A D V A N C E P R O G R A M

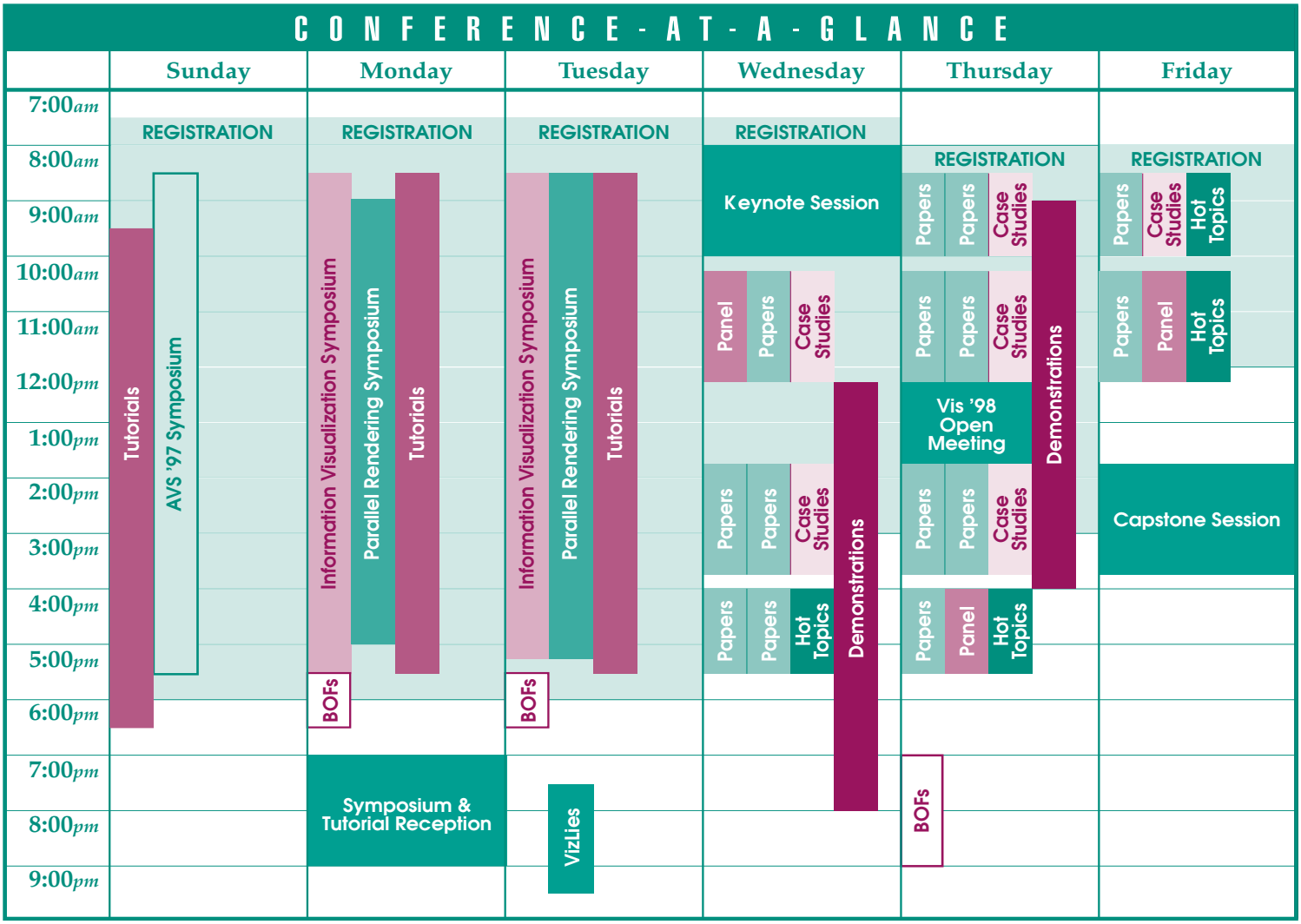
IEEE Visualization NINETY-SEVEN

October 19 • October 24, 1997
Sheraton Crescent Hotel, Phoenix AZ

THE INSTITUTE OF ELECTRICAL & ELECTRONICS ENGINEERS, INC. IEEE
IEEE COMPUTER SOCIETY

Sponsored by IEEE Computer Society Technical Committee on Computer Graphics In Cooperation with ACM/SIGGRAPH

CONFERENCE-AT-A-GLANCE



Sessions on Terascale Visualization, Volume Rendering, Flow Visualization, Vector Fields, Terrain Visualization, Medical Visualization, Information Visualization, Multiresolution, User Interfaces and Interaction, Educational Visualization, Isosurfaces, Visualization Systems, Web and Virtual Reality, Data Extraction, Engineering and Computational Geometry, Compression, Polygonal Surfaces, Math and Statistics, Surface Simplification, and Perceptual Measures for Visualization

Get complete, up-to-date listings of program information from

URL: http://www.erc.msstate.edu/vis97
http://davinci.informatik.uni-kl.de:8000/Vis97
PRS URL: http://www.icase.edu/~kma/prs97-info.html
InfoVis URL: http://www.erc.msstate.edu/vis97/cfp/infoviz.html
AVS97 URL: http://www.iavsc.org/IAC/AVS97
FTP server: ftp.erc.msstate.edu, directory vis97
or contact: Robert Moorhead, Mississippi State University, 601·325·2850, rjm@erc.msstate.edu

Welcome to IEEE Visualization '97

Welcome to the eigth IEEE Visualization conference! Continuing in the tradition of past conferences, we believe that we have another strong technical program that addresses the varied aspects of visualization: algorithms, techniques, and applications. The number of Late Breaking Hot Topic (LBHT) sessions have been doubled due to the very positive response we got to their introduction last year. These sessions consist of late breaking topics or works in progress. We think you will find our keynote speaker (Tom DeFanti) and our capstone speaker (Mark Pesce) rather insightful and thought-provoking. We have expanded our Friday program in response to the large increase in paper submissions we received this year.

The conference week has a varied program for you to choose from. The conference unofficially begins on Saturday with a workshop on Data Mining and Data Visualization and a new workshop on Visualization on Personal Computers. Symposia and Tutorials start on Sunday. We have three Symposia this year which start on Sunday: Information Visualization (InfoVis), Parallel Rendering (PRS), and a new symposium called AVS User and Developer Meeting (AVS97). In conjunction with the AVS97, we are offering a hands-on, all-day tutorial on Monday as part of the expanded tutorial program this year. A total of eight tutorials are offered Sunday through Tuesday and cover subjects for the beginner and the advanced attendee. The technical program starts Wednesday and begins with the Keynote Address, followed by concurrent sessions of papers, panels, case studies, and LBHTs, each presenting the latest issues, research, and applications in visualization. Demonstrations of visualization products, tools, and applications will begin mid-day on Wednesday and continue through Thursday afternoon. Also we have changed our registration system this year to offer attendees more opportunities to move between the various offerings on Sunday through Tuesday.

We hope you can join us in Phoenix the week of October 19 - 24, 1997 for IEEE Visualization '97. Besides the technical program, you have a chance to meet and talk with leaders in the field of visualization and enjoy one of the nicest places to be in mid-October. Don't forget your swim wear, basketball shoes, tennis racket, or desert hiking boots!

Robert Moorhead, Mississippi State University

Nancy Johnston, Lawrence Berkeley National Laboratory

IEEE Visualization '97 Conference Co-Chairs

Visualization '97 Conference Committee

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Michael Vannier, *Mallinckrodt Institute of Radiology*
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VISUALIZATION '97 TUTORIALS

Sunday, Monday, Tuesday

TUTORIAL 1

Sunday 9:30-6:30

Introduction to VRML

Instructors: D. Nadeau

Level: Beginner

Course Description:
Participants in this tutorial will learn how to use VRML to author their own 3-D virtual environments on the World Wide Web. The course also offers brief coverage of the JAVA3D standard. Participants will learn the syntax of VRML, typical usage patterns, ways of avoiding common mistakes, animation and scene design technique, and tricks for increasing performance and realism. This tutorial is intended for visualization programmers interested in developing 3-D applications or applets.

Who Should Attend:
This tutorial is intended for those persons interested in authoring their own 3D content on the Web using VRML

TUTORIAL 2

Sunday 9:30-6:30

Introduction To Data Visualization

Instructors: G. Grinstein, M. Ward

Level: Beginner

Course Description:
This tutorial will cover history, computer graphics background, and the system issues involved in interactive data visualization and data exploration. We will look at fundamental perceptual issues, discuss data representations, compare visualization systems, and examine different application domains. We will also present state of the art exploration environments, including integrated database visualization systems, information visualizers, and highly interactive virtual exploration spaces.

Who Should Attend:
This course is aimed at attendees who would like to acquire or strengthen their fundamental background in basic visualization theory and systems, and would like to improve their day-to-day visualization results (in research, development, and implementation).

TUTORIAL 3

Monday 8:30-5:30

Overview to Visualization with AVS/Express

Instructors: Members of the International AVS Centre (IAC) and the AVS Professional Services team

Level: Beginner/Intermediate

Course Description:
This one day tutorial will provide attendees with a high level overview of data visualization solutions with the Advanced Visual Systems AVS/Express product family. Attendees will be introduced to the fundamentals of data visualization with AVS/Express, a perspective on the range of possible solutions, and interesting tips and techniques.

Who Should Attend:
This session is designed for anyone tasked with producing and developing visualization solutions, but not thoroughly familiar with the AVS/Express visualization environment.

TUTORIAL 4

Monday 8:30-5:30

Volume Visualization: Principles and Practice

Instructors: A.E. Kaufman (Organizer and Speaker), R. Avila, W.E. Lorensen, L.M. Sobierajski, R. Yagel

Level: Intermediate

Course Description:
Volume visualization is a key technology for visualizing 3D sampled, simulated, and synthetic datasets. This course provides an overview of the nomenclature, the technology, and the techniques, with an emphasis on algorithms, software tools, and applications. The course covers different approaches in surface extraction, volume viewing, volume shading, volume synthesis, volumetric global illumination, commercially available software, and applications. Slides, videos, and live web demos will demonstrate state-of-the-art techniques.

Who Should Attend:
The tutorial is designed for scientists, engineers, computer graphicists, and graduate students who are new to the field of volume visualization or interested in expanding their knowledge in that field.

