VIS 2000
IEEE VISUALIZATION

CONFERENCE-AT-A-GLANCE

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
7:00am	REGISTRATION	REGISTRATION	REGISTRATION	REGISTRATION		
8:00am	Tutorials	Information Visualization Symposium / Volume Visualization Symposium / Tutorials	Information Visualization Symposium / Volume Visualization Symposium / Tutorials	Keynote Session — Grand Ballroom A, B, & C	REGISTRATION — Papers / Work in Progress / Case Studies	REGISTRATION — Papers / Panel / Case Studies
9:00am						
10:00am				Papers / Papers / Case Studies	Papers / Papers / Work in Progress / Demonstrations and CAL	Papers / Papers
11:00am						
12:00pm					Vis 2001 Open Meeting	
1:00pm						
2:00pm				Papers / Papers / Case Studies / Demonstrations and CAL	Papers / Papers / Case Studies	Capstone Session — Grand Ballroom C
3:00pm						
4:00pm				Papers / Panel / Case Studies	Papers / Panel / Work in Progress	
5:00pm						
6:00pm						
7:00pm		Symposium & Tutorial Reception — Alpine Ballroom	VizLies 2000 — Grand Ballroom B	Conference Reception — Alpine Ballroom	BOFs / SCI Institute School of Computing University of Utah Open House	
8:00pm						
9:00pm						

The three conference tracks will cover:

Visualization Algorithms *Volume Rendering, Flow Visualization, Isosurfaces, Compression, Vector and Tensor Visualization, Sonification, etc.*

Visualization Techniques *Information Visualization, Databases, Human Perception, Human Factors, Multivariate Visualization, Virtual Reality, etc.*

Visualization Applications *Archaeology, Astrophysics, Aerospace, Automotive, Biomedicine, Chemistry, Education, Electronics, Environment, Finance, Mathematics, Mechanics, Molecular Biology, Physics, Virtual Reality, WWW, Java, VRML, HTML, AVS, Data Explorer, Iris Explorer, Khoros, vtk, etc.*

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www.erc.msstate.edu/vis2000

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WELCOME TO IEEE VISUALIZATION 2000

At the 11th annual IEEE Visualization conference, to be held from October 8 through 13 in Salt Lake City, we will meet to celebrate another year of cutting edge research in scientific visualization.

Our keynote speaker, Michael Cohen, notes that revealing the hidden structure around us is at the core of visualization. His talk will provide an overview of advances in technology in computer vision, image based rendering, non-photorealistic rendering and visualization. As we finish the conference, our capstone speaker, Olivier Faugeras, will present recent research on applications of variational methods for medical imaging and visualization. During the numerous sessions scheduled between these two talks, you will find reports on the state-of-the-art in visualization and its relationship to computer graphics and computer vision.

Preceding the main conference you may attend tutorials by leaders in the field, who will discuss the background of their research as well as the in-depth details of their new work. You will also find two symposia: the symposium on information visualization, where techniques for the visualization of abstract information will be studied; and the symposium on volume visualization, where you will see the latest volume visualization research techniques and applications.

Charles Hansen, University of Utah

Chris Johnson, University of Utah

Steve Bryson, NASA Ames Research Center

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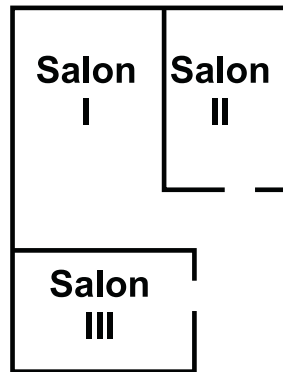Arie Kaufman, *State University of New York at Stony Brook*
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Bill Ribarsky, *Georgia Institute of Technology*
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VIS 2000

Salon I

Salon II

Salon III

Lobby Level, 1st floor

Grand Ballroom C

Grand Ballroom A

Grand Ballroom B
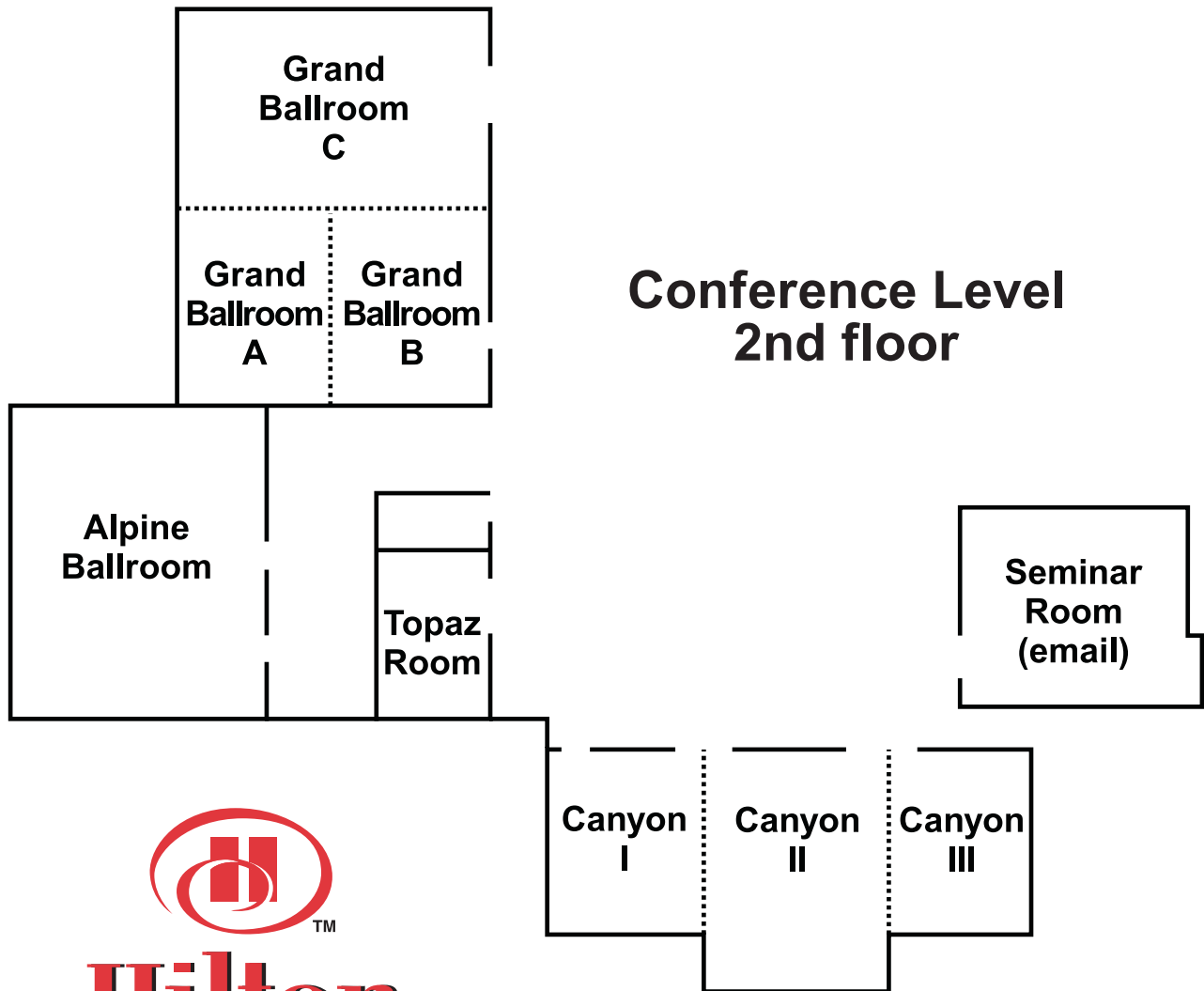
Conference Level 2nd floor

Alpine Ballroom

Topaz Room

Seminar Room (email)

Canyon I

Canyon II

Canyon III

Hilton™

VISUALIZATION 2000 TUTORIALS

Sunday, Monday, Tuesday

TUTORIAL 1   *Canyon 1*

Sunday 8:30-5:30

Multiresolution Techniques for Surfaces and Volumes

Instructors: Markus Gross, *Swiss Federal Institute of Technology (ETH)*
Kenneth Joy, *University of California at Davis*
Richard Hammersley, *Schlumberger Austin Technology Center*
Andreas Hubeli, *Swiss Federal Institute of Technology (ETH)*
Hong-Qian (Karen) Lu, *Schlumberger Austin Technology Center*
Hanspeter Pfister, *MERL - A Mitsubishi Electric Research Lab*

Level: Intermediate

Course Description:

Multiresolution methods and hierarchical data organization have become powerful tools for the representation of surfaces and volumes within visualization. Their power lies in the fact that they combine a lot of useful properties, such as level of detail, local support, smoothness, error bounds and fast computations. This allows one to design efficient methods for data approximation, analysis and compression often resulting in computationally less expensive algorithms. Therefore, multiresolution and hierarchical methods have been used widely and successfully in the visualization community and have developed to a core methodology. Prominent examples comprise adaptive surface and mesh simplification, multiresolution visualization, volume compression and rendering.

