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RESEARCH CHALLENGES IN COMPUTER GRAPHICS MEETING

Biographies of Participants

ELAINE COHEN is a professor of computer science at the University of Utah. She is co-head of the Geometric Design and Computation Project and co-author of *Geometric Modeling with Splines: An Introduction* (A. K. Peters, 2001). Dr. Cohen has focused her research in computer graphics, geometric modeling, and manufacturing, with emphasis on complex sculptured models represented using NURBS (Non-Uniform Rational B-splines) and NURBS-features. Results in manufacturing research have been focused on automating process planning, automatic toolpath generation for models having many surfaces, optimizing both within and across manufacturing stages and fixture automation. She has also been working on issues related to telepresence and design collaborations in virtual environments. Recent research has produced algorithms for determining both visibility and accessibility of one object by another. Computation of such information is necessary for manufacturing, assembly planning, graphics, and virtual environments. Research in haptics has been focused on developing new approaches to solving geometric computations such as fast and accurate contact and tracking algorithms for sculptured models and while research in haptics systems has focused on realistic force feedback in distributed haptic systems for complex mechanical models. Dr. Cohen was the 2001 recipient of the University of Utah Distinguished Research Award and is a member of the Computer Science and Telecommunications Board of the National Academies.

EUGENE FIUME is Professor and Chair of the Department of Computer Science at the University of Toronto, where he also co-directs the Dynamic Graphics Project. Following his BS degree in mathematics from the University of Waterloo and M.Sc. and Ph.D. degrees from the University of Toronto, he was an NSERC Postdoctoral Fellow and Maitre Assistant at the University of Geneva, Switzerland. He was awarded an NSERC University Research Fellowship in 1987 and returned to the University of Toronto to a faculty position. Dr. Fiume was Associate Director of the Computer Systems Research Institute, and was a Visiting Professor at the University of Grenoble, France. He is or was a member of various boards, including the Scientific Advisory Board of GMD, Germany; the Board of Directors of TrueSpectra, Inc. in Toronto; the Board of Directors of CITO; the Advisory Boards of CastleHill Ventures, PlateSpin, BitFlash, TrueSpectra and OctigaBay Systems; and the Executive Advisory Board of the IBM Lab in Toronto. His research interests include most aspects of realistic computer graphics, including computer animation, modeling natural phenomena, and illumination, as well as strong interests in internet based imaging, image repositories, software systems and parallel algorithms. He has written two books and (co-)authored over 85 papers on these topics. Dr. Fiume has won two teaching awards, as well as Innovation Awards from ITRC for research in computer graphics and Burroughs-Wellcome for biomedical research. He was also the Papers Chair for SIGGRAPH 2001.

JAMES D. FOLEY is Professor and Associate Dean in the College of Computing, and Professor in the School of Electrical and Computer Engineering. He earned the Ph.D. in Computer Information and Control Engineering at the University of Michigan and the BSEE at Lehigh University, where he was initiated into Phi Beta Kappa, Tau Beta Pi and Eta Kappa Nu. Dr. Foley first came to Georgia Tech in

1991 to establish the Graphics, Visualization & Usability Center, which in 1996 was ranked #1 by US News and World Report for graduate computer science work in graphics and user interaction. In 1996, he became director of Mitsubishi Electric Research Lab in Cambridge and then in 1998 chairman and CEO of Mitsubishi Electric ITA, directing corporate R&D at four labs in North America. He returned to Georgia as Executive Director and then CEO of Yamacraw, Georgia's economic development initiative in the design of broadband systems, devices and chips. Dr. Foley is a Fellow of ACM and IEEE, an inaugural member of the ACM/CHI Academy, and recipient of the biannual ACM/SIGGRAPH Stephen Coons Award for Outstanding Creative Contributions to Computer Graphics. The graphics textbooks he has co-authored are widely used and have been translated into six foreign languages. In 1992, the Georgia Tech College of Computing graduate students named him, "most likely to make students want to grow up to be professors." In July 2001, Dr. Foley became chairman of the Computing Research Association - an organization of over 200 computer science and computer engineering university departments, professional societies and industrial research labs.