CALL FOR STUDENT VOLUNTEERS

Students are invited to be a part of Visualization'97! In exchange for helping to run the conference, student volunteers may attend paper and panel sessions as well as workshops, symposia, and tutorials. For more information, see the student volunteer web site:

URL: http://glug.cs.uml.edu/~dpinkney/vis97

TUTORIAL 5

Monday 8:30-5:30

Wavelet and Numerical Methods for Visualization

Instructors: R. Machiraju, N. Max, T. Möller, R. Moorhead

Level: Intermediate

Course Description:
The focus of this course is a survey of wavelet and numerical tools for the imaging and visualization process. We will introduce basic numerical concepts of interpolation and approximation theory. The application of this theory to volume rendering and image analysis is demonstrated by different current research results. We especially introduce signal processing analysis tools and wavelet techniques. We show their relationship to numerical analysis and it's practical interpretation and use for the specification of image artifacts such as blurring and aliasing as well as for efficient algorithms (multi-resolution analysis).

Who Should Attend:
This tutorial is designed for scientists, engineers, computer graphicists, and graduate students who are interested in learning more about the mathematical foundations of imaging and visualization algorithms. It would also be of interest to professionals who would like to learn state-of-the-art techniques in image analysis and compression using multi-resolution techniques including wavelets. Some mathematical background and exposure to volume rendering is assumed.

Please note that the Sheraton Crescent does not have a complimentary shuttle bus from the airport to the hotel. However, you may use the Phoenix Super Shuttle at a charge of $12 per person. For reservations and information call 602·244·9000.

For information on the Technical Committee on Computer Graphics conferences, publications, and programs, check

http://www.cc.gatech.edu/gvu/tccg/

TUTORIAL 6

Tuesday 8:30-12:30

Perception for Visualization: From Design to Evaluation

Instructors: H. Levkowitz, V. Interrante, H.P. Meinzer

Level: Intermediate

Course Description:
This tutorial will teach you the basics of human perception and how to utilize them in the complete process of visualization: from design to evaluation.

Who Should Attend:
Anybody engaged in the design, implementation, and evaluation of visualizations.

TUTORIAL 7

Tuesday 1:30-5:30

Visualization Toolkits: Applications and Techniques

Instructors: K.M. Martin, W.E. Lorensen, W.J. Schroeder

Level: Intermediate

Course Description:
In this tutorial we will discuss fundamental issues regarding the design, implementation and application of 3D graphics and visualization systems. We will describe and contrast some current systems such as Open Inventor, AVS/Express, Data Explorer and the Visualization Toolkit. We will examine in more detail the implementation of the 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.

TUTORIAL 8

Tuesday 8:30-5:30

Interactive Visualization and Web based Exploration

Instructors: T.M. Rhyne, M. Botts, W. Hibbard, L. Treinish

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 sets will be discussed. Highly illustrative atmospheric, oceanographic and geographic examples will be demonstrated in real time. The process of developing effective visualization paradigms for supporting high speed networking, database management, heterogenous computing platforms, user interface design, collaborative computing, science education and the implementation of animation techniques will be highlighted.

Who Should Attend:
Scientific researchers, educators, and computer graphics 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 graphics programming.

ADVANCED VISUAL SYSTEMS USER AND DEVELOPER MEETING (AVS '97)

October 19, 1997 ■ *PHOENIX, AZ*

AVS '97 – the Advanced Visual Systems User and Developer Meeting – is a unique opportunity for AVS users to meet and share their experiences in using AVS products for scientific visualization and visualization application development. AVS '97 will be held on the first day of the IEEE Visualization '97 conference, the annual gathering for visualization experts from a variety of disciplines. This full day event will allow expert and novice users to meet and discuss their applications, as well as providing the opportunity to meet with Advanced Visual Systems executive, technical and marketing personnel to discuss future directions for AVS products.

The meeting is NOT restricted to current licensed users of Advanced Visual Systems products. However, current users are encouraged to present their work at the meeting. We are interested in receiving submissions concerning the application of the following Advanced Visual Systems products: Application Visualization System (AVS), AVS/Express (Developer Edition and Visualization Edition), Toolmaster, and Gsharp. Application areas can include, but are not limited to the following:

- Engineering (for example, computational fluid dynamics, finite element analysis, electronic design automation, simulation, etc.)
- Medical imaging
- Geospatial (for example, RF propagation, meteorology, hydrology, data fusion, ground water modeling)
- Oil and gas exploration and production
- Finance
- Data mining/OLAP

Papers (abstracts) will be reviewed by the program committee before final decisions are made. If you are interested in participating in the program committee, presenting a paper, or participating in some other capacity, please contact:

Scott Andersen, *Advanced Visual Systems Inc.*
Phone: 617·890·4300, x2220
Fax: 617·890·8287
Email: sandersen@avs.com

Format for paper submission and deadlines: Detailed specifications on the format for submissions, as well as deadlines, will be provided shortly on the Advanced Visual Systems Inc. world wide web homepage (http://www.avs.com), as well as via postings to the newsgroup comp.graphics.apps.avs.

Offered by the Visualization '97 Conference Committee and sponsored by the IEEE Computer Society Technical Committee on Computer Graphics

AVS '97 Program Committee

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TUESDAY EVENING SPECIAL SESSION – PARTY

Tuesday, October 21, 7:30pm (VizLies '97)

How to Lie and Confuse with Visualization

People have misled with statistics and maps for years. Now it's time to look again into misleading and confusing in the field of visualization. Your once-a-year big chance to do just that, in the open, will be in this special party session on Tuesday, October 21, 1997 at 7:30 PM.

You are invited to bring with you visualization lies and confusing articles (yours or others), on 35 mm slides or video. During this evening, it will be allowed to lie and confuse, but not to take credit to the work of others *, so please do not forget to mention the producers' names.

After the informal presentations and truthful debates, the audience will choose the biggest (visualization) lie for 1997. When the evening is over, lying will be outlawed again (for another year). Quite seriously, we hope that by presenting common and uncommon errors occurring in the visual presentation of information, all of us in the visualization community will benefit, or at least have a good laugh at the expense of others.

Reservations and advance submissions are now being accepted. Please send them to **Nahum Gershon**, The MITRE Corporation, 1820 Dolley Madison Blvd., McLean, VA 22102-3481 and **F. David Fracchia**, Simon Fraser University, Computing Science, Burnaby, BC V5A 1S6 Canada. Reservations and advance submissions are not required but are strongly recommended. Confused? For more information (genuine!), please contact gershon@mitre.org or fracchia@cs.sfu.ca.

**It is rather allowed to professionally blame those responsible for the lies and confusion.*

IEEE SYMPOSIUM ON PARALLEL RENDERING (PRS '97)

Sponsored by the IEEE Computer Society Technical Committee on Computer Graphics in Cooperation with ACM/SIGGRAPH

October 20-21, 1997 ■ *PHOENIX, AZ*

Monday, October 20

8:00 - 9:00 **Registration**

9:00 - 9:20 **Opening Session**

9:20 - 10:20 ***Keynote Address I*: Commodity Parallel Rendering <= Small Features + Big Chips**, F. Crow

10:20 - 10:40 Break

10:40 - 12:00 ***Papers*: Volume Rendering I**

(1) **Par Vox—A Parallel Splatting Volume Rendering System for Distributed Visualization**, P.P. Li, S. Whitman, R. Mendoza, J. Tsiao

(2) **Exploiting Deep Parallel Memory Hierarchies for Ray Casting Volume Rendering**, M.E. Palmer, R. Taylor, B. Totty

12:00 - 1:40 Lunch

1:40 - 3:00 ***Papers*: Load Balancing I**

(1) **Index Bit Permutations for Automatic Data Redistribution**, P. Mackerras, B. Corrie

(2) **Maintaining Dynamic Geometric Objects on Parallel Processors**, R. Garmann

3:00 - 3:30 Break

3:30 - 4:50 ***Papers*: Load Balancing II**

(1) **Parallel Progressive Rendering of Animation Sequences at Interactive Rates on Distributed-Memory Machines**, A. Reisman, C. Gotsman, A. Schuster

(2) **Hierarchical Graphics Databases in Sort-First**, C. Mueller

4:50 - 5:00 **Closing Remarks**

7:00 - 9:00 **Symposia Reception**

Tuesday, October 21

8:30 - 9:30 ***Keynote Address II:* Parallel Pixels: Hardware Considerations for Image-Based Rendering**, N. England

9:30 - 10:00 Break

10:00 - 12:00 ***Papers*: Radiosity**

(1) **Parallel Hierarchical Radiosity on Cache-Coherent Multiprocessors**, J. Richard, J.P. Singh

(2) **A Parallel Hierarchical Radiosity Algorithm for Complex Scenes**, C.C. Feng, S.N. Yang

(3) **Towards Efficient Parallel Radiosity for DSM-based Parallel Computers Using Virtual Interfaces**, L. Renambot, B. Arnaldi, T. Priol, X. Pueyo

12:00 - 1:40 Lunch

1:40 - 3:00 ***Papers*: Volume Rendering II**

(1) **Parallel Processing of the Shear-Warp Factorization with the Binary-Swap Method on a Distributed-Memory Multiprocessor System**, K. Sano, H. Kitajima, H. Kobayashi, T. Nakamura

(2) **A Scalable Parallel Cell-Projection Volume Rendering Algorithm for Three-Dimensional Unstructured Data**, K.L. Ma, T. Crockett

3:00 - 3:30 Break

3:30 - 5:00 ***Panel*: Are there really ANY applications for parallel rendering? OR, Why bother?**

Panelists: S. Uselton (*Moderator*), M. Cox, T. Crockett, M. Miller, M. Muuss

5:00 - 5:15 **Closing Remarks**

Symposium Co-Chairs

Kwan-Liu Ma, *ICASE*
James Painter, *Los Alamos National Laboratory*
Gordon Stoll, *Stanford University*

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For further information contact:
prs97-cochairs@icase.edu
or visit
http://www.icase.edu/~kma/prs97-info.html

IEEE SYMPOSIUM ON INFORMATION VISUALIZATION (INFOVIS '97)

October 20-21, 1997 ■ *PHOENIX, AZ*

Monday, October 20

8:30 - 8:45 **Opening**

8:45 - 10:00 **Keynote Session: *TBD***

10:00 - 10:30 Break

10:30 - 12:30 ***Session 1*: Visualizing Information Spaces**

(1) **H3: Laying Out Large Directed Graphs in 3D Hyperbolic Space**, T. Munzner

(2) **Visualizing Information on a Sphere**, M.H. Gross, T.C. Sprenger, J. Finger