The goal of this tutorial is twofold: we will describe the most important state-of-the-art surface and volume representations and we will elucidate their usefulness as modeling tools for visualization. The discussed representations include wavelets, hierarchical splines, subdivision surfaces, mesh reduction methods for surfaces and volumes, discrete surface and volume representations, schemes based on signal processing tools and classical representations. In addition we will show the power of the described methods in various applications with a special emphasis on geosciences. In each of them hierarchy is used in a different setting allowing us to demonstrate the versatility of design patterns and strategies for multiresolution methods.

Who Should Attend:

This course is intended for developers, researchers and practitioners of 3D graphics and data visualization who are interested in methods for addressing the problems of very large data sets. Attendees should have a basic understanding of computer graphics principles, data representation, and visualization algorithms such as color mapping and contouring.

TUTORIAL 2   *Canyon 2*

Sunday 1:30-5:30

An Introduction to Information Visualization Techniques for Exploring Large Databases

Instructor: Daniel A. Keim, *University of Halle*

Level: Beginning - Intermediate

Course Description:

The tutorial provides an overview of information visualization techniques which can be used for exploring large databases. The tutorial presents the state-of-the-art in information visualization, classifying the existing visual data exploration techniques into five groups: Geometric, Icon-based, Pixel-oriented, Graph-based, and Hierarchical Techniques. In addition to the visualization techniques, we also discuss a number of distortion and interaction techniques which have to be combined with the visualization techniques to allow an effective data exploration. Besides describing the techniques, the tutorial focuses on new developments in information visualization. In particular, we describe a wide range of recently developed techniques for visualizing large amounts of arbitrary multi-attribute data which does not have any two- or three-dimensional semantics and therefore does not lend itself to an easy display. A detailed comparison shows the strength and weaknesses of the existing techniques and reveals potentials for further improvements. Several examples demonstrate the benefits of visual data exploration techniques in real applications. The tutorial concludes with an overview of existing visual data exploration systems, including research prototypes, as well as commercial products.

Who Should Attend:

Those interested in exploring visual representations for large databases. A basic familiarity with standard visualization techniques would be helpful but is not necessary.

TUTORIAL 3   *Canyon 3*

Monday 8:30-5:30

The Convergence of Scientific Visualization Methods with the World Wide Web

Instructors: Theresa Marie Rhyne, *Lockheed Martin/ U.S. EPA Visualization Center*
Mike Bailey, *San Diego Supercomputer Center & UCSD*
Mike Botts, *University of Alabama in Huntsville*
Bill Hibbard, *University of Wisconsin at Madison*

Level: Intermediate

Course Description:

This tutorial will examine the convergence of visualization methods with the World Wide Web as well as the relationship between real- time interactivity and scientific information exploration. The application of visualization tools and interactive techniques to the examination and interpretation of scientific data and information will be reviewed. We will discuss how visualization tool development is expanding with the evolution of Java Servlets/Java3D, real time streaming, 3D Web tools (e.g. VRML and X3D), the Extensible Markup Language (XML), and other emerging internet technologies.

The process of developing effective visualization paradigms for supporting high speed networking, multi-platform computer architectures, database management, data mining, user interface design, remote collaborative exploration, science education and real time interactive animation will be addressed. Open source visualization tools are highlighted. Highly illustrative atmospheric, oceanographic and geographic examples will be demonstrated in real time. We will also step beyond traditional 3-D graphics displays and present solid freeform fabrication (SFF) as a visualization tool that yields actual physical 3D models from computer graphics data.

Who Should Attend:

Scientific researchers, educators, computer graphics and visualization specialists interested in exploring particular issues associated with handling the visual display of scientific information and large scientific data sets. Experience with scientific visualization systems and terminology is helpful as well as understanding of computer graphics programming.

INTERNET ACCESS

Seminar Room

Sunday	Noon - 7:00pm
Monday - Thursday	7:30am - 6:00pm
Friday	7:30am - Noon

TUTORIAL 4   *Canyon 1 & 2*

Monday 8:30-5:30

Visualization Toolkits: Applications and Techniques

Instructors: Kenneth (Ken) M. Martin, *Kitware Inc.*

Lisa Sobierajski Avila, *Kitware Inc.*

William (Bill) E. Lorensen, *GE Corporate Research & Development*

James (Jim) V. Miller, *GE Corporate Research & Development*

William (Will) J. Schroeder, *Kitware Inc.*

Level: Intermediate

Course Description:

In this tutorial we will discuss fundamental issues regarding the design, implementation and application of 3D graphics and visualization systems with a focus on the implementation used within the open source Visualization Toolkit. This will be used to illustrate important design issues such as graphics portability, interpreted versus compiled languages, multiple versus single inheritance, data flow models, and user interaction methods. In the remainder of this tutorial we will focus on applying visualization techniques and toolkits to solve problems from a selection of application domains.

Who Should Attend:

This course is intended for users, developers, researchers and practitioners of 3D graphics and data visualization. Attendees should have a basic understanding of computer graphics principles, software development techniques, and visualization algorithms such as color mapping and contouring.

TUTORIAL 5   *Canyon 1 & 2*

Tuesday 8:30-5:30

An Interactive Introduction to OpenGL Programming

Instructors: Ed Angel, *University of New Mexico*

Dave Shreiner, *Silicon Graphics Incorporated*

Level: Beginning

Course Description:

This course will present an overview of creating interactive three-dimensional graphics applications using the OpenGL programming interface. Using tutorials and simple programming exercises, as well as source code examples, and generated images, students will investigate topics ranging from specifying three-dimensional geometric models, and transformations to lighting, shading, and texture mapping interactively, immediately seeing the effects of inputs on rendered scenes. By the conclusion of the course, students should be able to write simple OpenGL applications utilizing the techniques described during the day.

Who Should Attend:

Visualization researchers, developers, and educators interested in using OpenGL for visualization. Students should be able to program in a structured programming language and have some familiarity with basic matrix operations. Knowledge of computer graphics concepts such as lighting, matrix transforms, and texture mapping is helpful, but not required. The course assumes no prior knowledge of OpenGL.

TUTORIAL 6   *Canyon 3*

Tuesday 8:30-5:30

Image Processing for Volume Graphics and Analysis

Instructors: Terry S. Yoo, *National Library of Medicine*

Raghu Machiraju, *The Ohio State University*

Ioannis A. Kakadiaris, *University of Houston*

Ross T. Whitaker, *The University of Utah*

Level: Intermediate

Course Description:

This course is designed around the presentation of an idealized volume visualization pipeline. Like a graphics pipeline, there are steps throughout the procedure that are familiar; however, the beginning is the reconstruction of a continuous model or function from sampled data rather than generative geometry/modeling. The later half of the pipeline will cover transfer functions for classification, shading, texturing, and finally the resampling and projection of the resulting models into image space. Each of these areas will be treated from the viewpoint of the mathematical tools that we use to study and manipulate the data.

The afternoon will be dedicated to exploring emerging techniques relevant to both 3D image processing and volume graphics. Topics for discussion include multiscale methods, segmentation techniques, and level set theory. The advantages of these techniques will be illustrated for analysis through suitable examples. Wavelet techniques will be described. Less emphasis will be paid to the actual design issues of such filters. Rather, the emphasis will be on the utility of these techniques. Similarly, the topics of segmentation and level sets are used as a semantic, rather than a syntactic description of image structure.

