

27/10/2000

EEE

IEEE VIRTUAL REALITY 2000

*Proceedings*

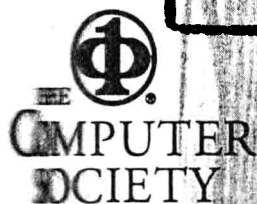
**IEEE**  
**Virtual Reality 2000**

18-21 March 2000  
New Brunswick, New Jersey

Edited by Steven Maner and Daniel Thalmann

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

江苏工业学院图书馆  
藏书章



Los Angeles, California  
Washington · Brussels · Tokyo

Copyright © 2000 by The Institute of Electrical and Electronics Engineers, Inc.  
All rights reserved

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries may photocopy beyond the limits of US copyright law, for private use of patrons, those articles in this volume that carry a code at the bottom of the first page, provided that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

Other copying, reprint, or republication requests should be addressed to: IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 133, Piscataway, NJ 08855-1331.

*The papers in this book comprise the proceedings of the meeting mentioned on the cover and title page. They reflect the authors' opinions and, in the interests of timely dissemination, are published as presented and without change. Their inclusion in this publication does not necessarily constitute endorsement by the editors, the IEEE Computer Society, or the Institute of Electrical and Electronics Engineers, Inc.*

IEEE Catalog Number 00CB37048  
ISBN: 0-7695-0478-7 (Softbound)  
ISBN: 0-7803-6399-X (Casebound)  
ISBN: 0-7695-0480-9 (Microfiche)  
ISSN: 1087-8270  
PR0478

IEEE Computer Society  
Customer Service Center  
10662 Los Vaqueros Circle  
P.O. Box 3014  
Los Alamitos, CA 90720-1314  
Tel: + 1-714-821-8380  
Fax: + 1-714-821-4641  
E-mail: cs.books@computer.org

IEEE Service Center  
445 Hoes Lane  
P.O. Box 1331  
Piscataway, NJ 08855-1331  
Tel: + 1-732-981-0060  
Fax: + 1-732-981-9667  
mis.custserv@computer.org

IEEE Computer Society  
Asia/Pacific Office  
Watanabe Bldg., 1-4-2  
Minami-Aoyama  
Minato-ku, Tokyo 107-0062  
JAPAN  
Tel: + 81-3-3408-3118  
Fax: + 81-3-3408-3553  
tokyo.ofc@computer.org

Editorial production by Anne Rawlinson

Cover art production by Joe Daigle/Studio Productions

Printed in the United States of America by Technical Communication Services



## Message from the General Co-Chairs

Welcome to the IEEE Virtual Reality 2000 Conference! This premier technical event is the seventh such meeting in the VRAIS/VR conference series. Sponsored by the IEEE Computer Society Technical Committee on Visualization and Graphics, it attracts the “crème de la crème” of VR researchers and developers from more than 20 countries.

The conference participants, from academia, industry and government, know that, by attending the IEEE VR Conference, they will hear high-quality, peer-reviewed papers and see the newest products in the field.

VR 2000 is the first time the conference has been organized on the east coast of the United States, in an area that has not seen a VR conference in seven years. New Brunswick is located in the heart of what we call the “east coast Silicon Valley,” close to such research organizations as Sarnoff, Siemens, Bell Labs, Johnson & Johnson, Princeton, and Rutgers. Recognizing that New Jersey is the most industrialized state of the US, the Steering Committee decided to allow (for the first time) one-day registrations. These are designed to help attract more industry participants, and thus broaden the conference's outreach.

Another change this year is a record number of Workshops designed to complement a strong Tutorials program. The number of exhibitor companies present shows the strength and breadth of the VR industry, as well as its fast pace of change. These companies will demonstrate the latest VR products spanning computing hardware, to interface devices, and simulation toolkits. Many of them are exhibiting at VR 2000 for the first time, a result of the efforts of Doug Bowman and Pat Hyde, our Exhibits Co-Chairs.

We have decided to continue the tradition of an Exhibits “kick-off” Sunday Reception started at VR '99 and have added a Dinner Cruise as our conference “grand finale.”

The main focus of the conference and its core value remains high-quality peer-reviewed papers. Our Program co-Chairs, Steven Feiner and Daniel Thalmann, did an excellent job of recruiting a record-sized Program Committee and selecting the best papers from the many submissions. Their diligent work and reputation also helped attract Andries van Dam and Stephen Ellis as our superb Keynote and Invited Speakers, respectively.

