



SIGGRAPH 1994

*21st International Conference
On Computer Graphics and
Interactive Techniques*

*Orange County Convention Center
Orlando, Florida
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Course Notes

27

VISUALIZING AND
EXAMINING LARGE
SCIENTIFIC DATASETS: A
FOCUS ON THE PHYSICAL
AND NATURAL SCIENCES

Organizer

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Lecturers

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ACM Siggraph94 Course #27

**Visualizing and Examining Large
Scientific Data Sets:**

**A Focus on the
Physical and Natural Sciences**

Course Chair:

**Theresa Marie Rhyne
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Instructors:

**Bill Hibbard
University of Wisconsin at Madison**

**Lloyd Treinish
IBM T.J. Watson Research Center**

**Kevin Hussey
NASA/Jet Propulsion Laboratory**

July 27, 1994

Introduction

The visual presentation and examination of large amounts of physical and natural sciences data often requires the merging of image processing methods with computer-generated color displays. Frequently there is a need for the integration of other computational technologies with visualization methods. These include:

- a) the integration of terabyte or gigabyte distributed physical and natural sciences databases with visualization systems;
- b) the display of data using cartography, statistical analyses, Computer Aided Design (CAD) and Geographic Information Systems (GIS) techniques in conjunction with visualization systems;
- c) the design of visualization tools, user interfaces, and animations which support the specific needs of scientists, policy analysts, regulators and the general public;
- d) the development of collaborative computing tools which allow the integration of multi-disciplinary data (e.g. atmospheric, oceanographic, and geographic) into visualization systems to foster cross-disciplinary exploration and communications.

This full day course explores these issues with illustrative examples of visualization software and animations designed to support the examination of large scientific data sets. Each of the instructors has prepared a visualization demonstration based on their own customized software tools which will (hopefully) be executed (in real time) on a workstation during the course.

We have divided these course notes into four sections and have included the demonstration discussions (case studies) at the end. During the delivery of the course, each section presented will be followed by a case study demonstration. To clarify this matter, we have included both a Table of Contents for the Course Notes and an Outline of the Presentation of the Course.

We hope that you enjoy attending this course and that these notes are insightful to you. Each of us learned a great deal and expanded our own horizons in collaborating together on this course.

Theresa Marie Rhyne

Bill Hibbard

Lloyd Treinish

Kevin Hussey

Table of Contents for the Course (#27) Notes

- I. Classifying and Modeling Data in the Physical and Natural Sciences**
- II. Solutions and Techniques for Data Management, Visual Display and Examination of Large Scientific Data Sets**
- III. Renaissance Teams and Collaborative Computing Needs for Exploring Multi-Variant Data**
- IV. Animations for Researchers, Decision Makers and the General Public which Maintain Physical and Natural Sciences Data Validity**

**Case Study #1 Visualizing Photochemical Model Data
(Examining an Air Pollution Model)**

**Case Study #2 Exploring and Probing Large Scientific Datasets
(Visually searching data with VISTA)**

**Case Study #3 Global Ozone Distribution
(The Ozone Hole)**

**Case Study #4 Examining Data Sets in Real Time
(VIS-5D and VIS-AD for Visualizing Earth
and Space Science Computations)**

**ACM Siggraph Course #27: Visualizing and Examining Large
Scientific Datasets: A Focus on the Natural and Physical Sciences
Course Outline
(July 27, 1994)**

Introduction/ Course Organization Remarks: Rhyne - 5 minutes

**Topic #1: Classifying and Modeling Data in the Physical and Natural Sciences
(Bill Hibbard - 45 minutes)**

**Case Study for Topic 1: (30 minutes)
Visualizing Photochemical Model Data- Rhyne**

Morning Break

**Topic #2: Solutions and Techniques for Data Management, Visual Display
and Examination of Large Scientific Data Sets
(Lloyd Treinish - 45 minutes)**

**Case Study for Topic 2: (30 minutes)
Exploring and Probing Large Scientific Datasets - Hussey**

Lunch

**Topic #3: Renaissance Teams and Collaborative Computing Needs
for Exploring Multi-Variant Data (Theresa Rhyne - 45 minutes)**

**Case Study for Topic 3: (30 minutes)
Global Ozone Distribution (the Ozone Hole) - Treinish**

Afternoon Break

**Topic #4: Animations for Researchers, Decision Makers and the
General Public which Maintain Data Validity
(Kevin Hussey - 45 minutes)**

**Case Study for Topic 4: (30 minutes)
Examining Data Sets in Real Time - Hibbard**

Wrap-Up Discussion: (All Instructors) (10 minutes)