Who Should Attend:

Members of the graphics community who are interested in gaining a deeper understanding of volume mathematics in the context of existing volume visualization research. Basic knowledge of 3D computer graphics and an understanding of the basic principles of image-processing would be helpful.

TUTORIAL 7   *Salon 3*

Tuesday 1:30-5:30

Rendering and Visualization in Parallel Environments

Instructors: Dirk Bartz, *University of Tübingen*

Bengt-Olaf Schneider, *IBM T.J. Watson Research*

Claudio Silva, *AT&T Labs - Research*

Level: Intermediate

Course Description:

The continuing commoditization of the computer market has precipitated a qualitative change. Increasingly powerful processors, large memories, big hard disks, high-speed networks, and fast 3D rendering hardware are now affordable without a large capital outlay. A new class of computers, dubbed Personal Workstations, has joined the traditional technical workstation as a platform for 3D modeling and rendering. In this tutorial, attendees will learn how to understand and leverage both technical and personal workstations as components of parallel rendering systems.

We will first discuss the fundamentals of parallel programming and parallel machine architectures. Topics include message passing vs. shared memory, thread programming, a review of different SMP architectures, clustering techniques, PC architectures for personal workstations, and graphics hardware architectures. The second section builds on this foundation to describe key concepts and particular algorithms for parallel polygon rendering and parallel volume rendering. Finally, in section three we put these techniques into the context of concrete parallel rendering implementations.

Who Should Attend:

The tutorial is intended for attendees with an understanding of the basics of 3D graphics and computer architecture. The goal is to provide an overview of existing technology and an introduction of important concepts in parallel rendering and visualization. Furthermore, the tutorial is not targeted at experts in the field. Hence, it will concentrate more on concepts and less on the details of particular techniques.

IEEE SYMPOSIUM ON INFORMATION VISUALIZATION (INFOVIS 2000)

Sponsored by the IEEE Computer Society Technical Committee on Visualization and Graphics

October 9–10, 2000 ■ *Grand Ballroom C*

Monday, October 9

8:30 - 10:00 **Keynote Address**: *Presentation, Visualization, What's Next?,* Jock D. Mackinlay, *University of Aarhus, Denmark*
Chairs: Steve Roth, and Daniel Keim

10:00 - 12:00 **Papers I**: *Visual Querying and Data Exploration*
Chair: Robert Spence

(1) **Polaris: A System for Query, Analysis, and Visualization of Multi-Dimensional Relational Databases,** Chris Stolte, and Pat Hanrahan, *Stanford University*

(2) **Getting Portals to Behave**, Chris Olston, *Stanford University*, and Allison Woodruff, *Xerox PARC*

(3) **A Scalable Framework for Information Visualization**, Matthias Kreuseler, Norma López, and Heidrun Schumann, *University of Rostock*

1:30 - 3:00 **Papers II**: *Graphs and Hierarchies*
Chair: Stephen North

(1) **Visualizing Massive Multi-Digraphs**, James Abello, and Jeffrey Korn, *AT&T Labs*

(2) **Density Functions for Visual Attributes and Effective Partitioning in Graph Visualization**, Ivan Herman, M. Scott Marshall, and Guy Melançon, *Centre for Mathematics and Computer Sciences (CWI)*

(3) **Focus+Context Display and Navigation Techniques for Enhancing Radial, Space-Filling Hierarchy Visualizations**, John Stasko, and Eugene Zhang, *Georgia Tech*

3:30 - 5:00 **Papers III**: *Taxonomies, Frameworks, and Methodology*
Chair: Stuart Card

(1) **A Taxonomy of Visualization Techniques Using the Data State Reference Model**, Ed Chi, *Xerox PARC*

(2) **GADGET/IV: A Taxonomic Approach to Semi-Automatic Design of Information Visualization Applications Using Modular Visualization Environment**, Issei Fujishiro, Rika Furuhata, Yoshihiko Ichikawa, and Yuriko Takeshima, *Ochanomizu University*

(3) **Redefining the Focus and Context of Focus+Context Visualizations**, Staffan Björk, and Johan Redström, *The Interactive Institute*

(4) **From Metaphor to Method: Cartographic Perspectives on Information Visualization**, André Skupin, *University of New Orleans*

(5) **Information Content Measures of Visual Displays**, Julie Yang-Peláez, and Woodie C. Flowers, *MIT*

(6) **Visualizing Sequential Patterns for Text Mining**, Pak Chung Wong, Wendy Cowley, Harlan Foote, Elizabeth Jurrus, and Jim Thomas, *Pacific Northwest National Laboratory*

5:15 - 6:00 **LBHT**
Chair: Keith Andrews

(1) **Star Coordinates: A Multi-dimensional Visualization Technique with Uniform Treatment of Dimensions**, Eser Kandogan, *IBM*

(2) **Visual Question Maps as Search Aids**, Terry Sullivan, Cathleen Norris, and Robert Pavur, *University of North Texas*

(3) **Discussion**

Tuesday, October 10

8:30 - 10:00 **Applications I**: *Document Visualization, Collaborative Visualization, Techniques*
Chair: Jim Thomas

(1) **ThemeRiver: Visualizing Theme Changes over Time**, Susan Havre, Beth Hetzler, and Lucy Nowell, *Battelle Pacific Northwest Division*

(2) **Lighthouse: Showing the Way to Relevant Information**, Anton Leuski, and James Allan, *University of Massachusetts*

(3) **New Methods for the Visualization of Electric Power System Information**, Thomas J. Overbye, *University of Illinois at Urbana-Champaign*, and Jamie D. Weber, *PowerWorld Corporation*

(4) **Collaborative Geographic Visualization: Enabling Shared Understanding of Environmental Processes**, Isaac Brewer, Alan M. MacEachren, H. Abdo, J. Gundrum, and G. Otto, *Penn State University*

10:30 - 12:00 **LBHT**
Chair: Nahum Gershon

(1) **Congestion Control in Mobile Networks**, K.R. Subramanian, and T.A. Dahlberg, *UNCC*

(2) **Should the Elements of Diagrams Be Rendered in 3D?**, Pourang Irani, and Colin Ware, *University of New Hampshire*

(3) **OmniViz Pro?: Applying Multiple Interactive Visualization for the Life and Chemical Sciences**, Deborah A. Payne, Cory Albright, Gus J. Calapristi, Randy Scarberry, Leigh Williams, Vern Crow, Gregory S. Thomas, Sean Zabriskie, Susan Havre, and Jeffrey D. Saffer, *OmniViz, Inc.*

(4) **Graph Drawing 2000: A Look Across the Fence**, Stephen C. North, *AT&T Labs*

(5) **Discussion**

1:30 -3:00 **Applications II**: *Algorithm Visualization, 3D Navigation*
Chair: Mark Derthick

(1) **Interactive Problem Solving Via Algorithm Visualization**, Pearl Pu, *Group of Ergonomics of Intelligent Systems & Design, Database Laboratory, Swiss Institute of Technology*, and Denis Lalanne, *LIA-CERI, Universite d'Avignon et des Pays de Vaucluse*

(2) **Metaphor-Aware 3D Navigation**, C. Russo Dos Santos, *Eurécom Institute*, P.Gros, *Eurécom Institute*, P.Abel, D. Loisel, N. Trichaud, and J-P. Paris, *France Telecom-CNET*

(3) **Creativity, Complexity, and Precision: Information Visualization for (Landscape) Architecture**, Monika Büscher, Dan Shapiro, *Lancaster University*, Michael Christensen, Preben Mogensen, and Peter Ørbæk, *University of Aarhus*

(4) **Using Visualization to Detect Plagiarism in Computer Science Classes**, Randy Ribler, *Lynchburg College*, and Marc Abrams, *Virginia Polytechnic Institute & State University*

3:30 - 5:00 **Capstone Address**, *Visual Storytelling - Where Technology and Culture Meet,* Nahum Gershon, *MITRE*
Chair: George Robertson