DON GREENBERG has been researching and teaching in the field of computer graphics since 1966. During the last 15 years, he has been primarily concerned with research advancing the state-of-the-art in computer graphics and with utilizing these techniques as they may be applied to a variety of disciplines. His specialties include hidden surface algorithms, geometric modeling, color science, and realistic image generation. He presently teaches the course Imaging and the Electronic Age in the Department of Architecture. Dr. Greenberg joined the faculty of Cornell in 1968, with a joint appointment in the Departments of Architecture and Structural Engineering. His prior education consisted of both the architecture and engineering disciplines at Cornell University and Columbia University. From 1960 to 1965, he served as a consulting engineer with Severud Associates, and was involved with the design of numerous building projects including the St. Louis Arch, New York State Theater of the Dance at Lincoln Center, and Madison Square Garden. He has taught courses in structural analysis and design, architectural design, shell structures, reinforced concrete, and computer applications in architecture. In 1970-1971, he was a guest professor at the ETH in Zurich, Switzerland, and he has been a visiting professor at Yale University. Dr. Greenberg is presently on the editorial boards of Computers and Graphics and Computer-Aided Design. He is a member of the ACM, IEEE, SIGGRAPH, and Eurographics societies.

PAT HANRAHAN has produced well-known publications in visualization, including pioneering work in volume rendering, the construction of effective pictorial representations, and the display of large, multi-dimensional data bases. He is best known for his contributions to the development of the popular RenderMan interface, including the design of RenderMan Shading Language. This work has led to programmable graphics hardware and real-time "shaders" for games and interactive entertainment applications. He has demonstrated extreme versatility in a wide range of computer graphics areas for more than two decades. Through the 1980's he worked at some of the most influential laboratories of their day, including the graphics lab at the New York Institute of Technology, Digital Equipment Co., and Pixar Animation Studios. He joined Princeton University in 1989, leaving for Stanford in 1995, and received the ACM SIGGRAPH Computer Graphics Achievement Award in 1993. Hanrahan earned his Ph.D. in Biophysics at the University of Wisconsin in 1985.

CHUCK HANSEN is an associate professor of computer science at the University of Utah. His research interests include large scale scientific visualization, rendering techniques and computer graphics, parallel algorithms, distributed computation, 3D shape representation, and computer vision. He received his AS in Computer Science at the Technology State Technical Institute in Memphis in 1977, BS in Applied Computer Science at the Memphis State University in 1981, and PhD in Computer Science at the University of Utah in 1987.

JESSICA HODGINS joined the Robotics Institute and Computer Science Department at Carnegie Mellon University as a Associate Professor in fall of 2000. Prior to moving to CMU, she was an Associate Professor and Assistant Dean in the College of Computing at Georgia Institute of Technology. She received her Ph.D. in Computer Science from Carnegie Mellon University in 1989. She has received a NSF Young Investigator Award, a Packard Fellowship, and a Sloan Fellowship. Dr. Hodgins is editor-in-chief of ACM Transactions on Graphics and will be Papers Chair for ACM SIGGRAPH 2003.

CHRIS JOHNSON directs the Scientific Computing and Imaging Institute at the University of Utah where he is a Distinguished Professor of Computer Science and holds faculty appointments in the Departments of Physics, and Bioengineering. His research interests are in the area of scientific computing. Particular interests include inverse and imaging problems, adaptive methods, problem solving environments, biomedical computing, and scientific visualization. Dr. Johnson founded the SCI research group in 1992 which has since grown to become the SCI Institute employing over 70 faculty, staff and students. He serves on several international journal editorial boards, as well as on advisory boards to several national research centers. Dr. Johnson was awarded a Young Investigator's (FIRST) Award from the NIH in 1992, the NSF National Young Investigator (NYI) Award in 1994, and the NSF Presidential Faculty Fellow (PFF) award from President Clinton in 1995. In 1996 he received a DOE Computational Science Award and in 1997 received the Par Excellence Award from the University of Utah Alumni Association and the Presidential Teaching Scholar Award. In 1999, Dr. Johnson was awarded the Governor's Medal for Science and Technology from Governor Michael Leavitt. In 2003 he received the Distinguished Professor Award from the University of Utah.