(3) **Spreadsheet Approach to Information Visualization**, E.H. Chi, P. Barry, J. Riedl, J. Konstan

(4) **Research Report: Adaptive Information Visualization Based On the User's Multiple Viewpoints-Interactive 3D Visualization of the WWW**, T. Teraoka, M. Maruyama

(5) **Business Demonstration**

(6) **Discussion**

12:30 - 2:00 Lunch

2:00 - 3:30 ***Session 2*: Visualizing Software Systems**

(1) **Managing Software with New Visual Representations**, M.C. Chuah, S.G. Eick

(2) **On Integrating Visualization Techniques for Effective Software Exploration**, M.-A.D. Storey, K. Wong, F.D. Fracchia, H.A. Muller

(3) **Research Report: Cacti: A Front End for Program Visualization**, S. Reiss

(4) **Business Demonstration**

(5) **Discussion**

3:30 - 4:00 Break

4:00 - 4:45 ***Session 3*: Visualizing Dense Information Fields**

(1) **Nonlinear Magnification Fields**, T.A. Keheay, E. L. Robertson

(2) **Research Report: Managing Multiple Focal Levels in a Focus+Context View**, T. Tenev, R. Rao

(3) **Discussion**

4:45 - 5:30 ***Special Address*: ISAT Study Group on Visualizing Information Spaces**, J.Hollan

5:30 - 6:30 ***Birds of a Feather (BOF) Session*: Web Visualization (WebVis)**

7:00 **Reception**

Tuesday, October 21

8:30 - 10:00 ***Keynote Panel*: 2D vs. 3D**

10:00 - 10:30 Break

10:30 - 12:30 ***Session 4*: Visualizing Data and Information Bases**

(1) **Coordinating Declarative Queries with a Direct Manipulation Data Exploration Environment**, M. Derthick, J. Kolojejchick, S.F. Roth

(2) **Domesticating Bead: Adapting an Information Visualization System to a Financial Institution**, M. Chalmers, D. Brodbeck, A. Lunzer, P. Cotture

(3) **Research Report: Design and Evaluation of Incremental Data Structures and Algorithms for Dynamic Query Interfaces**, E. Tanin, R. Beigel, B. Shneiderman

(4) **Research Report: Volume Rendering for Relational Data**, B.G. Becker

(5) **Business Demonstrations**

(6) **Discussion**

12:30 - 2:00 Lunch

1:30 - 2:30 ***Session 5*: General Issues**

(1) **The Structure of the Information Visualization Design Space**, S.K. Card, J. Mackinlay

(2) **Multidimensional Detective**, A. Inselberg

(3) **Concept Demonstration: Metrics for Effective Information Visualizations**, R. Brath

(4) **Discussion**

3:00 - 4:00 Break

4:00 - 5:00 ***Capstone Address*: Drawing on the Right Side of the Brain**, B. Edwards

5:00 - 5:15 **Conclusion**

5:30 - 6:30 ***Birds of a Feather (BOF) Session*: Business Visualization (BizVis)**

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Steven Roth, *Carnegie Mellon University*

Program Co-Chairs
Nahum Gershon, *The MITRE Corporation*
John Dill, *Simon Fraser University*

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Steven Feiner, *Columbia University*
Nahum Gershon, *The MITRE Corporation*
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Robert J. K. Jacob, *Tufts University*
Brian Johnson, *Synopsys, Inc.*
Daniel Keim, *University of Munich, Germany*
Adrienne Kleiboemer, *Concept5*
Robert Korfhage, *University of Pittsburgh*
Sharon Laskowski, *NIST*
Jock Mackinlay, *Xerox PARC*
Alberto O. Mendelzon, *University of Toronto*
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Jan Pedersen, *Verity*
Ramana Rao, *Xerox PARC*
Gruia-Catalin Roman, *Washington University*
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Ben Shneiderman, *University of Maryland*
Robert Spence, *Imperial College*
James Thomas, *PNNL*
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WORKSHOP ON ISSUES IN THE INTEGRATION OF DATA MINING AND DATA VISUALIZATION

Saturday, October 18, 1997

Georges Grinstein, *The MITRE Corporation*
grinstein@cs.uml.edu

Data Visualization deals with the effective portrayal of data with a goal towards insight about the data. Typically, the data is of high volume, multidimensional in nature, and does not lend itself to easy display. The data is also often non-spatial and temporal in nature.

Data visualization software systems are very popular with end-user domain scientists who require visual tools to explore and analyze their data. These visual tools however are used strictly as output of the exploration process and have received much attention whereas the input issues to the exploration process still have not. The knowledge-discovery-in-databases (KDD) community looks at visualization as a back-end of the exploration process; the visualization community looks at KDD and analytic methods also as applications to generate displays. However visualization can be used as input to KDD and analytic tools; it can also be used to support computational steering. This workshop will continue the discussions started at the first two workshop and focus on these and other issues that make a case for integrating KDD and visualization technologies.

Participation is limited to 20 people.

Two previous Workshops (Siggraph '90 and Visualization '91) have dealt with areas such as high-level requirements for data structures and access software, and data visualization environments. The first and second workshop on Database Issues for Data Visualization held in 1993 and 1995 explored the fundamental issues. A number of experimental, prototype, and research systems were presented. The second workshop also saw a beginning interest with data mining and visualization integration. This trend so significant in the commercial sector today is in its infancy.

Position Statements and papers are welcome on the following issues as they relate to KDD and data visualization integration - we would like to keep discussions focused on the end result, which is improving the integration of data mining and knowledge discovery systems with visualization:

- Requirements Visualization places on Knowledge Discovery Systems
- Data Models and Access Structures
- Modeling the User - Tasks
- Processes
- Support Issues
- Advanced User Interfaces for Data Mining
- Visual Languages for Data Mining
- System Integration Issues
- Computational Steering for Data Mining
- Distributed, Heterogeneous Data Set Issues
- Data and Computation Sharing
- Examples of Integrated Systems
- Applications of Integrated Systems

The Workshop format allows for the formal presentation of the papers in the morning session (accepted papers will be included in preprints). These presentations are designed to serve as catalysts for discussion. In addition, there will be a few invited papers, summaries of the first part of the KDD'97 workshop, and several afternoon subgroup discussion sessions. Participants will have an opportunity to edit and resubmit their papers for possible post-workshop publication.

Papers (and position papers to be expanded for final publication) are solicited that present research results in the integration of data mining and visualization. Papers should be limited to 5,000 words and may be accompanied by NTSC video. These should describe some original research on the particular subject, and how that research fits in with the overall theme of the workshop. Proper references should be cited. Position Statements (1-2 pages) are also accepted. Position Papers might preceed a longer paper to be given at the Workshop. Deadline for paper submissions is September 15, 1997.

This call for papers is also available via WWW: URL: http://www.cs.uml.edu/~grinstei/kddvis-workshop.html

Submissions may be post-mailed to: Georges Grinstein, Institute for Visualization and Perception Research, University of Massachusetts at Lowell, Lowell MA 01854 - USA. Hard Copy: 2 copies of original, double spaced.

Email or call with specific requests to Georges Grinstein, grinstein@cs.uml.edu, 508-934-3627, Andreas Wierse, wierse@rus.uni-stuttgart.de, +49-711-685-5796 or Usama Fayyad, fayyad@microsoft.com, 206-703-1528

WORKSHOP ON PC-BASED VISUALIZATION AND COMPUTER GRAPHICS

Saturday, October 18, 1997

Bill Ribarsky, *Georgia Institute of Technology*
ribarsky@cc.gatech.edu

This full-day workshop will examine the exciting possibilities and massive new markets that will result from the wide availability of interactive 3D graphics on PCs. Already consumers can buy 3D graphics accelerators for their home computers, and Intel estimates that by the year 2000, 80% of all PCs will have 3D graphics. What is to be done with this enormous increase in the availability of computer graphics to the consumer? What tools and applications will be needed? It may be that applications that are now minor or non-existent could become dominant in the coming years. How will we address the concurrent growth in the visualization of non-scientific data, and how will burgeoning areas such as the Web be affected by the wide availability of 3D computer graphics? A key question is: the PC is ubiquitous, 3D graphics is about to become ubiquitous, can we make visualization ubiquitous, too? This workshop will address these and other issues.

We plan to have invited participants from the computer and software industries and from academia. In addition we will select a limited number of additional participants for discussions and possible presentations. If you would like to participate, please submit a 1-2 page position paper by September 1, 1997 to the contact above.

To insure the widest possible dissemination of workshop discussions, a report on its activities will appear in IEEE Computer Graphics & Applications. In addition the report will be posted on the TCCG Web page. Finally, we will decide at the workshop whether to have a full symposium with refereed papers and a published proceedings at a future Visualization conference. For workshop attendees, this will be an opportunity to get involved early in establishing and running this symposium.

IBM VISUALIZATION DATA EXPLORER USER GROUP MEETING

Thursday, October 23, 1997
7:00 - 9:00pm

Keith Sams, *Mgr, Sales & Marketing*
IBM Visualization Data Explorer

Mae Lemke
IBM Visualization Data Explorer

ibmdx@watson.ibm.com
www.almaden.ibm.com/dx/

IBM Visualization Data Explorer users or anyone who is interested in learning more about IBM Visualization Data Explorer should plan on attending our Birds of a Feather session. We will have a guest speaker, who will discuss development of visual analysis applications with IBM Visualization Data Explorer. We will discuss the application of IBM Visualization Data Explorer in fields such as weather visualization, computational fluid dynamics, medical imaging, business informatics, Geo-spatial analysis, web-based visual analysis and many others... Key members of the development team will present what is new with version 3.1.4 of IBM Visualization Data Explorer and what the future might hold for IBM Visualization Data Explorer users. An open panel discussion will allow everyone to get involved in the discussion. Refreshments will be provided. Come learn more about today's fastest growing visual analysis software, IBM Visualization Data Explorer!

Birds of a Feather (BOF) sessions will be held Thursday evening. These sessions will provide participants the opportunity to discuss current topics with others. BOFs are open to all Vis '97 attendees. If you wish to lead a BOF, please contact Edward Swan (swan@ait.nrl.navy.mil). Be sure to check the final program to see what BOFs are offered and when you arrive, be sure to check for additional BOFs.