The complete program for the conference, with all its details (hotel, food, AV, Rutgers tour, dinner cruise, etc.) could not have been realized without the hard work of our Local Arrangements Co-Chairs, David Zeltzer and Mourad Bouzit. Our thanks also go to the other members of the VR 2000 Conference Committee. These are Susumu Tachi and Rudolph Darken (Panels), Mike Bevan and Mike Capps (Publicity), Sharon Stansfield and George Popescu (Videos), Don Allison and Benjamin Watson (Student Volunteers), Drew Kessler and Larry Hodges (Tutorials), Mike Capps (Workshops), Michael Haas and Mel Slater (Research Demos), and Sandy Epstein (Finance). To these we add our thanks for the valuable guidance and encouragement we received from the Steering Committee (Steve Bryson, Tom Caudell, Larry Hodges, Bill Ribarsky, Larry Rosenblum, Sharon Stansfield, and Susumu Tachi). Last, but not least, we must recognize the efforts of Rares Boian, our web master, who designed a great conference web site, attracting a significant number of visits. This was complemented by our moderated SIG email server, which now has a record twelve hundred subscribers.

In closing, we wish to point out that next year the IEEE VR meeting will take place in Japan (co-chaired by Susumu Tachi). This represents the first time our conference will be organized outside of the United

States, in recognition of the international growth of the field. We hope you will enjoy participating in IEEE VR 2000, and trust that we will see you next year in Tokyo!

**Grigore C. Burdea**  
*Rutgers University*

**R. Bowen Loftin**  
*University of Houston*

### **Acknowledgements**

The conference wishes to gratefully acknowledge the following entities for their support:

- the VR '99 Conference Committee for sponsoring advertisements in IEEE magazines;
- VR News for sponsoring the Best Paper Award, providing conference advertising and donating newsletter issues to the attendees;
- the CAIP Center at Rutgers University for providing PC and office equipment and sponsoring the Monday Reception;
- Johnson & Johnson for conference financial support.

## Message from the Program Co-Chairs

Welcome to *IEEE Virtual Reality 2000*, the first IEEE Virtual Reality conference of the new millennium—or, perhaps, the last of the old millennium. No matter how one counts, however, this is the latest in a series of conferences that grew out of *VRAIS '93* and the *1993 IEEE Symposium on Research Frontiers in Virtual Reality*.

Our world has changed a lot in the past seven years. Home PCs offer far faster 3D graphics hardware than what most researchers used in 1993; pocket MP3 players have more memory than high-end workstations of 1993; and head-worn displays with enough pixels to render legible imagery are now made by consumer electronics companies that were already household names ten years earlier still in 1983. Whether we call it virtual reality, virtual environments, or virtual worlds, this field, and our conference, encompass an astonishing range of multidisciplinary research. This has enabled a convergence of hardware and software, and of science, engineering, and art, all in the service of real-time, immersive, 3D interaction.

This year's technical program begins on Monday morning with a keynote address by Professor Andries van Dam of Brown University, who will tell us about the promise of virtual reality for scientific visualization, drawing on his perspective of decades of leading-edge research in 3D computer graphics. On Tuesday evening, Dr. Stephen Ellis of NASA Ames Research Center will give an invited talk on the role of human factors in the design of virtual environments.

Our program includes two panels, both looking toward the future of our field: one on shared virtual environments, and the other on haptic interfaces. The majority of the program is, as always, devoted to papers, and thanks to the careful reviews of 119 program committee members and 19 additional reviewers, 31 out of 93 submissions were selected for presentation as full papers. These span a wide range of topics in virtual environments, including workbench and other projection systems, haptics, human perception, distributed virtual environments, animation, navigation, mixed reality, tracking, and applications in many domains. The paper presentations are complemented by 13 poster presentations, providing overviews of a wealth of additional research.

Dealing with hundreds of submission contact authors and program committee members was a daunting task. Happily, it was made tractable through the able assistance of Drexel Hallaway, who developed spreadsheets to manage the paper assignment and review process, and oversaw the handling of the papers, aided by Tobias Höllerer, Elias Gagas, Sinem Güven, Tachio Terauchi, and Blaine Bell. Finally, Anne Rawlinson, of the IEEE Computer Society, put it all together (quite literally) to create the document that you are now reading. We hope that these presentations, and the proceedings that document them, will inspire fruitful discussions, both at the conference and afterwards—leading, of course, to your submissions to *IEEE Virtual Reality 2001*, next year in Japan!