JAMES T. KAJIYA started his career as a hardware designer. In 1972, at Quad-Eight Electronics, he designed automated mix-down equipment and SMPTE time-code synchronizers. In 1973, he joined the Evans and Sutherland Computer Corp. as the project engineer for the Evans and Sutherland frame buffer, the first commercially available random access frame buffer. He received a doctorate in computer science from the University of Utah in 1979. His thesis research applied Lie group representation theory to the modeling of the human visual system as a signal processing system to explain a wide range of phenomena in monochrome brightness perception and predict several new visual illusions and phenomena. From 1979 to 1994, Dr. Kajiya was at the California Institute of Technology, first as an assistant professor, then as associate professor of computer science. He has published papers on mathematical models for computer vision, high-level programming languages and mathematical logic for computer science. From 1994 to 1997, Kajiya was a senior researcher at Microsoft Research, where he built and led the graphics group. He is currently a director of research at Microsoft Corp. His recent work has focused on very high-quality computer graphics. Most recently, Kajiya has returned to graphics hardware design. He was the principal architect on Talisman, a low-cost hardware architecture for very high-quality real-time 3-D graphics. He is currently working on a language, nuBasic, intended to promote rich multimedia client applications. Kajiya has served on the external advisory board of the Defense Mapping Agency, on the National Neurocircuitry Database Committee for the National Academy of Sciences and Institute of Medicine, and on the SIGGRAPH executive committee. He received the SIGGRAPH Technical Achievement Award in 1991 and served as the technical program chair for SIGGRAPH 93. In 1997, Kajiya, along with Dr. Timothy Kay, received an Academy Award (technical certificate) for work on rendering hair and fur.

DAVID B. KIRK has been Chief Scientist for Nvidia since January 1997. From June 1996 to January 1997, Dr. Kirk was a software and technical management consultant. From 1993 to 1996, Dr. Kirk was Chief Scientist, Head of Technology for Crystal Dynamics, a video game manufacturing company. From 1989 to 1991, Dr. Kirk was an engineer for Apollo Systems Division of Hewlett-Packard Company. Dr. Kirk has authored seven patents relating to graphics design and has authored more than 50 articles on graphics technology. Dr. Kirk holds B.S. and M.S. degrees in Mechanical Engineering from the

Massachusetts Institute of Technology and M.S. and Ph.D. degrees in Computer Science from the California Institute of Technology.

MING C. LIN received her B.S., M.S., Ph.D. degrees in Electrical Engineering and Computer Science in 1988, 1991, 1993 respectively from the University of California, Berkeley. She is currently an associate professor in the Computer Science Department at the University of North Carolina (UNC), Chapel Hill. Prior to joining UNC, she was an assistant professor in the Computer Science Department at both Naval Postgraduate School and North Carolina A&T State University, and a Program Manager at the U.S. Army Research Office. She received the NSF Young Faculty Career Award in 1995, Honda Research Initiation Award in 1997, UNC/IBM Junior Faculty Development Award in 1999, and UNC Hettleman Award for Scholarly Achievements in 2002. Her research interests include real-time 3D graphics for virtual environments, applied computational geometry, physically-based modeling, robotics and distributed interactive simulation. She has served as a program committee member for many leading conferences on virtual reality, computer graphics, robotics and computational geometry. She was the general chair of the First ACM Workshop on Applied Computational Geometry, the co-chair of 1999 ACM Symposium on Solid Modeling and Applications, the co-chair of the Workshop on Intelligent Human Augmentation and Virtual Environments 2002, and the program co-chair of ACM SIGGRAPH / EG Symposium on Computer Animation 2003. She also serves on the Steering Committee of ACM SIGGRAPH/Eurographics Symposium on Computer Animation. She is a guest editor of the International Journal on Computational Geometry and Applications, the co-editor of the book "Applied Computation Geometry", co-editor of an special issue on HAPTIC RENDERING for IEEE Computer Graphics and Applications, and the Category Editor of ACM Computing Reviews in Computer Graphics.