VISUALIZATION '97 LATE BREAKING HOT TOPICS

Come and be a part of the Late Breaking Hot Topics Sessions during the Visualization '97 Conference. Presentations of late breaking results, works in progress, innovative ideas, and applications of visualization will be given. These shorter talks allow for lively interaction. The sessions will be held Wednesday, Thursday, and Friday as part of the technical program.

VISUALIZATION '97 CONFERENCE PROGRAM

Wednesday, Thursday, Friday

TECHNICAL CONFERENCE PROGRAM

	Wednesday			Thursday			Friday		
	Track A	*Track B*	*Track C*	*Track A*	*Track B*	*Track C*	*Track A*	*Track B*	*Track C*
8:00*am*	**Keynote Session** *Tom DeFanti*								
9:00*am*				5A *Papers:* User Interfaces & Interaction	5B *Papers:* Volume Rendering II	5C *Cases:* Educational Visualization	9A *Papers:* Polygonal Surfaces	9B *Cases:* Math & Statistics	9C *Hot Topic:s* Session III
10:00*am*	2A *Panel:* Terascale Visualization: Approaches, Pitfalls, & Issues	2B *Papers:* Volume Rendering I	2C *Cases:* Flow Visualization	6A *Papers:* Isosurfaces	6B *Papers:* Visualization Systems	6C *Cases:* Web & Virtual Reality	10A *Papers:* Surface Simplification	10B *Panel:* Perceptual Measures	10C *Hot Topic:s* Session IV
11:00*am*									
12:00*pm*									
1:00*pm*									
2:00*pm*	3A *Papers:* Vector Fields	3B *Papers:* Terrain Visualization	3C *Cases:* Medical Visualization	7A *Papers:* Data Extraction	7B *Papers:* Flow Visualization	7C *Cases:* Engineering and Computational Geometry	**Capstone Session** *Mark Pesce*		
3:00*pm*									
4:00*pm*	4A *Papers:* Information Visualization	4B *Papers:* Multi-Resolution	4C *Hot Topics:* Session I	8A *Papers:* Compression	8B *Panel:* Information Exploration Shootout	8C *Hot Topic:s* Session II			
5:00*pm*									

VIS'97 DEMONSTRATIONS *open at 12:15pm Wednesday*

Wednesday, 8:00 - 10:00am

KN *Keynote Session:*
Keynote Address: Global Tele-Immersion
Speaker: Thomas A. DeFanti

Wednesday, 10:15 - 12:15pm

2A *Panel:* **"Terascale Visualization: Approaches, Pitfalls, and Issues"**
Chairs: C. Hunter, R. Crawfis
Panelists: M. Cox, R. Crawfis, B. Hamann, C. Hansen, M. Miller

2B *Papers:* **Volume Rendering I**

(1) **A Comparison of Normal Estimation Schemes,** T. Möller, R. Machiraju, K. Mueller, R. Yagel

(2) **Collision Detection for Volumetric Models,** T. He, A. Kaufman

(3) **The VSBUFFER: Visibility Ordering of Unstructured Volume Primitives by Polygon Drawing,** R. Westermann, T. Ertl

(4) **Volume Rendering of Abdominal Aortic Aneurysms,** R.C. Tam, C.G. Healey, B. Flak

2C *Cases:* **Flow Visualization**

(1) **Vortex Identification - applications in aerodynamics,** D. Kenwright, R. Haimes

(2) **exVis 1.0: Developing a Wind Tunnel Data Visualization Tool,** S.P. Uselton

(3) **Visualizing 3D Flow with Volume LIC: issues and insights,** V. Interrante

(4) **Towards Efficient Visualization Support for Single-block and Multi-block Datasets,** J.M. Favre

Keynote Session: ***Global Tele-Immersion***

Speaker: Thomas A. DeFanti, *Electronic Visualization Laboratory, University of Illinois at Chicago*

Advances in computer visualization, virtual reality, high-performance computing and networking technology have opened up the possibility for entirely new modes of interaction and collaboration. The basic hardware technology exists for constructing shared interactive virtual reality simulations in which physical entities such as people,scientific instruments and machines can interact with synthetic entities, such as scientific simulations and agents acting as virtual people or teachers. Tele-Immersive applications are those virtual reality simulations that couple many sites and users located at geographically distributed locations.

Our prototypical tele-immersive environment consists of a collection of CAVE-like virtual reality displays in which user position in a shared virtual space is determined via one or more trackers attached to the user. Multichannel audio or haptic devices provide additional sensory feedback. Although the required computing and visualization technology are available on a stand-alone basis, fundamentally interactive modes of collaboration call for the interconnection of appropriate computers, visualization devices, information sources and people by high-speed networks. The current national and international networks are not sophisticated enough to allow teleimmersion as a vehicle for collaboration, science or education.

This talk will discuss many of the considerations for networking and virtual reality, particularly over national and international distances.

Biography: Tom DeFanti is an internationally recognized expert in computer graphics. In the 24 years he has been at University of Illinois at Chicago - Electronic Visualization Laboratory (EVL), Dr. DeFanti has amassed a number of credits, including: use of EVL hardware and software for the computer animation produced for the first "Star Wars" movie; early involvement in video game technology long before video games became popular; contributor and co-editor of the 1987 National Science Foundation-sponsored report "Visualization in Scientific Computing"; recipient of the 1988 ACM Outstanding Contribution Award; an appointment in 1989 to the Illinois Governor's Science Advisory Board; University Scholar for 1989-1992; appointed an ACM Fellow in 1994; appointed one of several USA technical advisors to the G7 GIBN activity in 1995; appointed to the Internet 2 Advisory Committee in 1997; and, recognition along with EVL co-director Daniel J. Sandin for conceiving the CAVE virtual reality theater in 1991.

He has also been active in the ACM SIGGRAPH organization and in the ACM/IEEE Supercomputing (SC) conference. Current and past activities include: secretary of SIGGRAPH (1977-1981); co-chair of the SIGGRAPH 79 conference; chair of SIGGRAPH (1981-1985); past chair of SIGGRAPH(1985-1989); editor of the "SIGGRAPH Video Review" video publication, which he founded in 1979; and, member of the SIGGRAPH 92 and SIGGRAPH94 conference committees. He was information architect on the SC'95 conference committee, responsible for the I-WAY and GII Testbed activities and is a member of the SC'97 Program Committee. He is one of the Co-PI's of the National Computational Science Alliance (NCSA).

Capstone Session: ***Dissolving Descartes: Perception and the Construction of Reality***

Speaker: Mark Pesce, *Independent Author*

Johannes Kepler had a devil of a time trying to discern the laws of planetary motion from the observed movements of the heavenly bodies. He spent months - perhaps years, trying to divine the circles which could contain their motions. From Pythagoras to Kepler, our visualization of the "perfect" forms of circle and sphere constrained the development of science far more than they aided it; when Kepler discovered the ellipsoid- and Newton wrote an equation to describe it - they laid down the fundamental mechanism of scientific discovery, in it an endless two-step of visualization and codification.

What we observe becomes scientific law; what we can see becomes true. The old proverb goes, "Seeing is believing," but somewhere along the way "seeing" has become confused with "visualizing", leading researchers in directions conditioned more by preconceived notions of underlying reality than any foundation of phenomena.

Science refuses to stir from its Narcissus trance; transfixed by our own gazings into the mirror, only the subtle genius of a Heisenberg to remind us that our reflections tell us more about ourselves than the outside universe.

Yet visualizations *are* useful; the ability to bend space and time, to map to the human sensorium that which can not be directly observed has extended our understanding immeasurably, from the inner boundaries of quantum uncertainty to the outer edges of the Big Bang. For this reason - and because visualization will become increasingly the foundation from which we make the decisions upon which our lives depend – the sciences of visualization must articulate a philosophical system which infuses these perceptions with a necessary self-consciousness. As the heirs to Wiener, McLuhan and Maturana, it's been left to us to build a synthetic coherence from both phenomena and perception, moving from Cartesian duality to a quantum poesis, from separation to unity, from perception to reality.

Biography: Mark Pesce is an Internet visionary and co-creator of VRML. What started as a vision of 3D information on the Internet has blossomed into the reality of a true Cyberspace under his guidance. He has presented his vision of VRML on numerous occasions to the international World Wide Web community. Pesce is the co-recipient of Meckler's Market Impact Award for Virtual Reality, and was recently named one of Network Computing's Most Influential People in Networking.

In his efforts to create a comprehensive framework for the inventory of affect in cyberspace, Pesce has consistently critiqued the medium he helped to create. "Final Amputation: Pathogenic Ontology in Cyberspace", delivered at CYBERCONF3, laid out a model - perceptual cybernetics - useful in understanding the psychological consequences of communicative mediation. Tying this foundation to Post-Modernist theory on one hand and esoteric magick on the other, Pesce outraged/delighted the audience at ISEA 1995, with "Ontos, Eros, Noos,Logos", uniting the Deleuzian discourse of assemblage with the ancient forms of ritual and witchcraft. In "Proximal and Distal Unities", presented at CYBERCONF5, Pesce argued that Peirre Teilhardde Chardin's Noosphere had arrived, and seemed to be using human agency to invoke itself into greater being.

During their 1996 competition, Mr. Pesce received an Honorable Mention from the Ars Electronica Foundation for WebEarth, which creates a fully-interactive real-time model of the planet from space, on the desktop. Mr. Pesce is the author of three books, "VRML: Browsing and Building Cyberspace", "VRML: Flying Through the Web", and " Learning VRML: Design for Cyberspace", all published by New Riders Publishing. Most recently, Mr. Pesce was selected as one of the " ID 40" for 1997 by International Design magazine, and as one of the Microtimes 100 for 1996.