For further information *http://www.infovis.org/infovis2000*

Symposium Chair
Jock Mackinlay, *Xerox PARC*

Program Co-Chairs
Steve Roth, *MAYA Viz*
Daniel A. Keim, *University of Halle*

Late-Breaking Hot Topics
Nahum Gershon, *MITRE Corp.*
Keith Andrews, *Graz University of Technology*

Program Committee
Keith Andrews, *Graz University of Technology*

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Jim Wise, *Integrations Corporation*
Pak Chung Wong, *Pacific Northwest National Lab*
William Wright, *Visible Insights, Inc.*

VOLUME VISUALIZATION AND GRAPHICS SYMPOSIUM (VOLVIS 2000)

Co-sponsored by the IEEE Computer Society and ACM/SIGGRAPH

October 9–10, 2000 ■ *Grand Ballroom B*

Monday, October 9

9:00 - 9:15 **Opening Remarks**

9:15 - 10:15 **Interactive Volume Rendering**

(1) **Level-of-Detail Volume Rendering via 3D Textures**, Manfred Weiler, Rüdiger Westermann, Chuck Hansen, Kurt Zimmerman, and Thomas Ertl

(2) **Gigabyte Volume Viewing Using Split Software/Hardware Interpolation**, William R. Volz

11:00 - 12:00 **Iso-Surfacing**

(1) **Reducing Aliasing Artifacts in Iso-Surfaces of Binary Volume**s, Ross T. Whitaker

(2) **Time Critical Isosurface Refinement and Smoothing**, C.L. Bajaj, and V. Pascucci

1:30 - 3:00 **Volume Graphics**

(1) **Fast CSG Voxelization by Frame Buffer Pixel Mapping**, Shiaofen Fang, and Duoduo Liao

(2) **Volume Scene Graphs**, David R. Nadeau

(3) **Shape-based Volumetric Collision Detection**, N. Gagvani, and D. Silver

3:45 - 4:45 **Acceleration of Volume Rendering**

(1) **Accelerating Volume Rendering With Quantified Voxels**, Benjamin Mora, Jean-Pierre Jessel, and René Caubet

(2) **The ULTRAVIS System**, Gunter Knittel

Tuesday, October 10

9:15 - 10:15 **Volume Rendering**

(1) **A Practical Evaluation of Four Popular Volume Rendering Algorithms**, Michael Meißner, Jian Huang, Dirk Bartz, Klaus Mueller, and Roger Crawfis

(2) **ZSWEEP: An Efficient and Exact Projection Algorithm for Unstructured Volume Rendering**, Ricardo Farias, Joseph S. B. Mitchell, and Claudio T. Silva

11:00 - 12:00 **Volume Reconstruction and Backprojection**

(1) **Mastering Windows: Improving Reconstruction**, Thomas Theussl, Helwig Hauser, and Eduard Groeller

(2) **Volumetric Backprojection**, Frank Dachille, Klaus Mueller, and Arie Kaufman

1:30 - 2:30 **Time-varying Volume Rendering**

(1) **Accelerating Time-Varying Hardware Volume Rendering Using TSP Trees and Color-Based Error Metrics**, David Ellsworth, Ling-Jen Chiang, and Han-Wei Shen

(2) **4D Volume Rendering With the Shear Warp Factorisation**, Kostas Anagnostou, and Tim J. Atherton

3:15 - 4:45 **Capstone Talk,** Arie Kaufmann, *State University of New York, Stony Brook*

Symposium Chair
Bill Lorensen, *GE Corporate R&D Center*

Program Co-Chairs
Roger Crawfis, *The Ohio State University*
Daniel Cohen-Or, *Tel Aviv University*

Symposium Committee
Min Chen, *University of Wales, Swansea*
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Michael Vannier, *University of Iowa College of Medicine*
Peter Williams, *Lawrence Livermore National Laboratory*
Karel Zuiderveld, *Vital Images*

For further information e-mail: *volviz00@cis.ohio-state.edu* **or see** *http://www.cis.ohio-state.edu/volviz/volviz00.html*

SYMPOSIUM & TUTORIAL RECEPTION
Monday Evening
7:00pm - 9:00pm
Alpine Ballroom

VIZLIES 2000

Tuesday Evening Special Session
How to Lie and Confuse with Visualization

Tuesday 7:30pm - *Grand Ballroom B*

VISUALIZATION 2000 WORKSHOPS/BOFS

IRIS EXPLORER USER'S MEETING
Grand Ballroom A

Thursday, October 12, 2000 – 7:00pm-8:30pm

Jeremy Walton, *The Numerical Algorithms Group Ltd,* jeremyw@nag.co.uk

http://www.nag.com/Welcome_IEC.html

IRIS Explorer is a visualization toolkit and application builder available from The Numerical Algorithms Group (NAG) for major Unix platforms (including Linux) and Windows NT. The current release (4.0) incorporates a variety of new features, including collaborative visualization (originally presented at IEEE Visualization '96), improved VRML output and an enhanced user interface. This meeting gives users (and prospective users) a chance to hear the latest news about the system (including details of the new features in IRIS Explorer 5.0) and user resources (such as the web-based module repository) from the development team itself.

AVS USER'S MEETING
Grand Ballroom C

Thursday, October 12, 2000 – 7:00pm-8:30pm

Ian Curington, *Advanced Visual Systems Inc.,* ianc@avs.com

http://www.avs.com

AVS, AVS/Express, OpenViz and other products from Advanced Visual Systems will be discussed at the AVS User's Meeting. The meeting gives users a chance to hear news of new releases and future developments from Advanced Visual Systems, a chance to ask questions and discuss user issues and share experiences of using the visualization tools. An update from the International AVS Centre (IAC) who operate the IAC module repository and web site will be given.

Speaker Prep

Room 324 on the 3rd Floor of the Hilton

OPEN VISUALIZATION DATA EXPLORER (OPENDX)
Grand Ballroom B

Thursday, October 12, 2000 – 7:00pm-8:30pm

David Thompson, *VIS, Inc.,* dthompsn@vizsolutions.com, 406·257·8530

Open Visualization Data Explorer(OpenDX) is an application and development software package for visualizing data, especially 3D data from simulations or acquired from observations. it uses a Graphical User Interface based on X windows and Motif. It comes with a complete set of standard visualization tools for looking at data that include cutting planes, vector line traces, volume rendering, and isosurface, isocontour tools. the OpenDX project is a free-source project based on code and ideas found in the IBM Visualization Data Explorer program product. The distribution license for OpenDX has been officially certified as being compliant with open Source Definition by the Open Source Initiative.

In this BOF we will have a brief overview of OpenDX and developers, discuss the current status of the project and the latest updates, solicit ideas and proposals from the OpenDX community regarding future directions, and meet with the OpenDX community and interested developers to exchange information.

ENSIGHT GOLD AND OTHER PRODUCTS FROM CEI
Salon 1

Thursday, October 12, 2000 – 7:00pm-8:30pm

Kent Misegades, *CEI,* kent@ceintl.com

http://www.ensight.com

Representatives from CEI will present results from their research on a number of fronts related to large-scale visualization including, parallel processing on SMP and DMP systems, parallel rendering: monster mode and multipipe, other acceleration techniques, feature extraction, virtual reality, and web-centric visualization tools.

Examples from CEI's involvement with the ASCI project will be shown, for instance the recent record-setting 11.5 billion cell model benchmark.

All users and prospective users of CEI's products, EnSight - general-purpose visualization package, EnSight Gold - for very large models and VR, EnLiten - a platform-independent 'rich' geometry viewer, and EnVideo - a platform-independent animation player, are encouraged to attend this BOF.

VISUALIZATION 2000 CREATIVE APPLICATIONS LAB
Wednesday, 12:15pm - 8:00pm and Thursday, 9:00am - 4:00pm
Canyons Room

The Creative Applications Lab (CAL) is designed to let conference attendees interact with presenters and each other on an individual basis. The CAL will have a variety of computers on which contributors and attendees can install their materials and visualization systems for attendees' experimentation and enjoyment. The CAL will be open in conjunction with demonstrations at Visualization 2000. This is a unique opportunity for conference attendees to interface directly with conference contributors. Please come visit the CAL while you are at Vis 2000! For further information, please contact **Russ Taylor** (taylorr@cs.unc.edu).