LEONARD MCMILLAN is an Assistant Professor in the Electrical Engineering and Computer Science department at the Massachusetts Institute of Technology. He is a member of the MIT Laboratory for Computer Science and a co-leader of the MIT Computer Graphics Group. Leonard received his Bachelors (1983) and Masters (1984) degrees in Electrical Engineering from Georgia Institute of Technology. Leonard received his Ph.D. in Computer Science from the University of North Carolina at Chapel Hill (1997). Leonard has been a Member of Technical Staff at AT&T Bell Laboratories where he worked in the Digital Signal Processing Architecture Group and was a co-architect of the AT&T Pixel Machine. Leonard has also worked as a Senior Staff Engineer at Sun Microsystems where he helped develop several visualization and multimedia products. Leonard is a pioneer in the field of image-based rendering. Image-based rendering is a new approach to computer graphics where scenes are rendered directly from a collection of reference images rather than a geometric model. Leonard is also interested in a wide range of related topics including computer graphics rendering, imaging methods and technologies, three-dimension display technologies, computer graphics hardware, and the fusion of image processing, multimedia, and computer graphics.

CYNTHIA PATTERSON is a study director and program officer with the Computer Science and Telecommunications Board of the National Academies. She is currently involved in a diverse set of CSTB projects including a project on the future of supercomputing, a study on telecommunications research and development, and a workshop on the fundamental research challenges in computer graphics. She has just completed a project on critical information infrastructure protection and the law, a project that outlined a research agenda at the intersection of geospatial information and computer science, and she completed a joint study with Board on Earth Sciences and Resources and Board on Atmospheric Sciences and Climate on public-private partnerships in the provision of weather and climate services. She has also been involved with the congressionally mandated study on Internet searching and the domain name system. Prior to joining CSTB, Ms. Patterson completed a M.Sc from the Sam Nunn School of International Affairs at the Georgia Institute of Technology. Her graduate work was supported by the Department of Defense and SAIC. In a previous life, Ms. Patterson was employed by IBM as an IT consultant for both federal government and private industry clients. Her work included application

development, database administration, network administration and project management. She received a B.Sc. in Computer Science from the University of Missouri-Rolla.

RICH RIESENFELD is a professor of computer science at the University of Utah. He has been involved in research in the areas of computer graphics, animation, computer aided geometric design and CAD/CAM since joining the Computer Science faculty at the University of Utah in 1972. Recently he has been investigating a broad spectrum of research problems in computer graphics, geometric modeling, and manufacturing within an integrated experimental testbed system motivated by the unifying principles of spline theory. He received his A.B. degree in mathematics from Princeton University, and his M.S. degree in mathematics and Ph.D. degree in computer science from Syracuse University.

HOLLY RUSHMEIER is a research staff member at the IBM T.J. Watson Research Center. Her research interests include data visualization, rendering algorithms, and acquisition of input data for computer graphics image synthesis. She received a B.S., M.S., and Ph.D. in mechanical engineering from Cornell University in 1977, 1986, and 1988, respectively. In 1990, she was selected as a US National Science Foundation Presidential Young Investigator. She has served as papers chair or co-chair for the ACM SIGGRAPH conference, the IEEE Visualization conference, and the Eurographics Rendering Workshop. From 1996 to 1999, she was editor in chief of ACM Transactions on Graphics.