Wednesday, 1:45 - 3:45pm

3A *Papers:* Vector Fields

(1) **Auralization of Streamline Vorticity in Computational Fluid Dynamics Data**, C.R. Volpe, E.P. Glinert

(2) **Singularities in Nonuniform Tensor Fields**, Y. Lavin, Y. Levy, L. Hesselink

(3) **Visualization of Higher Order Singularities in Vector Fields**, G. Scheuermann, H. Hagen, H. Krueger, M. Menzel, A. Rockwood

(4) **Principal Stream Surface**, W. Cai, P.A. Heng

3B *Papers:* Terrain Visualization

(1) **ROAMing Terrain**, M.A. Duchaineau, M. Wolinsky, D.E. Sigeti, M.C. Miller, C. Aldrich, M. Mineev

(2) **Visualization of Height Field Data with Physical Models and Texture Photomapping**, D. Clark, M.J. Bailey

(3) **Visualization of Large Terrains in Resource-Limited Computing Environments**, B. Rabinovitch, C. Gotsman

(4) **Building and Traversing a Surface at Variable Resolution**, L. De Floriani, P. Magillo, E. Puppo

3C *Cases:* Medical Visualization

(1) **Brushing Techniques for Exploring Volume Datasets,** P. C. Wong, R.D. Bergeron

(2) **Interactive Volume Rendering for Virtual Colonoscopy,** S. You, L. Hong, K. Junyaprasert, A. Kaufman, S. Muraki, Y. Zhou

(3) **DNA Visual and Analytic Data Mining: A Case Study**, P. Hoffman, G. Grinstein, K. Marx, I. Grosse, E. Stanley

(4) **An Interactive Cerebral Blood Vessels Exploration System**, A. Puig, D. Tost, I. Navazo

Wednesday, 4:00 - 5:30pm

4A *Papers:* Information Visualization

(1) **Multivariate Visualization Using Metric Scaling,** P.C. Wong, R.D. Bergeron

(2) **Visualizing the Behavior of Higher Dimensional Dynamical Systems**, R. Wegenkittl, H. Loeffelmann, E. Groeller

(3) **Displaying Data in Multidimensional Relevance Space with 2D Visualization Maps,** J. Assa, D. Cohen-Or, T. Milo

4B *Papers:* Multiresolution

(1) **Multiresolution Tetrahedral Framework for Visualizing Volume Data,** Y. Zhou, B. Chen, A. Kaufman

(2) **Haar Wavelets over Triangular Domains with Applications to Multiresolution Models for Flow over a Sphere**, G.M. Nielson, I.H. Jung, J. Sung

(3) **Wavelet-based Multiresolutional Representation of Computational Field Simulation Datasets,** Z. Zhu, R. Machiraju, B. Fry, R.J. Moorhead

4C *Hot Topics Session I*

IEEE VISUALIZATION '98

October 18 - 23, 1998
Sheraton Imperial Hotel
Research Triangle Park, North Carolina

Thursday, 8:30 - 10:00am

5A *Papers:* User Interfaces & Interaction

(1) **Dynamic Color Mapping of Bivariate Qualitative Data,** P. Rheingans

(2) **The Contour Spectrum**, C.L. Bajaj, V. Pascucci, D.R. Schikore

(3) **Constrained 3D Navigation with 2D Controllers,** A.J. Hanson, E. Wernert

5B *Papers:* Volume Rendering II

(1) **Two-Phase Perspective Casting for Interactive Volume Navigation**, M.L. Brady, K. Jung, H.T. Nguyen, T. Nguyen

(2) **Accelerated Volume Rendering Using Homogenous Region Encoding**, J.L. Freund, K. Sloan

(3) **An Anti-Aliasing Technique for Splatting,** E.J. Swan II, K. Mueller, T. Möller, N. Shareef, R.A. Crawfis, R. Yagel

5C *Cases:* Educational Visualization

(1) **Instructional Software for Visualizing Optical Phenomena,** D.C. Banks, J.T. Foley, K.N. Vidimce, M.H. Kiu

(2) **Wildfire Visualization,** J. Ahrens, P. McCormick, J.Bossert, J. Reisner, J. Winterkamp

(3) **Visualization of Geometric Algorithms in an Electronic Classroom,** M. Shneerson, A. Tal

Thursday, 10:15 - 12:15pm

6A *Papers:* Isosurfaces

(1) **A Topology Modifying Progressive Decimation Algorithm**, W.J. Schroeder

(2) **Efficient Subdivision of Finite-Element and CFD Datasets into Consistent Tetrahedra**, G. Albertelli, R.A. Crawfis

(3) **Interval Volume Tetrahedralization**, G.M. Nielson, J. Sung

(4) **Computing the Separating Surface for Segmented Data**, G.M. Nielson, R. Franke

6B *Papers:* Visualization Systems

(1) **Application-Controlled Demand Paging for Out-of-Core Visualization,** M.B. Cox, D. Ellsworth

(2) **GADGET: Goal-Oriented Application Design Guidance for Modular Visualization Environments,** I. Fujishiro, Y. Takeshima, Y. Ichikawa, K. Nakamura

(3) **Collaborative Visualization**, J.D. Wood, H. Wright, K.W. Brodlie

(4) **VizWiz: A Java Applet for Interactive 3D Scientific Visualization on the Web**, C.K. Michaels, M.J. Bailey

6C *Cases:* Web & Virtual Reality

(1) **Collaborative Augmented Reality: Exploring Dynamical Systems,** A. Fuhrmann, H. Loeffelmann, D. Schmalstieg

(2) **Visualizing Customer Segmentations Produced by Self Organizing Maps,** H. Rushmeier, R. Lawrence, G. Almasi

(3) **Pearls Found on the way to the Ideal Interface for Scanned-probe Microscopes,** R.M. Taylor, J. Chen, S. Okimoto, N. Llopis-Artime, V.L. Chi, F.P. Brooks Jr., M. Falvo, S. Paulson, P. Thiansanthaporn, D. Glick, S. Washburn, R. Superfine

(4) **Viewing IGES Files Through VRML,** Jed Marti

Thursday, 1:45 - 3:45pm

7A *Papers:* Data Extraction

(1) **View Synthesis from a Sparse Set of Views**, Q. Chen, G.G. Medioni

(2) **Virtualized Reality: Constructing Time-Varying Virtual Worlds from Real World Events,** P.W Rander, P.J. Narayanan, T. Kanade

(3) **Extracting Feature Lines from 3D Unstructured Grids,** K.L. Ma, V.L. Interrante

(4) **I/O Optimal Isosurface Extraction,** Y.J. Chiang, C.T. Silva

7B *Papers:* Flow Visualization

(1) **CAVEvis: Distributed Real-Time Visualization of Time-Varying Scalar and Vector Fields Using the CAVE Virtual Reality Theater**, V.S. Jaswal

(2) **Fast Oriented Line Integral Convolution for Vector Field Visualization via the Internet,** R. Wegenkittl, E. Groeller

(3) **UFLIC: A Line Integral Convolution Algorithm for Visualizing Unsteady Flows,** H.W. Shen, D.L. Kao

(4) **The Motion Map: Efficient Computation of Steady Flow Animations,** B. Jobard, W. Lefer

7C *Cases:* Engineering and Computational Geometry

(1) **Visualization of Plant Growth,** J. Loomis, X. Liu, Z. Ding, K. Fujimura

(2) **Determination of Unknown Particle Charges in a Thunder Cloud Based Upon Detected Electric Field Vectors,** D. Drake, T. Simpson, L. Smithmeir, P. Rheingans

(3) **Interactive Visualization of large Polynomial Environments,** L. Sobierajski Avila, W. Schroeder

(4) **Efficient visualization of Physical and Structural Properties in Crash-worthiness Simulations,** S. Kuschfeldt, T. Ertl, M. Holzner

Thursday, 4:00 - 5:30pm

8A *Papers:* Compression

(1) **Integrated Volume Compression and Visualization**, T.C. Chiueh, C.K Yang, T. He, H. Pfister, A. Kaufman

(2) **Multiresolution Compression and Reconstruction**, O.G. Staadt, M.H Gross, R. Weber

(3) **Optimized Geometry Compression for Real-time Rendering**, M.M. Chow

8B *Panel:* "Information Exploration Shootout Project and Benchmark Data Sets: Evaluating how Visualization does in Analyzing Real-World Data Analysis Problems"

Chair: G. Grinstein

Panelists: S. Laskowski, B. Rogowitz, G. Wills, other unnamed panelists

8C *Hot Topic Session II*

Friday, 8:30 - 10:30am

9A *Papers:* Polygonal Surfaces

(1) **Visibility Culling using Portal Textures,** D.G. Aliaga, A.A. Lastra

(2) **Repairing CAD Models,** G. Barequet, S. Kumar

(3) **Dynamic Smooth Subdivision Surfaces for Data Visualization**, C. Mandal, H. Qin, B.C. Vemuri

9B *Cases:* Math & Statistics

(1) **Visualization of Rotation Fields,** M.A. Livingston

(2) **Isosurface Extraction Using Particle Systems,** P. Crossno, E.S. Angel

(3) **A Visualization of Music,** S.M. Smith, G.N. Williams

9C *Hot Topic Session III*

Friday, 10:15 - 12:15pm

10A *Papers:* **Surface Simplification**

(1) **Smooth Hierarchical Surface Triangulations**, T.S. Gien, B. Hamann, K.I. Joy, G.L. Schlussmann, I.J. Trotts

(2) **The Multilevel Finite Element Method for Adaptive Mesh Optimization and Visualization of Volume Data**, R. Grosso, C. Luerig, T. Ertl

(3) **Simplifying Polygonal Models Using Successive Mappings**, J. Cohen, D. Manocha, M. Olano

(4) **Controlled Simplification of Genus for Polygonal Models**, J. El-Sana, A. Varshney

10B *Panel:* **"Perceptual Measures for Effective Visualizations"**

Chair: H. Rushmeier

Panelists: H. Barrett, P. Rheingans, S. Uselton, A. Watson

10C *Hot Topic Session IV*

Friday, 1:00 - 3:00pm

CS *Capstone Session:*

Awards for Best Paper, Best Panel, Best Hot Topics and Best Case Study

Capstone Address, M. Pesce

VISUALIZATION '97 CORPORATE PARTNERS

The IEEE Visualization '97 Conference Committee gratefully acknowledges:

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VISUALIZATION '97 DEMONSTRATIONS

Wednesday, Thursday

Attending Visualization '97 will be a multinational audience of innovators and leaders from academia, business, and government – people who purchase and recommend computer hardware and software for their organizations. Join them by participating in one of these demonstration categories:

Corporate Partners Cost: $5,000
Our Corporate Partners will have a place of prominence at Visualization '97, as we acknowledge their support of the conference and its goals.

Corporate Demonstrations Cost $1,750
These demonstrations are more technical presentations as opposed to traditional trade show style presentations. The goal is to emphasize research results, novel tools, new equipment, and new applications.