VISUALIZATION 2000 CONFERENCE PROGRAM
Wednesday, Thursday, Friday

TECHNICAL CONFERENCE PROGRAM

	Wednesday			Thursday			Friday		
	Grand Ballroom C	*Grand Ballroom B*	*Grand Ballroom A*	*Grand Ballroom C*	*Grand Ballroom B*	*Grand Ballroom A*	*Grand Ballroom C*	*Grand Ballroom B*	*Grand Ballroom A*
8:00am									
9:00am	**Keynote Session** *Michael Cohen* *Grand Ballroom A, B, & C*			**P6** *Papers:* Visual Perception	**W1** *Work in Progress:* InfoVis	**C4** *Cases:* Environmental Applications I	**P12** *Papers:* Clustering Vector Fields	**N3** *Panel:* "Next-Generation Visualization Displays..."	**C6** *Cases:* Environmental Applications II
10:00am									
11:00am	**P1** *Papers:* Biomedical Visualization	**P2** *Papers:* Information Visualization	**C1** *Cases:* Techniques	**P7** *Papers:* Volume Rendering	**P8** *Papers:* Textures & Geometry	**W2** *Work in Progress:* Vector & Tensorfields	**P13** *Papers:* Reconstruction & Modeling	**P14** *Papers:* Polygon Meshes	
12:00pm									
1:00pm							**Capstone Session** *Olivier Faugeras* *Grand Ballroom C*		
2:00pm	**P3** *Papers:* Tetrahedral Grids	**P4** *Papers:* Visual & Haptic Displays	**C2** *Cases:* Biomedical Applications	**P9** *Papers:* Isosurfaces	**P10** *Papers:* Multi-Dimensional & Visualization Systems	**C5** *Cases:* Physics, Information, & Fields			
3:00pm									
4:00pm	**P5** *Papers:* Flow Visualization	**N1** *Panel:* "The Impact of Computer Games..."	**C3** *Cases:* Scientific Applications	**P11** *Papers:* Collaboration & Network Visualization	**N3** *Panel:* "The Transfer Function Bake-Off"	**W3** *Work in Progress:* Frameworks, ...			
5:00pm									

VISUALIZATION 2000 DEMONSTRATIONS & CAL *open at 12:15pm Wednesday*

Wednesday, 8:30 - 10:00am

KEYNOTE *Keynote Session:* **"Visualization of Everyday Things"**, Michael Cohen, *Microsoft Research*

Wednesday, 10:15 - 12:15pm

P1 *Papers:* **Biomedical Visualization**
Chair: Pak Chung Wong

(1) **Extracting Regions of Interest Applying a Local Watershed Transformation**, Stanislav L. Stoev and Wolfgang Straßer, *University of Tübingen*

(2) **A Visibility Determination Algorithm for Interactive Virtual Endoscopy**, Rami Hietala and Jarkko Oikarinen, *University of Oulu*

(3) **3D Digital Cleansing using Segmentation Rays**, Sarang Lakare, Ming Wan, Mie Sato, and Arie Kaufman, *State University of New York at Stony Brook*

(4) **CEASAR: Accurate and Robust Algorithm for Extracting a Smooth Centerline**, Ingmar Bitter, Mie Sato, Michael Bender, Kevin T. McDonnell, Arie Kaufman, and Ming Wan, *State University of New York at Stony Brook*

P2 *Papers:* **Information Visualization**
Chair: David Ebert

(1) **Creating Reusable Visualizations with the Relational Visualization Notation**, Matthew C. Humphrey, *Intellisure*

(2) **H-BLOB: A Hierarchical Visual Clustering Method Using Implicit Surfaces**, T.C. Sprenger, R. Brunella, and M.H. Gross, *ETH Zurich*

(3) **A Spreadsheet Interface for Visualization Exploration**, T.J. Jankun-Kelly and Kwan-Liu Ma, *University of California, Davis*

(4) **Procedural Annotation of Uncertain Information**, Andrej Cedilnik and Penny Rheingans, *University of Maryland, Baltimore County*

C1 *Cases:* **Techniques**
Chair: Kelly Gaither

(1) **Fast Visualization Methods for Comparing Dynamics: A Case Study in Combustion**, Kay A. Robbins and Michael Gorman, *University of Texas at San Antonio*

(2) **Mastering Interactive Surface Rendering for Java-Based Diagnostic Applications**, Lukas Mroz, Rainer Wegenkittl, and Eduard Gröller, *Institute of Computer Graphics, Vienna*

(3) **A Computational Steering System for Studying Microwave Interactions with Space-Borne Bodies**, J. Edward Swan II, Marco Lanzagorta, Doug Maxwell, Eddy Kuo, Jeff Uhlmann, Wendell Anderson, Haw-Jye Shyu, and William Smith, *The Naval Research Laboratory*

(4) **Four-Dimensional Non-Linear Ray Tracing as a Visualization Tool for Gravitational Physics**, Daniel Weiskopf, *University of Tübingen*

KEYNOTE SESSION

Visualization of Everyday Things

Speaker: Michael Cohen, *Microsoft Research*
Grand Ballroom A, B, & C

We are surrounded every day with phenonmena that appear so normal and natural that we simply filter them out to allow us to focus on events relevant to the moment. However, in almost each moment there is structure and beauty that we are simply allowing to slip by. The methods and technologies that have been devoted to scientific visualization, computer vision, and computer graphics provide the tools to let us once again "see" what is slipping by us in our everyday lives.

Revealing the hidden structure around us is at the core of visualization. This talk will provide an overview of advances in technology in computer vision, image based rendering, non-photorealistic rendering and visualization and apply these to common everyday events

Biography:
Michael F. Cohen, Senior Researcher, Manager of the Graphics Research Group, joined Microsoft Research in 1994 from Princeton University where he was on the Computer Science faculty. Michael recently received the 1998 SIGGRAPH Computer Graphics Achievement Award. Michael received his Ph.D. in 1992 from the University of Utah. He also holds undergraduate degrees in Art and Civil Engineering from Beloit College and Rutgers University respectively, and an M.S. in Computer Graphics from Cornell. Dr. Cohen also served on the Architecture faculty at Cornell University and was an adjunct faculty member at the University of Utah. His work at the University of Utah focused on spacetime control for linked figure animation. He is perhaps better known for his work on the radiosity method for realistic image synthesis as discussed in his recent book "Radiosity and Image Synthesis" (co-authored by John R. Wallace). Michael has published and presented his work internationally in these areas. At Microsoft, Dr. Cohen has worked on a number of projects. One project focuses on the problem of image based rendering; capturing the complete flow of light from an object for later rendering from arbitrary vantage points. This work, dubbed "The Lumigraph" is analogous to creating a digital hologram. He has since extended this work through the construction of "Layered Depth Images" that allow manipulation on a PC. Michael also is continuing his work on linked figure animation. In the current work, he and colleagues are focusing on means to allow simulated creatures to portray their emotional state (i.e., a happy walk vs. a sad walk), and to automatically transition between verbs. Dr. Cohen also served as paper's chair for SIGGRAPH '98.

CAPSTONE SESSION

Variational Methods in Medical Imagery: Application to the Segmentation of Anatomical Structures

Speaker: Olivier Faugeras, *INRIA*
Grand Ballroom C

The shapes of anatomical structures can be extremely complicated and their recovery and representation from Medical Imagery is both a technical and a mathematical challenge. On the other hand, one knows a lot about the appearance and the geometry of these structures. A natural question then is how to design principled methods that can incorporate this knowledge? Variational methods are excellent candidates as a starting point for designing such methods: they are built on such solid ground as the theory of Partial Differential Equations (PDEs) and leave themselves to a formal and quantitative analysis.