**Steven Feiner**  
*Columbia University*

**Daniel Thalmann**  
*Swiss Federal Institute of Technology*

# **IEEE Technical Committee on Visualization and Graphics Executive Committee**

## **Chairman**

**Robert Moorhead**  
*Engineering Research Center*  
rjm@ERC.MsState.Edu

## **Vice Chair for Virtual Reality**

**Steve Bryson**  
*NASA-Ames Research Center*  
bryson@nas.nasa.gov

## **Vice Chair for Finance**

**Rachael Brady**  
*Beckman Institute*  
rbrady@uiuc.edu

## **Secretary**

**Lloyd A. Treinish**  
*IBM Thomas J. Watson Research Center*  
lloydt@us.ibm.com

## **Directors**

**Gregory M. Nielson**  
*Arizona State University*  
nielson@asu.edu

**Arie Kaufman**  
*State University of New York  
at Stony Brook*  
ari@cs.sunysb.edu

**Larry Rosenblum**  
*Naval Research Laboratory*  
rosenblum@ait.nrl.navy.mil

## **Director and Vice-Chair for Conferences**

**William Ribarsky**  
*Georgia Tech*  
bill.ribarsky@cc.gatech.edu

## **Other Executive Committee Members**

**Steven Feiner**  
*Columbia University*  
feiner@cs.columbia.edu

**Theresa-Marie Rhyne**  
*United States Environmental Protection Agency*  
rhyne.theresa@epa.gov

**David Ebert**  
*University of Maryland, Baltimore County*  
ebert@cs.umbc.edu

**Bowen Loftin**  
*University of Houston*  
bowen@uh.edu

**Frits H. Post**  
*Delft University of Technology*  
frits.post@its.tudelft.nl

**Daniel A. Keim**  
*University of Halle*  
keim@informatik.uni-halle.de

**Charles Hansen**  
*University of Utah*  
hansen@cs.utah.edu

**Kwan-Liu Ma**  
*University of California, Davis*  
ma@cs.ucdavis.edu

## **Ex-Officio Members**

**Hans Hagen, EIC of TVCG**  
*University of Kaiserslautern*  
hagen@informatik.uni-kl.de

**Jim Thomas, EIC of CG&A**  
*Battelle Northwest Labs*  
Jim.Thomas@pnl.gov



# Steering Committee

**Bill Ribarsky, Chair**

IEEE Technical Committee on Visualization and Computer Graphics  
*Georgia Institute of Technology*  
bill.ribarsky@cc.gatech.edu