Corporate Support Cost: $1,000
You can be associated with Visualization '97 as Corporate Support, gaining attention for your products and providing the conference with your assistance without the need to mount a demonstration.

Non-Profit Demonstrator Cost: $400
The Non-Profit Demonstrator is one whose organization does not sell any visualization products. Non-Profit Demonstrators typically come from research groups in government, industry or academia that have developed visualization software, but do not sell them as a commercial product.

Academic Institution Demonstrator No fee
This category is for academic institutions who do not sell any visualization products. Demonstrations may be proposed in this category and a limited number will be accepted depending on the quality of and interest in the presentation.

We must receive your commitment to participate soon so that we can make arrangements and you can benefit from full publicity for your participation. Don't Delay! For further information, please contact:

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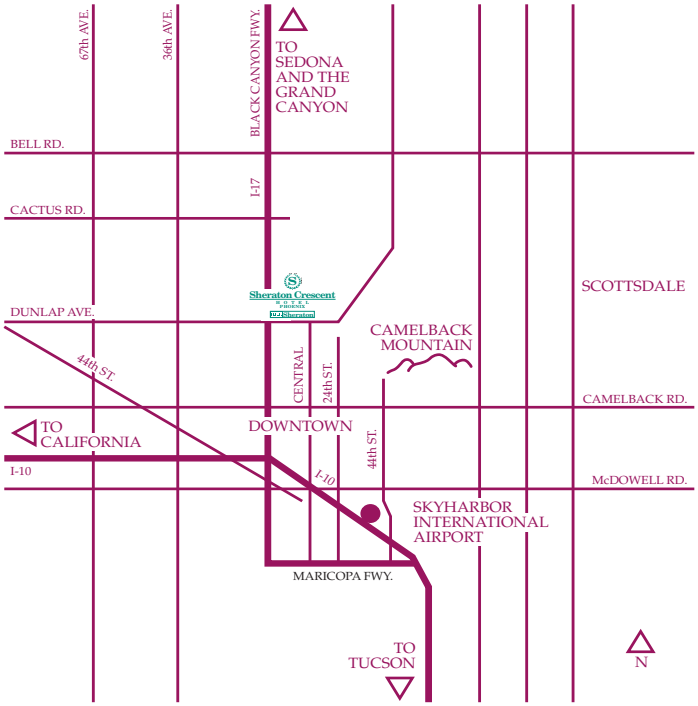
PHOENIX, ARIZONA

Phoenix offers something for everyone who visits this beautiful southwestern city. There are several premier golf courses in the area. Arizona's largest shopping and entertainment complex, the Metrocenter, is across the interstate from the Sheraton Crescent and offers 25 restaurants and hundreds of shops. Castles 'n Coasters amusement park features a 90-foot-high corkscrew roller coaster, miniature golf, bumper boats and an array of games.

Arizona's natural and scenic wonders are all just a day trip away; included are The Grand Canyon, Sedona/Oak Creek Canyon, Arizona-Sonora Desert Museum, Old Tucson, and Biosphere II. Phoenix also boasts two recreational parks that are in close proximity to spring training baseball parks.



CONFERENCE HOTEL

Sheraton Crescent Hotel – Phoenix, Arizona

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The Sheraton Crescent is a cool oasis conveniently located just west of Scottsdale and 30 minutes away from Phoenix Sky Harbor International Airport and the city's top shopping, entertainment and sporting venues. Here, European elegance combines with casual, southwestern ambiance in a lush, tropical setting that offers a dazzling array of choices. When it's time to play, the Sheraton offers a sparkling swimming pool with a whirlpool spa, a complete fitness center with squash courts, lighted tennis courts, sand volleyball and basketball courts, and a new water slide. Special rates for the Sheraton are listed below. Rates are per room per night.

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Check in time is 3:00 p.m. and check-out is 12:00 p.m.

To make your reservation, please phone the hotel directly at 800·423·4126 or complete the following form and return it to the hotel by mail or fax at the address given below. **Reservations must be received by the hotel before September 26, 1997 to obtain these rates.** Be sure to mention the Vis '97 conference when making your reservation.

NOTE: *Please sign up at the conference hotel. We understand that you are all on a budget, but so are we. We need your hotel room reservations in the Vis '97 block at the conference hotel, or else the conference has to pay extra for the conference rooms. Because we have a heavy AV requirement, we have to book a hotel that has large conference rooms and high ceilings. There aren't many of those who will book a small conference like ours. Please help us out by supporting the conference hotel. We don't want to have to raise our rates to cover hotel penalties.*

HOTEL REGISTRATION FORM

Visualization '97 October 19 - October 24, 1997

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Room type desired:

- ☐ 1 King
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APPENDIX

A

Adam, Nabil, *Rutgers University* 7
Ahlberg, Christopher, *IVEE* 7
Ahrens, James, *Los Alamos National Laboratory* 12
Akeley, Kurt, *Silicon Graphics, Inc.* 6
Albertelli, Guy, *The Ohio State University* 13
Aldrich, Charles, *Los Alamos National Laboratory* ...12
Almasi, George 13
Aliaga, Daniel G., *University of North Carolina at Chapel Hill* 13
Andersen, Scott, *Advanced Visual Systems Inc.* 2, 5
Andrews, Keith, *Graz University of Technology* 7
Angel, Edward S., *Univesity of New Mexico* 13
Apperly, Mark M., *University of Waikato, New Zealand* 7
Arnaldi, Bruno, *IRISA, France and Universitat de Girona, Spain* 6
Assa, Jackie, *Computer Science Department* 12
Avila, Lisa Sobierajski, *General Electric Corporate R & D Center* 3, 13
Avila, Rick, *General Electric Corporate R & D Center* 3

B

Bailey, Michael J., *San Diego Supercomputer Center/University of California, San Diego* 2, 12, 13
Bajaj, Chandrajit L., *Purdue University* 2, 12
Baker, H. Harlyn, *Interval Research Corporation* 2
Baker, Polly, *National Center for Supercomputing Applications* 2
Banks, David C., *Mississippi State University* 2, 12
Barequet, Gill, *Johns Hopkins University* 13
Barrett, Harrison, *University of Arizona* 14
Barry, P. 7
Becker, B.G., *Silicon Graphics, Inc.* 7
Beigel, R. 7
Bender, Michael, *University Kaiserslautern* 2
Benton, Stephen A., *Media Lab, MIT* 2
Bergeron, R. Daniel, *University of New Hampshire* .2, 12
Böecker, Hienz-Dieter, *GMD-IPSI, Darmstadt* 7
Boff, Kenneth R., *Armstrong Lab* 7
Bossert, James, *Los Alamos National Laboratory* 12
Botts, M. 4
Brady, Martin L., *Intel Corp.* 12
Brady, Rachael, *National Center for Supercomputing Applications* 2
Brath, R., *Visible Decisions* 7
Brodbeck, D. 7
Brodlie, Ken W., *University of Leeds* 13
Brooks Jr., Fredrick P., *University of North Carolina at Chapel Hill* 13
Brown, Mike, *Computer Modeling Group* 5
Bryson, Steve, *MRJ/NASA Ames* 2

C

Cabral, Brian, *Silicon Graphics, Inc.* 2
Cai, Wenli, *Fraunhofer Institute for Computer Graphics* ..12
Campbell, Kevin, *Lawrence Berkeley National Laboratory* ..2
Card, Stuart K., *Xerox Parc* 7
Chalmers, Allen, *University of Bristol* 6
Chalmers, Matthew, *Ubilab, Union Bank of Switzerland* ..7
Chen, Baoquan, *Center for Visual Computing* 12
Chen, Jun 13
Chen, Qian, *University of Southern California* 13
Chi, Ed H., *University of Minnesota* 7
Chi, Vernon L. 13
Chiang, Yi-Jen, *State University of New York, Stony Brook* 13
Chiueh, Tzi-Cker, *State University of New York, Stony Brook* 13
Chow, Mike M., *Massachusetts Institute of Technology* ..13
Chuah, Mei C., *Carnegie Mellon University* 7
Clark, Dru, *University of California San Diego* 12
Cohen, Jonathan, *University of North Carolina, Chapel Hill* 14
Cohen-Or, Daniel, *Tel-Aviv University, Israel* 2, 12
Corrie, Brian, *Australian National University* 6
Coquillart, Sabine *INRIA, France* 2
Cotture, P., *Unilab, Switzerland* 7
Cox, Donna, *NCSA* 2
Cox, Michael B., *MRJ at NASA Ames Research Center* 2, 6, 10, 13
Crawfis, Roger A., *The Ohio State University* ..10, 12, 13
Crockett, Tom, *ICASE* 6
Crossno, Patricia, *University of New Mexico* 13
Crow, Frank, *Interval Research Corporation* 6

D

DeFanti, Thomas A., *Electronic Visualization Laboratory, University of Illinois at Chicago* 2, 10, 11
De Floriani, Leila, *University of Genova* 12
Derthick, M. 7
Dill, John, *Simon Fraser University* 7
Ding, Zhaohua 13
Drake, Dan 13
Duchaineau, Mark A., *Lawrence Livermore National Laboratory* 12

E

Earnshaw, Rae A., *University of Bradford, UK* 2
Ebert, David, *University of Maryland, Baltimore County* ..2
Edwards, Betty, *California State University* 7
Eick, Stephen G., *AT&T Bell Laboratories* 2, 7
Ellsworth, David, *MRJ at NASA Ames Research Center* .6, 13
El-Sana, Jihad, *State University of New York* 14
Encarnacao, Jose, *Fraunhofer Institut für Graphische Datenverarbeitung, Germany* 2, 7
England, Nick, *University of North Carolina at Chapel Hill* 6
Erbacher, Rob, *University of Massachusetts, Lowell* ..2
Ertl, Thomas, *Universitaet Erlangen-Nuernberg* ..10, 13, 14
Ezquerra, Noberto, *Georgia Institute of Technology* ..2

