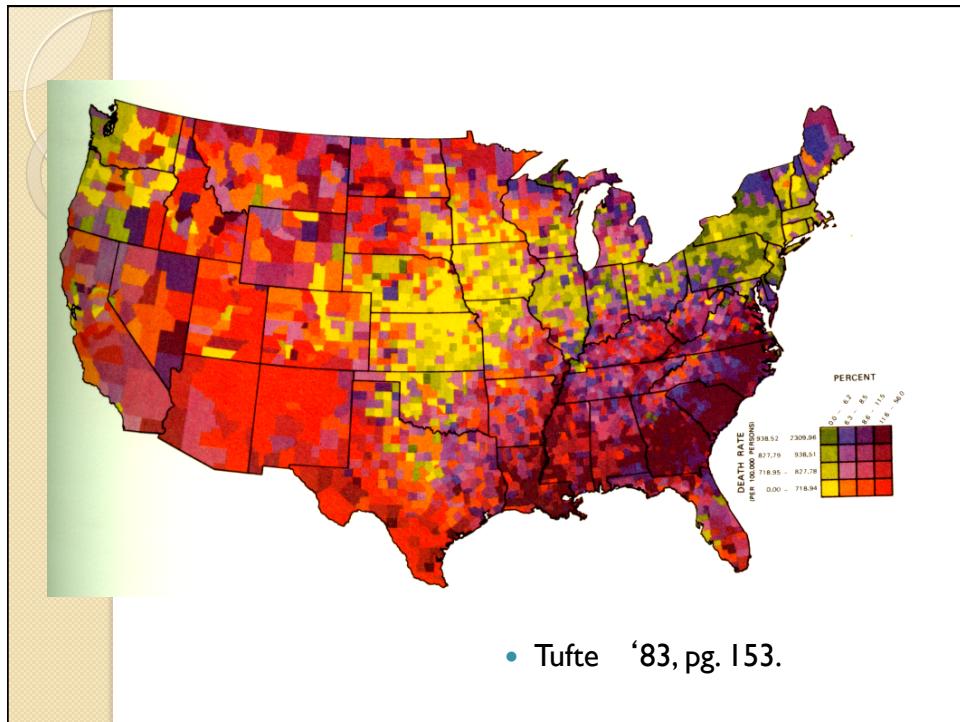
- Environmental Modeling/Monitoring
- Computational Fluid Dynamics
- Medical Diagnosis/Treatment Planning
- Drug Design
- Basic Science
- Public Health
- Social and Economic Justice
- Urban Planning
- Education