I take two examples of this approach. The first example is the problem of the detection of blood vessels in Magnetic Resonance Angiography images. The geometric information is that the small blood vessels are well approximated by three-dimensional curves, i.e. manifolds of the three-dimensional space of codimension 2. This information can be used in the design of a snake-like algorithm that minimizes an energy measure by solving a PDE which evolves tubular structures representing the blood vessels. The second example is the problem of using information about the "average" shape in the segmentation of anatomical structures from MR images. I discuss the representation of an average shape through the use of distance functions and show that this information can be naturally used in another snake-like algorithm that also solves a particular class of PDEs. Both cases are illustrated with many examples.

Biography:
Olivier Faugeras is Research Director at INRIA, France, and Adjunct Professor in the EE and CS Department at MIT where he belongs to the AI Lab. He is a member of the French National Academy of Sciences.

Wednesday, 1:45 - 3:45pm

P3 *Papers:* **Tetrahedral Grids**
Chair: Edward Swan

(1) **Simplification of Tetrahedral Meshes with Accurate Error Evaluation**, P. Cignoni, D. Costanza, C. Montani, C. Rocchini, and R. Scopigno, *Consiglio Nazionale delle Ricerche, Pisa*

(2) **Tetrahedron Based, Least Squares, Progressive Volume Models With Application to Freehand Ultrasound Data**, Tom Roxborough and Gregory M. Nielson, *Arizona State University*

(3) **On-the-Fly Rendering of Losslessly Compressed Irregular Volume Grids**, Chuan-kai Yang, Tulika Mitra, and Tzi-cker Chiueh, *State University of New York at Stony Brook*

(4) **Hardware-Accelerated Volume and Isosurface Rendering Based on Cell-Projection**, Stefan Röttger, Martin Kraus, and Thomas Ertl, *University of Stuttgart*

P4 *Papers:* **Visual & Haptic Displays**
Chair: Amitabh Varshney

(1) **Color Calibration of Projectors for Large Tiled Displays**, Aditi Majumder, Zhu He, Herman Towles, and Greg Welch, *University of North Carolina at Chapel Hill*

(2) **Methods for Achieving Seamlessness on High-Resolution Displays Using Uncalibrated Cameras**, Yuqun Chen, Douglas W. Clark, Adam Finkelstein, Timothy Housel, and Kai Li, *Princeton University*

(3) **Shock and Vortex Visualization Using a Combined Visual/Haptic Interface**, Dale A. Lawrence, Christopher D. Lee, Lucy Y. Pao, and Roman Y. Novoselov, *University of Colorado, Boulder*

(4) **Six Degree-of-Freedom Haptic Display**, Arthur Gregory, Ajith Mascarenhas, Stephen Ehmann, Ming C. Lin, and Dinesh Manocha, *University of North Carolina at Chapel Hill*

C2 *Cases:* **Biomedical Applications**
Chair: Steve Bryson

(1) **Combining Local and Remote Visualization Techniques for Interactive Volume Rendering in Medical Applications**, Klaus Engel, Peter Hastreiter, Bernd Tomandl, Knut E.W. Eberhardt, and Thomas Ertl, *University of Stuttgart*

(2) **An Integrated Visualization and Design Toolkit for Flexible Prosthetic Heart Valves**, A.J. Fenlon, T. David, and J.P.R.B. Walton, *The Numerical Algorithms Group Ltd.*

(3) **Immersive Virtual Reality for Visualizing Flow Through an Artery**, Andrew Forsberg, Mike Kirby, David Laidlaw, George Karniadakis, Andries van Dam, and Jonathan Elion, *Brown University*

(4) **Mastering Interactive Virtual Bronchioscopy on a Low-End PC**, Rainer Wegenkittl, Anna Vilanova, B. Hegedüs, D. Wagner, Martin Freund, and Eduard Gröller, *Vienna University of Technology*

VIS 2000

P5 *Papers:* **Flow Visualization**
Chair: Frits Post

(1) **A Level-Set Method for Flow Visualization**, Rüdiger Westermann, *University of Stuttgart,* Christopher Johnson, *University of Utah,* and Thomas Ertl, *University of Stuttgart*

(2) **Hardware-Accelerated Texture Advection for Unsteady Flow Visualization**, B. Jobard, G. Erlebacher, and M.Y. Hussaini, *Florida State University*

(3) **A Flow-guided Streamline Seeding Strategy**, Vivek Verma, David Kao, and Alex Pang, *University of California, Santa Cruz, NASA Ames Research Center*

N1 *Panel:* *"***The Impact of Computer Games on Scientific & Information Visualization: 'If you can't beat them, join them'"**
Organizer: Theresa Marie Rhyne, *Lockheed Martin/U.S. EPA Visualization Center*
Panelists: Peter Doenges, *Evans and Sutherland*
Bill Hibbard, *University of Wisconsin at Madison*
Hanspeter Pfister, *MERL*
Nate Robbins, *Acclaim Entertainment, Inc.*

C3 *Cases:* **Scientific Applications**
Chair: Russell M. Taylor II

(1) **Interactive Visualization of Protein Dynamics**, Henk Huitema and Robert van Liere, *CWI, The Netherlands*

(2) **Interactive Visualization of Particle-In-Cell Simulations**, Patric Ljung, Mark Dieckmann, Niclas Andersson, and Anders Ynnerman, *National Supercomputer Centre, Linköpings Universitet, Sweden*

(3) **Visualization of Time Dependent Confocal Microscopy Data**, Wim C. de Leeuw, Robert van Liere, Pernette J. Verschure, Astrid E. Visser, Erik M. M. Manders, and Roel van Driel, *CWI, The Netherlands*

P6 *Papers:* **Visual Perception**
Chair: Victoria Interrante

(1) **Enabling Level-of-Detail Selection for Exterior Scene Synthesis**, Randy K. Scoggins, *U.S. Army Engineer Research and Development Center,* Raghu Machiraju, *The Ohio State University*, and Robert J. Moorhead, *Mississippi State University*

(2) **Visual Cues for Imminent Object Contact in Realistic Virtual Environments**, Helen H. Hu, Amy A. Gooch, William B. Thompson, Brian E. Smits, , *University of Utah,* John J. Rieser, *Vanderbilt University*, and Peter Shirley, *University of Utah*

(3) **Basic Research for Coloring Multichannel MRI Data**, Shigeru Muraki, Toshiharu Nakai, and Yasuyo Kita, *Electrotechnical Laboratory, MITI*

W1 *Work in Progress:* **InfoVis**
Chair: Penny Rheingans

(1) **ARCHAVE: A Virtual Environment for Archaeological Research**, Daniel Acevedo, Eileen Vote, David H. Laidlaw, and Martha S. Joukowsky, *Brown University*

(2) **Bring back the past - reconstructing the history of Homburg/Germany**, Manfred Brill, *University of Applied Science, Germany*

(3) **Modifiable Treemaps Containing Boxes of Variable Size**, Frederic Vernier, and Laurence Nigay

(4) **Unified Content-based Video Retrieval Modeling**, Yi Wu, Yueting Zhuang, and Yunhe Pan, *Institute of Artificial Intelligence, ZheJiang University, P.R. China*

(5) **Integrated segmentation, registration and visualization of multimodal medical image datasets**, Ravi Bansal, Bernhard Geiger, Ali Banihashemi, and Arun Krishnan, *Department of Imaging and Visualization, Siemens Corporate Research*

C4 *Cases:* **Environmental Applications I**
Chair: Robert Moorhead

(1) **Visual Data Fusion for Applications of High-Resolution Numerical Weather,** Lloyd A. Treinish, *IBM Thomas J. Watson Research Center*

(2) **A Methodology for Plume Visualization with Application to Real-Time Acquisition and Navigation**, Karen G. Bemis, Deborah Silver, Peter A. Rona, and Chengwei Feng, *Rutgers University*

(3) **Vector Fields Simplification - A Case Study of Visualizing Climate Modeling and Simulation Data Sets**, Pak Chung Wong, Harlan Foote, Ruby Leung, Elizabeth Jurrus, Dan Adams, and Jim Thomas, *Pacific Northwest National Laboratory*

CONFERENCE RECEPTION

Wednesday Evening 7:00pm - 9:00pm
Alpine Ballroom

P7 *Papers:* **Volume Rendering**
Chair: Hanspeter Pfister

(1) **Volume Illustration: Non-Photorealistic Rendering of Volume Models**, David Ebert and Penny Rheingans, *University of Maryland, Baltimore County*