F

Falvo, Mike 13
Favre, Jean M., *CSCS–Swiss Center for Scientific Computing* 5, 10
Fayyad, Usama, *Microsoft* 8
Feiner, Steve, *Columbia University* 2, 7
Feng, Chen-Chin, *National Tsing Hua University, Taiwan* ..6
Finger, J. 7
Flak, Borys, *University of British Columbia* 10
Flanery Jr., Ray E., *Oak Ridge National Laboratory* 2, 5
Foley, James D., *Mitsubishi Electric Research Laboratories* 2, 7
Foley, John T., *Mississippi State University* 12
Forrest, A. Robin, *University of East Anglia, UK* 2
Fracchia, F. David, *Simon Fraser University* 5, 7
Franke, Richard, *Naval Postgraduate School* 13
Freund, Jason L., *University of Alabama at Birmingham* ..12
Fry, Bryan, *Mississippi State University* 12
Fuchs, Henry, *University of North Carolina, Chapel Hill* ..2
Fuhrmann, Anton 13
Fujimura, Kikuo, *Ohio State University* 13
Fujishiro, Issei, *Ochanomizu University, Japan* 2, 13
Furnas, George W., *University of Michigan* 7

G

Gaither, Kelly, *Mississippi State University* 2
Gallagher, Richard S., *R.S. Gallagher and Associates* ..2
Garmann, Robert, *Universitat Dortmund, Germany* ..6
Gershon, Nahum, *The MITRE Corporation* 2, 5, 7
Gien, Tran S., *University of California, Davis* 14
Glick, Dave 13
Glinert, Ephraim P., *Rensselaer Polytechnic Institute* 12
Goebel, Martin, *National German Research Center for Information Technology* 2
Gotsman, Craig, *Technion–Israel Institute of Technology* ..6, 12
Grady, Nancy, *Oak Ridge National Laboratory* 2
Greenwade, L. Eric, *Lockheed Martin Idaho Technologies* ..2, 5
Grinstein, Georges, *University of Massachusetts at Lowell* 3, 8, 12, 13
Groeller, Eduard, *Vienna University of Technology* ..12, 13
Gross, Markus H., *Swiss Federal Institute of Technology* 2, 7, 13
Grosse, Ivo 12
Grosso, Roberto, *Universitaet Erlangen-Nuernberg* 14

H

Hagen, Hans, *University of Kaiserslautern* 2, 7, 12
Haimes, Robert, *MIT* 10
Hamann, Bernd, *University of California, Davis* 10, 14
Hanrahan, Pat, *Stanford University* 6
Hansen, Charles, *University of Utah* 2, 6, 10
Hanson, Andrew J., *Indiana University* 2, 12
He, Taosong, *Bell Labs* 10, 13
Healey, Christopher G., *University of California at Berkeley* .10
Hearst, Marti, *Xerox PARC* 7
Heirich, Alan, *Silicon Graphics, Inc.* 6
Heng, Pheng-Ann, *The Chinese University of Hong Kong* ..12
Hesselink, Lambertus, *Stanford University* 2, 12
Hibbard, William, *University of Wisconsin, Madison* 2, 4
Hoehne, Karl Heinz, *University of Hamburg, Germany* 2
Hoffman, Patrick, *University of Massachusetts, Lowell* 12
Hollan, James, *University of New Mexico* 7
Holzner, Michael 13
Hong, Lichan, *State University of New York, Stony Brook* 12
Human, Dawn, *Oak Ridge National Laboratory* 2
Hunter, Carol, *Lawrence Livermore National Laboratory* .2, 10

I

Ichikawa, Yoshihiko, *Ochanomizu University, Japan* .13
Interrante, Victoria L., *ICASE* 4, 10, 13
Inselberg, Alfred., *Multidimensional Graphs, Israel* ..7

J

Jacob, Robert J.K., *Tufts University* 2, 7
Jansen, Frederik W., *Delft University of Technology* ..6
Jaswal, Vijendra S., *NCSA* 13
Jobard, Bruno, *University of Littoral* 13
Johnson, Brian, *Synopsys, Inc.* 7
Johnson, Chris, *University of Utah* 2
Johnston, Nancy, *Lawrence Berkeley National Laboratory* ...2
Joy, Kenneth I., *University of California, Davis* 14
Jung, Il-Hong, *Arizona State University* 12
Jung, Kenneth, *Intel Corp.* 12
Junyaprasert, Kittiboon 12

K

Kamgar-Parsi, Behzad, *Naval Research Laboratory* 2
Kanade, Takeo, *Carnegie Mellon University* 13
Kao, David L., *NASA Ames Research Center* 13
Kaufman, Arie, *State University of New York at Stony Brook* 2, 3, 6, 10, 12, 13
Keheay, Alan T., *Indiana University* 7
Keim, Daniel A. *University of Munich, Germany* ..2, 7
Kenwright, David, *MRJ at NASA Ames Research Center* ..10
Kikinis, Ron, *Brigham and Women's Hospital and Harvard Medical School* 2
Kitajima, Hiroyuki, *Tohoku University, Japan* 6
Kitson, Fred, *Hewlett-Packard Laboratories* 2
Kiu, Ming-Hoe, *Mississippi State University* 12
Kleiboemer, Adrienne, *Concept5* 7
Klimenko, Stanislav, *Institute for High Energy Physics, Moscow* 2
Kobayashi, Hiroaki, *Tohoku University, Japan* 6
Kolojejchick, J. Konstan, *Univiversity of Minnesota* 7
Konstan, J., ...7
Korfhage, Robert, *University of Pittsburgh* 7
Krueger, Heinz, *University of Kaiserslautern* 12
Kumar, Subodh, *Johns Hopkins University* 13
Kunii, Tosiyasu, *University of Aizu, Japan* 2
Kuschfeldt, Sven 13

L

Laskowski, Sharon, *National Institute for Standards and Technology* 7, 13
Lastra, Anselmo A., *University of North Carolina at Chapel Hill* 13
Lau, Steve, *Lawrence Berkeley National Laboratory* 2
Lavin, Yingmei, *Stanford University* 12
Lawrence, Rick 13
Lefer, Wilfrid, *University of Littora* 12
Lemke, Mae, *IBM Visualization Data Explorer* 9

Levkowitz, Haim, *University of Massachusetts, Lowell* 4
Levy, Yuval 12
Li, P. Peggy, *Jet Propulsion Laboratory and Equator Technology, Inc.* 6
Liu, Xiuwen 12
Livingston, Mark A., *University of North Carolina at Chapel Hill* 13
Llopis-Artime, Noel 13
Lodha, Suresh, *University of California, Santa Cruz* 2
Loeffelmann, Helwig K., *Vienna University of Technology* 12, 13
Loomis, Jeremy 13
Lorensen, William E., *GE Corporate R & D Center* 2, 3, 4
Luerig, Christoph, *Universitaet Erlangen-Nuernberg* 14
Lunzer, A. 7

M

Ma, Kwan Liu, *ICASE* 2, 6, 13
Machiraju, Raghu, *Mississippi State University* . .4, 10, 12
MacKerras, Paul, *Australian National University* 6
Mackinlay, Jock, *Xerox PARC, Palo Alto, CA* 7
Magillo, Paola, *University of Genova* 12
Mandal, Chhandomay, *University of Florida* 13
Manocha, Dinesh, *University of North Carolina at Chapel Hill* 14
Maruyama, M., *Shinshu University Japan* 7
Marti, Jed 13
Martin, Kenneth M., *GE Corporated R & D Center* . . .4
Marx, Ken 12
Max, Nelson, *Lawrence Livermore National Laboratory* . . .2, 4
McCormick, Patrick, *Los Alamos National Laboratory* 12
McDermott, Robert, *University of Utah* 2
Medioni, Gerard G., *University of Southern California* 13
Meinzer, H.P. 4
Mendelzon, Alberto O., *University of Toronto* 7
Mendoza, Roberto, *Jet Propulsion Laboratory and Equator Technology, Inc.* 6
Menzel, Martin, *University of Kaiserslautern* 12
Michaels, Cherilyn K., *University of California San Diego* 13
Miller, Mark C., *Lawrence Livermore National Laboratory* 6, 10, 12
Milo, Tova 12
Mineev, Mark, *Los Alamos National Laboratory* 12
Möller, Torsten, *The Ohio State University* 2, 4, 10, 12
Molnar, Steve, *University of North Carolina at Chapel Hill* . . .6
Moorhead, Robert, *Mississippi State University* . . .1, 2, 4, 12
Morphet, Helen, *International AVS Centre* 5
Mueller, Carl, *University of North Carolina at Chapel Hill* 6
Mueller, Klaus, *The Ohio State University* 10, 12
Muller, H.A., *Simon Fraser University, and University of Victoria, Canada* 7
Munzner, Tamara, *Stanford University* 7
Muraki, Shigeru, *State University of New York, Stony Brook* 2, 12
Muuss, Mike, *U.S. Army Research Laboratory* 6

N

Nadeau, D. 3
Nakamura, Kyoko, *Sony Corporation* 13
Nakamura, Tadao, *Tohoku University, Japan* 6
Narayanan, P.J., *The Centre for Artificial Intelligence and Robotics* 13
Navazo, Isabel, *Polytechnical University of Catalonia* . . .12
Neumann, Ulrich, *University of Southern California* 6
Nguyen, H.T., *Intel Corp.* 12
Nguyen, Thinh, *Intel Corp.* 12
Nielson, Gregory M., *Arizona State University* 2, 12, 13
North, Stephen C., *AT&T Research* 7

O

Obeysekare, Upul, *Concurrent Technologies Corporation* 2, 5, 15
Okimoto, Shoji 13
Olano, Marc, *University of North Carolina at Chapel Hill* 14
Olson, Art, *Research Institute of Scripps Clinic* 2

P

Pagendarm, Hans-Georg, *German Aerospace Research Establishment* 2
Painter, Jamie, *Los Alamos National Laboratory* 2, 6
Palmer, Michael E., *California Institute of Technology,* 6
Syracuse University, and Inktomi Corporation
Pang, Alex, *University of California, Santa Cruz* 2
Pascucci, Valerio, *Center for Computational Image Analysis and Data Visualization* 12
Paulson, Scott 13
Pederson, Jan, *Verity* 7
Pesce, Mark, *Independent Author* 2, 10, 11, 14
Pfister, Hanspeter, *Mitsubishi Electric Research Laboratories* 13
Pickney, Dave, *University of Massachusetts, Lowell* 2
Post, Frits H., *Delft University of Technology, The Netherlands* 2
Priol, Thierry, *IRISA, France and Universitat de Girona, Spain* 6
Puig, Anna, *Polytechnical University of Cataloni* 12
Pueyo, Xavier, *IRISA, France and Universitat de Girona, Spain* 6
Puppo, Enrico, *National Research Council* 12
Puque, Mike, *Scripps Research Institute* 5