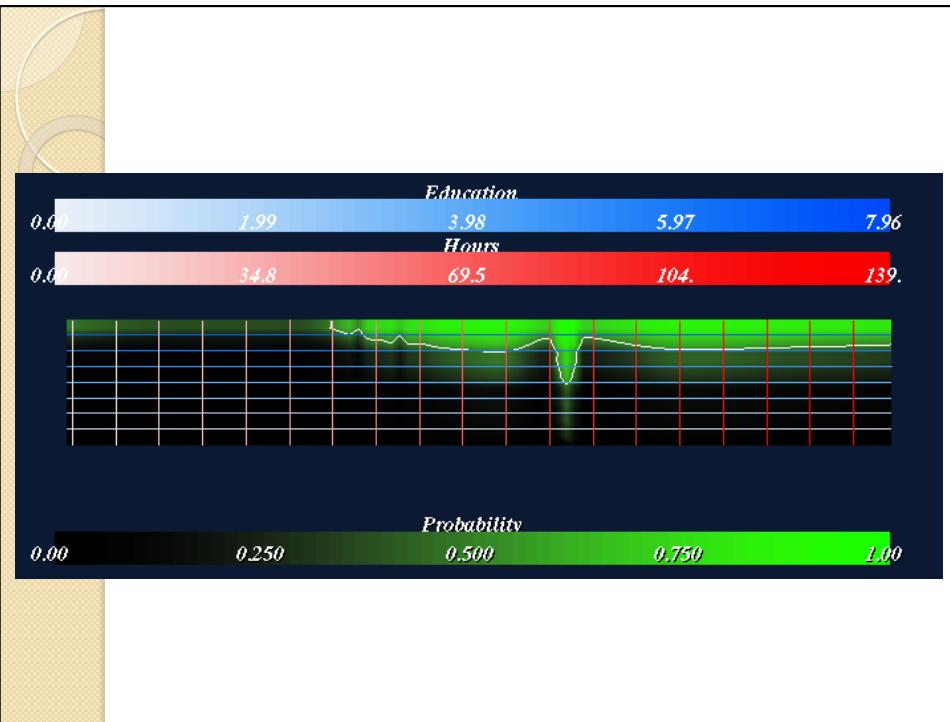






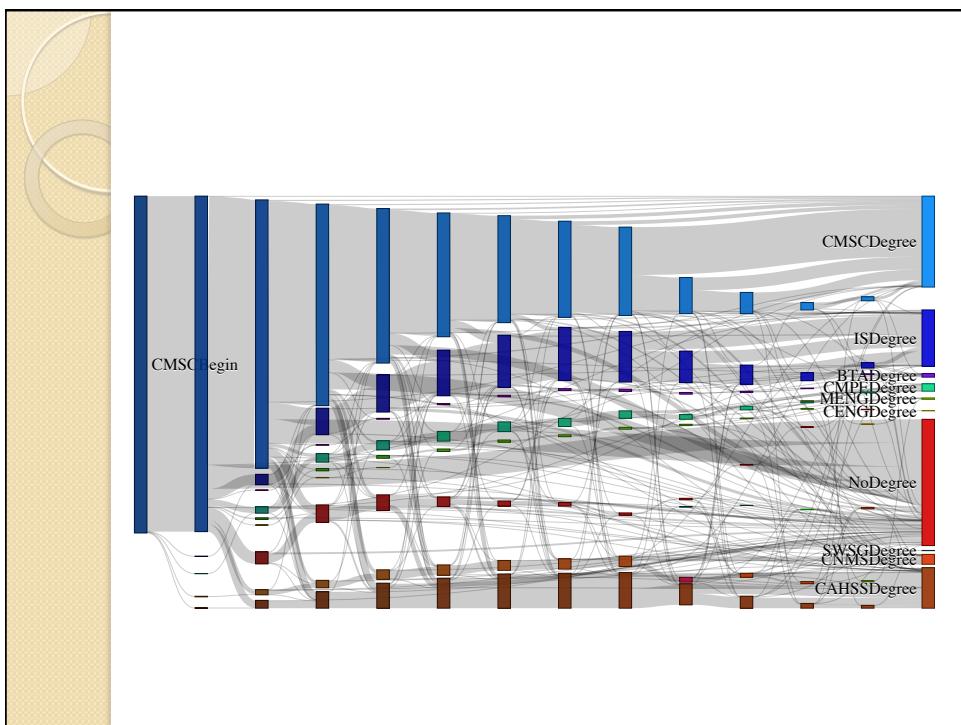
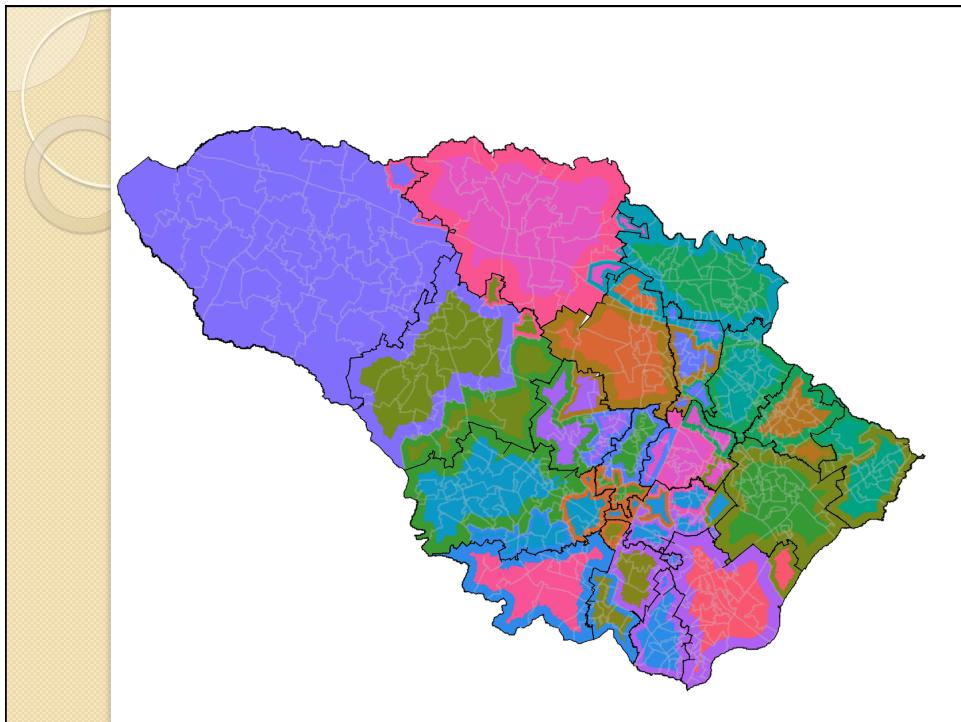






Administrivia

- Pre-reqs
 - Graphics, statistics, design helpful but not expected
 - strong programming skills or domain expertise
- Web page
 - www.cs.umbc.edu/~rheingan/636
- Piazza – sign up at
 - <https://piazza.com/umbc/fall2017/cmsc436636>
- Readings
 - Information Visualization 3rd edition, Colin Ware
 - Visualization Analysis & Design, Tamara Munzner
 - Reading from current research papers
 - All available online (some require DL)
- No final





Administrivia (cont)

- Office hours
 - Tues 8:30-10am (ITE 355), by appt
 - drop in when door's open (ITE 355,452)
- Grade components -- something due most weeks
 - Quizzes (10%)
 - Visualization Construction (10%)
 - Critical Reviews (5%)
 - Analysis of Technical Papers (5%)
 - In class exercises and participation (10%)
 - Project (50%)
 - Peer evaluation (10%)



Assignments

- Construction: Oct 17
- Vis Critiques: Sept 25
- Implementation: Oct 26 (636 only)
- Paper Analysis (multiple dates)
 - Write blog post on each group of papers
 - Comment on other's posts
- Project (multiple dates)

Project Mechanics

- Group development of new visualization technique or application
- Phases
 - Proposal
 - Annotated Bibliography + Revised Proposal
 - Alpha, Beta, Final Releases
 - Presentation
 - Poster
 - Paper draft and final
 - Beta review; draft review (636 only)

Project Topics

- Data as Art, Kathy Marmor, Visual Art
- Visualizing Focus Group Transcripts, Danyelle Ireland, CWIT
- Revisiting the Conquest of Pestilence, Terry Yoo, NIH
- Visualization of Applicant Pool, Erica D'Eramo, CWIT
- Visualization of Biological Outcomes, Greg Szeto, CBEE
- Major-changing in Context, Penny Rheingans, CSEE & CWIT
- Visualizing COEIT Data, Marie desJardins, COEIT & CSEE
- Exploring CSEE Capacity, Richard Chang, CSEE
- VR Exploration of Research Funding, Don Engel, OVPR
- Choice Program Pattern Discovery, Shirey Baig, Shriver Center