**Steve Bryson, Chair**

*NASA/Ames Research Center*  
bryson@nas.nasa.gov

**Larry Rosenblum**

*Naval Research Laboratory*  
rosenblu@ait.nrl.navy.mil

**Sharon Stansfield**

*Sandia National Laboratories*  
sastans@sandia.gov

**Tom Caudell**

*University of New Mexico*  
tpc@eece.unm.edu

**Larry Hodges**

*Georgia Institute of Technology*  
hodges@cc.gatech.edu

**Bowen Loftin**

*University of Houston*  
bowen@uh.edu

**Grigore Burdea**

*Rutgers University*  
burdea@vr.rutgers.edu

**Susumu Tachi**

*University of Tokyo*  
tachi@star.t.u-tokyo.ac.jp

# Conference Committee

## General Co-Chairs

**Grigore Burdea**  
*CAIP Center, Rutgers University*  
burdea@vr.rutgers.edu

**Bowen Loftin**  
*University of Houston*  
bowen@uh.edu

## Program Co-Chairs

**Steven Feiner**  
*Columbia University*  
feiner@cs.columbia.edu

**Daniel Thalmann**  
*Swiss Federal Institute of Technology*  
thalmann@lig.di.epfl.ch

## Panels Co-Chairs

**Susumu Tachi**  
*University of Tokyo*  
tachi@star.t.u-tokyo.ac.jp

**Rudolph Darken**  
*Naval Postgraduate School*  
darken@acm.org

## Local Arrangements Co-Chairs

**David Zeltzer**  
*Franzblau Center for Research in Computer  
Graphics*  
dzeltzer@crcg.edu

**Mourad Bouzit**  
*CAIP Center, Rutgers University*  
bouzit@caip.rutgers.edu

## Exhibits Co-Chairs

**Doug Bowman**  
*Virginia Tech*  
bowman@vt.edu

**Patricia Hyde**  
*University of Houston*  
hyde@uh.edu

## Publicity Co-Chairs

**Mike Bevan**  
*VRNEWS*  
mike@vrnews.com

**Michael Capps**  
*Naval Postgraduate School*  
capps@acm.org

## Video Co-Chairs

**Sharon Stansfield**  
*Sandia National Labs*  
sastans@sandia.gov

**George V. Popescu**  
*CAIP Center, Rutgers University*  
vpopescu@caip.rutgers.edu

### **Student Volunteers Co-Chairs**

**Benjamin Watson**  
*University of Alberta*  
watsonb@cs.ualberta.ca

**Don Allison**  
don@cc.gatech.edu

### **Tutorials Co-Chairs**

**Drew Kessler**  
*Lehigh University*  
dkessler@eecs.lehigh.edu

**Larry F. Hodges**  
*Georgia Institute of Technology*  
hodges@cc.gatech.edu

### **Workshops Chair**

**Michael Capps**  
*Naval Postgraduate School*  
capps@acm.org

### **Research Demonstrations Co-Chairs**

**Michael W. Haas**  
*Technical Director, AFRL/HECP*  
Michael.Haas@he.wpafb.af.mil

**Mel Slater**  
*University College of London,*  
m.slater@cs.ucl.ac.uk

### **Finance Chair**

**Sandra Epstein**  
*CAIP Center, Rutgers University*  
sepstein@caip.rutgers.edu

# Table of Contents

Message from the General Co-Chairs .....	xi
Message from the Program Co-Chairs.....	xiii
IEEE Technical Committee on Visualization and Graphics Executive Committee.....	xiv
Steering Committee.....	xvi
Conference Committee.....	xvii
Program Committee.....	xix

## Keynote Address

Immersive Virtual Reality for Scientific Visualization: A Progress Report .....	1
<i>Andries van Dam</i>	

## Paper Session 1: WORKBENCHES

Physically-based Manipulation on the Responsive Workbench .....	5
<i>B. Fröhlich, H. Tramberend, A. Beers, M. Agrawala, and D. Baraff</i>	
The Perceptive Workbench: Toward Spontaneous and Natural Interaction in Semi-immersive Virtual Environments .....	13
<i>B. Leibe, T. Starner, W. Ribarsky, Z. Wartell, D. Krum, B. Singletary, and L. Hodges</i>	
Real Mirrors Reflecting Virtual Worlds .....	21
<i>O. Bimber, L. M. Encarnação, and D. Schmalstieg</i>	

## Paper Session 2: HAPTICS: FEELING GOOD!

Dynamic Deformable Models for Enhanced Haptic Rendering in Virtual Environments .....	31
<i>R. Ramanathan and D. Metaxas</i>	
Optimization-based Virtual Surface Contact Manipulation at Force Control Rates.....	37
<i>D. D. Nelson and E. Cohen</i>	
inTouch: Interactive Multiresolution Modeling and 3D Painting with a Haptic Interface.....	45
<i>A. D. Gregory, S. A. Ehmman, and M. C. Lin</i>	

### **Paper Session 3: APPLICATIONS I**

Interaction with Geoscience Data in an Immersive Environment.....	55
<i>C-R. Lin, R. B. Loftin, and H. R. Nelson, Jr.</i>	
Virtual Environment Applications in Clinical Neuropsychology .....	63
<i>A. Rizzo, J. G. Buckwalter, C. van der Zaag, U. Neumann, M. Thiebaut, C. Chua, A. van Rooyen, L. Humphrey, and P. Larson</i>	
The Thing Growing: Autonomous Characters in Virtual Reality Interactive Fiction .....	71
<i>J. Anstey, D. Pape, and D. Sandin</i>	

### **Panel Session I**

The Future of Shared Virtual Environments .....	79
<i>M. Capps, M. Macedonia, K. McCurdy, and D. Thalmann</i>	

### **Paper Session 4: PERCEPTION**

Pseudo-Haptic Feedback: Can Isometric Input Devices Simulate Force Feedback? .....	83
<i>A. Lécuyer, S. Coquillart, A. Kheddar, P. Richard, and P. Coiffet</i>	
Enhancing Fish Tank VR.....	91
<i>J. D. Mulder and R. van Liere</i>	
Adjusting the Difference between 3D Spaces in VR Systems and Human Perception through Object Manipulation .....	99
<i>K. Kakusho, J. Kitawaki, S. Hagihara, and M. Minoh</i>	