(2) **Pen-and-Ink Rendering in Volume Visualization**, S.M.F. Treavett and M. Chen, *University of Wales, Swansea*

(3) **Two-Level Volume Rendering-Fusing MIP and DVR**, Helwig Hauser, Lukas Mroz, Gian-Italo Bischi, and Eduard Gröller, *Vienna University of Technology*

(4) **Optimized Software Splatting Using FastSplats on Rectilinear Grid**, Jian Huang, Klaus Mueller, *State University of New York at Stony Brook*, Naeem Shareef, and Roger Crawfis, *The Ohio State University*

P8 *Papers:* **Textures and Geometry**
Chair: Hans Hagen

(1) **Texturing Techniques for Terrain Visualization**, Jurgen Dollner, Konstantin Baumann, and Klaus Hinrichs, *University of Münster*

(2) **Simplification of Surface Annotations**, Frank Suits, James T. Klosowski, William P. Horn, and Frank Barral, *IBM T.J. Watson Research Center*

(3) **Uniform Frequency Images: Adding Geometry to Images to Produce Space-Efficient Textures**, Adam Hunter and Jonathan Cohen, *The Johns Hopkins University*

(4) **Image Based Rendering with Stable Frame Rates**, Huamin Qu, Ming Wan, Jiafa Qin, and Arie Kaufman, *State University of New York at Stony Brook*

W2 *Work in Progress:* **Vector and Tensorfields**
Chair: David Kenwright

(1) **Adaptive LIC Image Generation Based on Significance Map**, Li Chen, *Research Organization for Information Science & Technology, Japan, State Key Laboratory of CAD&CG, Zhejiang University*, and Qunsheng Peng, *State Key Laboratory of CAD&CG, Zhejiang University*

(2) **Streamtubes and Streamsurfaces for Visualizing Diffusion Tensor MRI Volume Images**, Song Zhang, Charles T. Curry, Daniel S. Morris, David H. Laidlaw, *Brown University*

(3) **Towards Optimizing Local Feature Metric for Simplifying Colored Interval Volumes**, Hiroko Nakamura, Yuriko Takeshima, and Issei Fujishiro, *Ochanomizu University*

(4) **Visualizing Gradient Descent in Probability Space**, Geoffrey Matthews, *Western Washington University*

(5) **Line Integral Convolution with Prickly Texture**, Koji Koyamada, *Iwate Prefectural University*

(6) **Restricted Line Integral Convolution**, Koji Koyamada, *Iwate Prefectural University*

P9 *Papers:* **Isosurfaces**
Chair: Claudio Silva

(1) **Topology Preserving and Controlled Topology Simplifying Multiresolution Isosurface Extraction**, Thomas Gerstner, *University of Bonn* and Renato Pajarola, *University of California, Irvine*

(2) **Isosurfacing in Higher Dimensions**, Praveen Bhaniramka, Rephael Wenger, and Roger Crawfis, *The Ohio State University*

(3) **Semi-Regular Mesh Extraction from Volumes**, Zoe Wood, *Caltech,* Mathieu Desbrun, *University of Southern California,* Peter Schröder, and David Breen, *Caltech*

(4) **Scanline Surfacing: Building Separating Surfaces from Planar Contours**, David Weinstein, *University of Utah*

P10 *Papers:* **Multi-Dimensional and Visualization Systems**
Chair: Nancy Grady

(1) **Navigating High-dimensional Spaces to Support Design Steering**, Helen Wright, *University of Hull,* Ken Brodlie, and Tim David, *University of Leeds*

(2) **Visualization of Multi-Dimensional Data with Vector-fusion**, Robert R. Johnson, *University of Utah*

(3) **Real-World Relativity: Image-Based Special Relativistic Visualization**, Daniel Weiskopf, Daniel Kobras, and Hanns Ruder, *University of Tübingen*

(4) **Visualizing Geodesics**, Ingrid Hotz and Hans Hagen, *University of Kaiserslautern*

C5 *Cases:* **Physics, Information, and Fields**
Chair: Roger Crawfis

(1) **WEAVE: A System for Visually Linking 3-D and Statistical Visualizations Applied to Cardiac Simulation and Measurement Data**, D.L. Gresh, B.E. Rogowitz, R.L. Winslow, D.F. Scollan, and C.K. Yung, *IBM T.J. Watson Research Center*

(2) **Visualizing High-Dimensional Predictive Model Quality**, Penny Rheingans and Marie desJardins, *University of Maryland Baltimore County*

(3) **Visualizing Volume Data using Physical Models**, David R. Nadeau and Michael J. Bailey, *San Diego Supercomputer Center*

(4) **Visualizing DIII-D Tokamak Magnetic Field Lines**, Greg Schussman, Kwan-Liu Ma, David Schissel, and Todd Evans, *University of California, Davis*

**SCI INSTITUTE
SCHOOL OF COMPUTING
UNIVERSITY OF UTAH
OPEN HOUSE**

Thursday Evening 7:00pm - 9:00pm

Buses will run continuously from outside the Hilton Lobby

VIS 2000

P11 *Papers:* **Collaboration and Network Visualization**
Chair: Bill Hibbard

(1) **Geometric Compression for Interactive Transmission**, Olivier Devillers and Pierre-Marie Gandoin, *INRIA, Sophia Antipolis Cedex*

(2) **Toward a Compelling Sensation of Telepresence: Demonstrating a Portal to a Distant (Static) Office**, Wei-Chao Chen, Herman Towles, Lars Nyland, Greg Welch, and Henry Fuchs, *The University of North Carolina at Chapel Hill*

(3) **Multi-User View-Dependent Rendering**, Jihad El-Sana, *Ben-Gurion University*

N2 *Panel:* "**The Transfer Function Bake-Off**"
Organizer: Hanspeter Pfister, *MERL - A Mitsubishi Electric Research Laboratory*
Panelists: Will Schroeder, *Kitware Inc.*
Chandrajit Bajaj, *University of Texas at Austin*
Gordon Kindlmann, *University of Utah*
Hanspeter Pfister, *MERL*

W3 *Work in Progress:* **Frameworks, Visualization Systems, Volume Rendering**
Chair: Rachael Brady

(1) **A Visualization System using Multi Agent Technologies**, Achim Ebert, Andreas Divivier, *DFKI GmbH*, Michael Bender, *University of Kaiserslautern*, and Henning Barthel, *DFKI GmbH*

(2) **Remote Rendering Using Vtk and Vic**, Robert Olson, *Argonne National Laboratory*, and Michael Papka, *Argonne National Laboratory, University of Chicago*

(3) **Design Issues in the AVS/Express Multi-Pipe Edition**, Paul G. Lever, George W. Leaver, Ian Curington, James S. Perrin, Andrew, W. Dodd, Nigel W. John, and W. T. Hewitt, *University of Manchester*

(4) **Speed-up of Volume Rendering by Adaptive Distance Sampling**, H. Chen, J. Hesser, and R. Messnner

(5) **Segmentation and Volume Rendering of Human Brain Cryosections**, Ikuko Takanashi, Eric Lum, *University of California, Davis*, Joerg Meyer, *Mississippi State University*, Kwan-Liu Ma, Bernd Hamann, *University of California, Davis*, and Arthur J. Olson, *The Scripps Research Institute*

(6) **A Shading Function for Projection-based Direct Volume Rendering**, Andreas Werner, and Roland Ruehle, *University of Stuttgart*

P12 *Papers:* **Clustering Vector Fields**
Chair: Alex Pang

(1) **Topology Preserving Compression of 2D Vector Fields**, Suresh Kumar Lodha, Jose C. Renteria, and Krishna M. Roskin, *University of California, Santa Cruz*

(2) **A Continuous Clustering Method for Vector Fields**, Harald Garcke, Tobias Preußer, Martin Rumpf, *University of Bonn*, Alexandru Telea, *Eindhoven University of Technology*, Ulrich Weikard, *University of Bonn*, and Jarke van Wijk, *Eindhoven University of Technology*