Q

Qin, Hong, *University of Florida* 13

R

Rabinovitch, Boris, *Technion* 12
Rander, Peter W., *Carnegie Mellon University* 13
Rao, Ramana, *Xerox PARC and InXight Software Inc.* 7
Reisman, Amit, *Technion–Israel Institute of Technology* 6
Reisner, Jon, *Los Alamos National Laboratory* 12
Reiss, Steven P., *Brown University* 7
Renambot, Luc, *IRISA, France and Universitat de Girona, Spain* 6
Riedl, John T. 7
Rheingans, Penny, *University of Mississippi* . .12, 13, 14
Rhodes, Mike, *Ortho Diagnostic Systems* 2
Rhyne, Theresa-Marie, *Lockheed Martin/US EPA* . . .2, 4, 5
Ribarsky, Bill, *Georgia Institute of Technology* 2, 9
Richard, Jim, *Stanford University and Princeton University* 6
Robertson, Edward L., *Indiana University* 7
Robertson, George, *Microsoft* 7
Robertson, Phil, *Canon Information Systems Research, Australia (CISRA)* 2
Rockwood, Alyn, *Arizona State University* 12
Rogowitz, Bernice, *IBM T.J. Watson Research Center* . . .13
Roman, Gruia-Catalin, *Washington University* 7
Rosenblum, Larry, *Naval Research Laboratory* 2
Roth, Steven F., *Carnegie Mellon University* 2, 7
Rushmeier, Holly, *IBM Corporation* 13, 14

S

Sams, Keith, *IBM T.J. Watson Research Center* 9
Sano, Kentaro, *Tohoku University, Japan* 6
Scheuermann, Gerik, *University of Kaiserslautern* . . .12
Schikore, Daniel R., *Lawrence Livermore National Laboratory* 2, 12
Schkolnick, Mario, *Silicon Graphics, Inc* 2
Schlussmann, Gregory L., *University of California, Davis* 14
Schmalstieg, Dieter 13
Schoof, Larry A., *Sandia National Laboratories* 5
Schroeder, William J., *GE Corporate R&D Center* . . .2, 4, 13
Schuster, Assaf, *Technion–Israel Institute of Technology* 6
Senay, Hikmet, *J.P. Morgan* 7
Shareef, Nameem, *The Ohio State University* 2, 12
Shen, Han-Wei, *MRJ at NASA Ames Research Center* . . .13
Shirley, Peter, *University of Utah* 6
Shneerson, Maria, *The Weizmann Institute of Science* . . .12
Shneiderman, Ben, *University of Maryland* 7
Sigeti, David E., *Los Alamos National Laboratory* 12
Silva, Claudio T., *State University of New York, Stony Brook* 13
Singh, Jaswinder Pal, *Stanford University and Princeton University* 6
Simpson, Thomas 13
Sloan, Kenneth, *University of Alabama at Birmingham* 12
Smith, Sean M., *University of Massachusetts Lowell* . .13
Smithmeir, Larry 13
Spence, Robert, *Imperial College* 7
Sprenger, T.C. 7
Staadt, Oliver G., *ETH Zurich* 13
Stanley, Eugene 12
Stoll, Gordon, *Stanford University* 2, 6
Storey, M.-A.D. 7
Strasser, Wolfgang, *University of Tuebingen, Germany* . . .2
Stuetzle, Werner, *University of Washington* 2
Sung, Junwon, *Arizona State University* 12, 13
Superfine, Richard 13
Swan II, J. Edward, *Naval Research Lab* 2, 9, 12

T

Takeshima,Yuriko, *Ochanomizu University, Japan* . . .13
Tal, Ayellet, *Technion–Israel Institute of Technology* 12
Talent, Steve, *Motorola* 2
Tam, Roger C., *University of British Columbia* 10
Tanin, E. 7
Taylor II, Russell M., *University of North Carolina at Chapel Hill* 6, 13
Teller, Seth, *Massachusetts Institute of Technology* 6
Tenev, Tichomir G., *Xerox Palo Alto Research Center and InXight Software Inc.* 7
Teraoka, T., *Mitsubishi, Japan* 7
Thalman, Nadia Magnenat, *University of Geneva* 2
Thiansanthaporn, Pichet 13
Thomas, James, *PNNL* 7
Totty, Brian, *California Institute of Technology, Syracuse University, and Inktomi Corporation* 6
Tost, Dani, *Polytechnical University of Catalonia* 12
Treinish, Lloyd, *IBM Thomas J. Watson Research Center* . .2, 4
Trotts, Issac J., *University of California, Davis* 14
Tsiao, James, *Jet Propulsion Laboratory and Equator Technology, Inc.* 6

U

Uselton, Samuel P., *MRJ at NASA Ames Research Center* 6, 10, 14

V

Van Dam, Andres, *Brown University* 2
Van Wijk, Jarke, J., *Netherlands Energy Research Foundation ECN* 2
Vannier, Michael, *Mallinckrodt Institute of Radiology* . . .2
Varshney, Amitabh, *State University of New York, Stony Brook* 2, 14
Vaziri, *NASA Ames Research Center* 5
Vemuri, Baba C., *University of Florida* 13
Vidimce, Kiril N., *Mississippi State University* 12
Volpe, Christopher R., *GE Corporate Research and Development* 12

W

Ward, M. 3
Ware, Colin, *University of New Brunswick, Canada* 7
Washburn, Sean 13
Watson, Andrew, *NASA Ames* 14
Watson, Val, *NASA Ames* 2
Weber, Roger, *ETH Zurich* 13
Wegenkittl, Rainer, *Vienna University of Technology* . . .12, 13
Wernert, Eric, *Indiana University* 12
Westermann, Ruediger, *University of Erlangen* 10
Wierse, Andreas, *Unilab, Switzerland* 8
Whitman, Scott, *Equator Technologies* 6
Williams, Glen N., *Texas A&M University* 13
Wills, Graham, *Lucent Technologies* 13
Wise, Jim, *Intergations* 7
Winterkamp, Judith, *Los Alamos National Laboratory* 12
Wittenbrink, Craig M., *Hewlett-Packard Laboratories* 2, 6
Wolinsky, Murray, *Los Alamos National Laboratory* 12
Wong, K. 7
Wong, Pak Chung, *University of New Hampshire* 12
Wood, Jason D., *University of Leeds* 13
Wright, Helen, *University of Leeds* 13
Wright, William, *Visible Decisions, Inc.* 7

Y

Yagel, Roni, *The Ohio State University* 2, 3, 10, 12
Yang, Chuan-Kai 13
Yang, Shi-Nine, *National Tsing Hua University, Taiwan* 6
You, Suya 12

Z

Zhou, Yong, *Center for Visual Computing* 12
Zhu, Zhifan, *Mississippi State University* 12

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Please check the tutorial and/or symposia you wish to sign up for. Please select only one offering per day; you will receive paper proceedings for that choice. All tutorial, symposia, and conference proceedings and notes will be on the Vis97 CD-ROM.

Tutorial Choices *(includes Monday reception, Wednesday keynote, and Wednesday-Thursday demonstrations)*

☐	Sunday Full Day	***1. Introduction to VRML***
☐	Sunday Full Day	***2. Introduction to Data Visualization***
☐	Monday Full Day	***3. Overview to Visualization with AVS/Express***
☐	Monday Full Day	***4. Volume Visualization: Principles and Practice***
☐	Monday Full Day	***5. Wavelet and Numerical Methods for Visualization***
☐	Tuesday Half Day, AM	***6. Perception for Visualization: From Design to Evaluation***
☐	Tuesday Half Day, PM	***7. Visualization Toolkits: Applications & Techniques***
☐	Tuesday Full Day	***8. Visualization in the Physical Sciences***

Symposia Choices *(includes Monday reception, Wednesday keynote, and Wednesday-Thursday demonstrations)*

☐	1-day (Sun.)	***AVS97***
☐	2-day (Mon., Tues.)	***Parallel Rendering***
☐	2-day (Mon., Tues.)	***Information Visualization***

Tutorial Registration: *(You may attend any tutorial or symposia on the day you are registered. You may select either tutorial or symposia as your choice above. Circle your choice. Note: The two Tuesday half day tutorials count as one choice.)*

	Early Registration *(by Sept.26)*			Late Registration *(Sept. 27 or later)*		
	1-day	2-day	3-day	1-day	2-day	3-day
IEEE/ACM member	275	500	725	330	610	890
Nonmember	350	650	950	420	790	1160
Full-time student	200	300	400	250	350	450

Tutorial Fee $_____

Symposia Registration: *(You may attend any symposia on the day you are registered. Circle your choice.)*

	Early Registration *(by Sept.26)*			Late Registration *(Sept. 27 or later)*		
	1-day	2-day	3-day	1-day	2-day	3-day
IEEE/ACM member	225	325	510	300	375	635
Nonmember	300	410	670	380	475	815
Full-time student	190	250	400	240	290	490

Symposia Fee $_____

Conference: *(includes Wed., Thurs., Fri. sessions, Wed.-Thurs. demonstrations, and Wednesday reception)*

	Early Registration *(by Sept.26)*	Late Registration *(Sept. 27 or later)*
IEEE/ACM member	350	450
Nonmember	420	500
Full-time student	195	250

Conference Fee $_____

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CRITICAL DATES

September 26	Close of Early Registration
September 26	Cut-off for Guaranteed Hotel Reservations (*5pm, Mountain time*)
Oct. 19	Conference Commences

- Multivariate Visualization
- Information Visualization
- Biomedical Visualization
- Visualization Techniques
- Visualization Education
- Flow Visualization
- Virtual Reality
- Visualization Applications
- Vector & Tensor Topology
- Exploratory Visualization
- Volume Visualization
- Parallel Rendering
- Human Factors
- Databases

WHAT YOU GET WITH YOUR REGISTRATION

	CONFERENCE	TUTORIAL	SYMPOSIA
Vis'97 Proceedings	●		
Vis'97 Reception	●		
Vis'97 Keynote and CapstoneEvents	●	●	●
Papers	●		
Panels	●		
Cases	●		
Late Breaking Hot Topics	●		
CD-ROM	●	●	●
Conference Video	●	●	●
Tutorial Notes		●	
Tutorial Attendance		●	
Symposium Proceedings			●
Symposium Attendance		●	●
Tutorial/Symposium Reception		●	●
Demonstrations	●	●	●
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