### **Paper Session 5: PROJECTION-BASED DISPLAYS**

Immersive Planar Display using Roughly Aligned Projectors .....	109
<i>R. Raskar</i>	
A Method of Constructing a Telexistence Visual System Using Fixed Screens.....	117
<i>Y. Yanagida, T. Maeda, and S. Tachi</i>	
Eye Mark Pointer in Immersive Projection Display .....	125
<i>K. Asai, N. Osawa, H. Takahashi, Y. Y. Sugimoto, S. Yamazaki, M. Samejima, and T. Tanimae</i>	

### **Paper Session 6: DISTRIBUTED VIRTUAL ENVIRONMENTS**

Priority Round-robin Scheduling for Very Large Virtual Environments .....	135
<i>C. Faisstnauer, D. Schmalstieg, and W. Purgathofer</i>	
The QUICK Framework for Task-specific Asset Prioritization in Distributed Virtual Environments .....	143
<i>M. V. Capps</i>	

Scalable Prediction Based Concurrency Control for Distributed Virtual Environments .....	151
<i>J. Yang and D. Lee</i>	

## **Paper Session 7: ANIMATION AND NAVIGATION**

LoD Management on Animating Face Models .....	161
<i>H. Seo and N. M. Thalmann</i>	

First Steps with a Rideable Computer .....	169
<i>R. S. Allison, L. R. Harris, M. Jenkin, G. Pintilie, F. Redlick, and D. C. Zikowitz</i>	

An Intelligent User Interface with Motion Planning for 3D Navigation .....	177
<i>T-Y. Li and H-K. Ting</i>	

## **Invited Presentation**

The Elements of Human Factors: Illustrations from the Collision at the Mir Space Station .....	185
<i>Stephen R. Ellis</i>	

## **Paper Session 8: APPLICATIONS II**

Virtual Fekete Point Configurations: A Case Study in Perturbing Complex Systems .....	189
<i>R. van Liere, J. Mulder, J. Frank, and J. de Swart</i>	

Interactive Stereoscopic Rendering of Voxel-based Terrain .....	197
<i>M. Wan, N. Zhang, A. Kaufman, and H. Qu</i>	

Systematic Design of Interactive Illustration Techniques for User Guidance in Virtual Environments .....	207
<i>V. Paelke</i>	

## **Paper Session 9: HAPTICS: MOVERS AND SHAKERS**

Development of Ground Surface Simulator for Tel-E-Merge System .....	217
<i>H. Noma, T. Sugihara, and T. Miyasato</i>	

Virtual Roller Coaster .....	225
<i>Z-C. Shih, Y-S. Jaw, and M-L. Hsu</i>	

Visuo-Haptic Display Using Head-mounted Projector .....	233
<i>M. Inami, N. Kawakami, D. Sekiguchi, Y. Yanagida, T. Maeda, and S. Tachi</i>	

## **Panel Session II**

The Haptic Interfaces of the Next Decade .....	241
<i>H. Iwata, R. Nakatsu, J. M. Hollerbach, J. F. Kramer, and T. Massie</i>	

## Paper Session 10: MIXED REALITY AND TRACKING

Accurate Image Overlay on Video See-through HMDs Using Vision and Accelerometers .....	247
<i>Y. Yokokohji, Y. Sugawara, and T. Yoshikawa</i>	
A Stereoscopic Video See-through Augmented Reality System Based on Real-time Vision-based Registration .....	255
<i>M. Kanbara, T. Okuma, H. Takemura, and N. Yokoya</i>	
A Unified Linear Algorithm for a Novel View Synthesis and Camera Pose Estimation in Mixed Reality .....	263
<i>T. Kobayashi, G. Inoue, Y. Ohta, and L. Quan</i>	
A Wireless, Inexpensive Optical Tracker for the CAVE™ .....	271
<i>E. Sharlin, P. Figueroa, M. Green, and B. Watson</i>	