(3) **A Topology Simplification Method for 2D Vector Fields**, Xavier Tricoche, Gerik Scheuermann, and Hans Hagen, *University of Kaiserslautern*

N3 *Panel:* "**Next-Generation Visualization Displays: The Research Challenges of Building Tiled Displays**"
Organizers: Mike Papka and Rick Stevens, *ANL/University of Chicago*
Panelists: Jim Ahrens, *LANL*
Kai Li, *Princeton University*
Mike Papka, *ANL/University of Chicago*
Dan Reed, *University of Illinois*
Rick Stevens, *ANL/University of Chicago*

C6 *Cases:* **Environmental Applications II**
Chair: Theresa-Marie Rhyne

(1) **Real-time Visualization of the Clear-up of a Former U.S. Naval Base**, Paul Chapman, Derek Wills, Peter Stevens, and Graham Brookes, *Hull, UK*

(2) **Scientific Visualization of Water Quality in the Chesapeake Bay**, Robert J. Stein, Alan M. Shih, M. Pauline Baker, Carl F. Cerco, and Mark R. Noel, *National Center for Supercomputer Applications*

(3) **Multi-Resolution Visualization Techniques for Nested Weather Models**, Lloyd A. Treinish, *IBM T.J. Watson Research Center*

**For information on the Technical Committee on
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Friday, 10:15 - 12:15pm

P13 *Papers:* **Reconstruction and Modeling**
Chair: Sam Uselton

(1) **Constructing Material Interfaces From Data Sets with Volume-Fraction Information**, Kathleen S. Bonnell, *University of California, Davis*, Mark A. Duchaineau, *Lawrence Livermore National Laboratory*, Daniel R. Schikore, *Computational Engineering International*, Bernd Hamann, and Kenneth I. Joy, *University of California, Davis*

(2) **New Techniques for Topologically Correct Surface Reconstruction**, Udo Adamy, Joachim Giesen, and Matthias John, *ETH Zurich*

(3) **Polyhedral Modeling**, Georges-Pierre Bonneau, and Stefanie Hahmann, *Laboratoire LMC-CNRS, Grenoble*

(4) **Bicubic Subdivision-Surface Wavelets for Large-Scale Isosurface Representation and Visualization**, Martin Bertram, Mark A. Duchaineau, *Lawrence Livermore National Laboratory,* Bernd Hamann, and Kenneth I. Joy, *University of California, Davis*

P14 *Papers:* **Polygon Meshes**
Chair: David Kao

(1) **Anisotropic Geometric Diffusion in Surface Processing**, Ulrich Clarenz, Udo Diewald, and Martin Rumpf, *University of Bonn*

(2) **Fairing of Non-Manifolds for Visualization**, Andreas Hubeli and Markus Gross, *ETH Zurich*

(3) **Interior/Exterior Classification of Polygonal Models**, F.S. Nooruddin, and Greg Turk, *Georgia Institute of Technology*

(4) **Multi-Resolution Dynamic Meshes with Arbitrary Deformation**, Ariel Shamir, Valerio Pascucci, and Chandrajit Bajaj, *University of Texas, Austin*

Friday, 1:00 - 3:00pm

CAPSTONE *Capstone Session:* **Awards for Best Paper, Best Panel, Best Hot Topics, and Best Case Study**
Capstone Address: **Variational Methods in Medical Imagery: Application to the Segmentation of Anatomical Structures,** Olivier Faugeras, *INRIA*

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Visualization is a vital research and applications frontier shared by a variety of science, medical, engineering, business, and entertainment fields. IEEE Visualization 2001 focuses on interdisciplinary methods and collaboration among developers and users of visualization methods across all of science, engineering, medicine, and commerce. Sunday through Tuesday of Conference Week will include tutorials, symposia, and mini-workshops. Papers, panels, case studies, and work in progress will be presented Wednesday through Friday.

We invite you to participate in IEEE Visualization 2001 by submitting your original research through papers, panels, case studies, work in progress, and demonstrations. Share your perspectives through panels and workshops, or your experience through tutorials. Please select the forum appropriate to your submission, where it will be considered by your peers for presentation. Particular focus on parallel techniques in visualization and information visualization are addressed in special two-day symposia.

For further information on the conference, evolving symposia, or on submissions, contact:
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Conference Papers *(due March 31, 2001)*

Papers are solicited that present research results related to all areas of visualization. Original papers are limited to 5,000 words. The submission of NTSC VHS video (up to 5 minutes in length) to accompany the paper is strongly recommended. This year we will begin accepting electronic submissions of papers. If you choose to submit electronically, please submit in the PDF or postscript format. If you choose to submit hardcopy, please submit 7 hardcopies of all materials. Regardless of whether you submit your paper electronically or in the hardcopy format, a complete paper submission form including the abstract must be sent through the conference website for each submission. Details for electronic submission are available on the web page. Accepted papers will be included in the conference proceedings; the videos will be included in the conference video proceedings.

Panel Proposals *(due March 31, 2001)*

Panels should address the most important issues in visualization today. Panelists should be experts in their fields who can discuss the challenges of visualization, and engage the audience and fellow panel members in a stimulating, interactive debate. Panel proposals should describe the topic to be addressed and identify the prospective panelists. Each panelist should include a position statement on the topic and a short biography, the total of which should be limited to 500 words. The statements will be included in the conference proceedings. Details for proposal submission are available on the web page.

Case Study Papers *(due March 31, 2001)*

Case studies are reports on how visualization has contributed to the analysis of data in actual applications or studies of the visualization process. A short paper limited to 2500 words (maximum 4 pages B/W plus 1 page color) will be included in the conference proceedings. Images and/or NTSC VHS video to accompany the paper are recommended; the video will be included in the conference video proceedings. Details for submission are available on the web page.

Work in Progress *(due June 15, 2001)*

Submissions are solicited for Work in Progress sessions that pertain to all areas of Visualization. These submissions must be original abstracts, must describe work in progress by the authors and their collaborators, and may not exceed 500 words or a maximum of 1 page including images. Images and/or NTSC VHS video to accompany the abstract are recommended. Authors of accepted abstracts will have an opportunity to submit a revised and extended abstract, as well as presenting the work at the conference. These extended abstracts may not exceed 1000 words or a maximum of 2 pages including images. All accepted abstracts will be distributed at the conference but not published in the conference proceedings. Videos associated with accepted abstracts may be included in the conference video proceedings. Details for submission are available on the web page.

Tutorial Proposals *(due March 31, 2001)*

Half-day and full-day course proposals are invited for visualization systems, methods, and application areas. Tutorials will be offered Sunday, Monday, and Tuesday. Details for submission are available on the web page.

Mini-Workshop and Birds-of-a-Feather Proposals *(due March 31, 2001)*

Proposals may be submitted for evening Birds-Of-A-Feather (BOF) gatherings on visualization methods or application areas. They should deal with state-of-the-art topics and involve experts in the field. Discipline-focused proposals devoted to a particular discipline's methods and needs are encouraged. Details for proposal submission are available on the web page.

Demonstration Proposals

Visualization 2001 is a unique opportunity to present your products or research to visualization experts from a wide variety of fields. We invite demonstrations of commercial hardware, software, integrated systems peripherals, and literature, as well as academic research. We encourage demonstrators to have technical representatives in attendance. Details for proposal submission are available on the web page.

Creative Applications Lab

The Creative Applications Lab (CAL) is designed to let presenters interact with conference attendees on an individual basis. The CAL will have a variety of computers on which the contributors can install their materials for attendees' experimentation and enjoyment. The CAL will be open in conjunction with the demonstrations at Visualization 2001. Details for submission are available on the web page.

Co-located with IEEE Visualization 2001 are:

IEEE 2001 Symposium on Information Visualization (InfoVis 2001) *(submission deadline March 31, 2001)*

Papers, panels and case studies concentrating on issues specific to abstract information visualization. http://www.infovis.org/infovis2001

IEEE/SIGGRAPH 2001 Symposium on Parallel Visualization and Graphics (PVG 2001) *(submission deadline March 31, 2001)*

Papers and case studies in parallel visualization and graphics, with particular interest in techniques and applications for large data visualization.