## Posters

Multimodal Menu Presentation and Selection in Immersive Virtual Environments.....	281
<i>N. Kim, G. J. Kim, C-M. Park, I. Lee, and S. H. Lim</i>	
Virtual Drama as a Learning Medium: The Caracol Time Travel Project.....	282
<i>J. M. Moshell, C. E. Hughes, D. Reed, D. Z. Chase, and A. Chase</i>	
An Architecture for Collaboration in Virtual Environments.....	283
<i>S. Shirmohammadi and N. D. Georganas</i>	
A Six DOF Haptic Interface for Medical Virtual Reality Applications: Design, Control and Human Factors .....	284
<i>A. Benali, P. Richard, and P. Bidaud</i>	
Real-time Representation of Elastic Object.....	285
<i>K. Hirota and T. Kaneko</i>	
Model Simplification for Interactive Applications .....	286
<i>D. Brodsky and B. Watson</i>	
Extending Locales: Awareness Management in MASSIVE-3 .....	287
<i>J. Purbrick and C. Greenhalgh</i>	
A Collaborative Virtual Environment for Industrial Training .....	288
<i>J. C. de Oliveira, S. Shirmohammadi, and N. D. Georganas</i>	
VR Operational Assistance System for Rough Terrain Crane .....	289
<i>M. Yoneda, F. Arai, T. Fukuda, and K. Miyata</i>	
An Adaptive Occlusion Culling Algorithm for Use in Large VEs .....	290
<i>K. Bormann</i>	

Man Multi-agent Interaction in VR: A Case Study with RoboCup.....	291
<i>H. J. W. Spoelder, L. Renambot, D. Germans, H. E. Bal, and F. C. A. Groen</i>	
Tethering and Reattachment in Collaborative Virtual Environments.....	292
<i>E. A. Wernert and A. J. Hanson</i>	
String-based Haptic Interface Device for Multi-fingers .....	293
<i>S. Walairacht, Y. Koike, and M. Sato</i>	
<b>Tutorials</b>	
Tutorial 1: The Art and Science of 3D Interaction .....	294
Tutorial 2: Psychophysics and Technology of 3-Dimensional Virtual Acoustic Displays .....	295
Tutorial 3: Digital Mock-Up and the Application of Virtual Reality Technologies.....	295
Tutorial 4: Virtual Environments and Mental Health Applications .....	296
Tutorial 5: Obtaining Realistic Sounds for Virtual Environments: Digitize or Synthesize? .....	296
Tutorial 6: Advanced LOD For Dynamic Fidelity Control .....	297
Tutorial 7: Avatars and Autonomous Virtual Humans in Virtual Environments .....	297
Tutorial 8: VR in Medicine.....	298
<b>Workshops</b>	
Perceptual and Multi-Modal Interfaces .....	299
Haptics in Virtual Environments.....	300
<b>Author Index</b> .....	301



# Keynote Address

## Immersive Virtual Reality for Scientific Visualization: A Progress Report

Andries van Dam  
Department of Computer Science  
Brown University  
Providence, RI

### Abstract

Immersive Virtual Reality (IVR) is still in an early stage of development, due to significant deficiencies on many fronts, including input and output hardware performance and ergonomics, interaction techniques, application software, development environments, cost, and reliability. There are areas, such as vehicle simulation and walkthroughs of buildings and processing plants, in which IVR has clearly demonstrated its utility, and even its cost-effectiveness. However, the promise of IVR for scientific visualization has scarcely been realized, although there is anecdotal evidence thus far that immersion can help in scientific (or information) visualization. Can we show conclusively that there are visualization tasks for which being immersed in one's data/model provides extra or faster insight? I remain optimistic that in this area, too, we will be able to show that IVR has significant, measurable advantages over non-immersive environments. To illustrate, I will present some scientific visualization interaction research in our four-wall IVR system.

*Andries van Dam (Andy) received the B.S. degree with Honors in Engineering Sciences from Swarthmore College in 1960 and the M.S. and Ph.D. from the University of Pennsylvania in 1963 and 1966, respectively. Professor van Dam joined Brown University in 1965, where he co-founded and was the first chair of the Department of Computer Science, and is Thomas J. Watson Jr. University Professor of Technology and Education and Professor of Computer Science. He is a PI and former director of the NSF Science and Technology Center for Graphics and Visualization. Dr. van Dam co-authored the well-known books Fundamentals of Interactive Computer Graphics, Computer Graphics: Principles and Practice, Introduction to Computer Graphics, and others. Among his many awards are the IEEE Centennial Medal (1984), the ACM SIGGRAPH Steven A. Coons Award (1991), the ACM Karl V. Karlstrom Outstanding Educator Award (1994), and the IEEE James H. Mulligan, Jr. Education Medal (1999).*