JOHN STAUDHAMMER is a rotator from UCLA, where he has been teaching Logic Design and Computer Engineering courses and laboratories. Previously he has been a Program Officer with the Office of Naval Research, with the National Science Foundation, and with the Army Research Office. He was Professor of Electrical and Computer Engineering at Arizona State University, North Carolina State University and the University of Florida. He has taught and conducted research in Automated Circuit Analysis, Logic Design and Computer Graphics. He has served on numerous Program Committees for international meetings in Computer Aided Design and Computer Graphics, has been Editor-in-Chief of IEEE Computer Graphics and Applications, and was Co-Chair of the Seventh International Conference on CAD and CG.

DEMETRI TERZOPOULOS is Professor of Computer Science and Professor of Electrical & Computer Engineering at the University of Toronto. He is currently on leave at New York University. Terzopoulos received the PhD degree ('84) in Computer Science (AI) from the Massachusetts Institute of Technology (MIT) and the MEng and Honours BEng degrees in Electrical Engineering from McGill University. After graduation, he was a research scientist at the MIT Artificial Intelligence Lab, Cambridge, MA. Prior to becoming an academic in 1989, he was affiliated with Schlumberger, Inc., serving as Program Leader at corporate research centers in California and Texas. He has been a visiting professor at the Schlumberger Laboratory for Computer Science in Austin, TX, at Digital's (then Compaq's, now Hewlett-Packard's) Cambridge Research Laboratory in Cambridge, MA, at Intel Corporation in Santa Clara, CA, and at the IBM Almaden Research Center in San Jose, CA. His published work includes more than 200 scientific articles, primarily in computer vision and graphics, and also in computer-aided design, medical imaging, artificial intelligence, and artificial life, including the recent edited volumes Real-Time Computer Vision (Cambridge Univ. Press '94), Animation and Simulation (Springer-Verlag '95), and Deformable Models in Medical Image Analysis (IEEE CS Press '98). Professor Terzopoulos was elected a Fellow of the The Institute of Electrical and Electronics Engineers (IEEE), a Killam Research Fellow of the Canada Council for the Arts, an AI and Robotics Fellow of the Canadian Institute for Advanced Research, and an E.W.R. Steacie Memorial Fellow of the Natural Sciences and Engineering Research Council of Canada, the highest honor for Canadian scientists and engineers under the age of 40. His other citations include six University of Toronto Excellence Awards, an award from the American Association for Artificial Intelligence in 1987 for his work on deformable models in vision, an award from the IEEE in 1987 for his work on active contours (snakes), an award from NICOGRAPH in 1996 for his work on human facial modeling and animation, and awards from the International Digital Media Foundation in 1994 and from

Ars Electronica, the premier competition for creative work with digital media, in 1995 for his work on artificial animals for computer animation and virtual reality. In 1998 he received an award from the Canadian Image Processing and Pattern Recognition Society for his outstanding contributions to research and education in image understanding. Professor Terzopoulos has served on DARPA, NSF, and NIH advisory committees and on the program committees of the major graphics and vision conferences. He was program co-chair of the 1998 IEEE Conference on Computer Vision and Pattern Recognition (CVPR '98). He is a founding member of the editorial boards of the journals Medical Image Analysis, Graphical Models, Videre: Journal of Computer Vision Research, and the Journal of Visualization and Computer Animation, and is a member of the ACM, IEEE, NYAS, and Sigma Xi.

JAMES J. THOMAS is the Chief Scientist for Information Technologies at Pacific Northwest National Laboratory, and has won numerous national and international awards for innovation and has led several national interdisciplinary science teams to define research and industrial action agendas. He has served on the National Academy of Sciences panel for Virtual Reality and sits on several national and international science and technology boards for universities, states and industry. He is considered one of the fathers of computer graphics and has been involved at the cutting edge of computer and information technology for the past 30 years.

ANDRIES VAN DAM is vice president for research at Brown University. He has been on Brown's faculty since 1965, and was one of the Computer Science Department's founders and its first Chairman, from 1979 to 1985. He was a Principal Investigator and was the Director from 1996-1998, in the NSF Science and Technology Center for Graphics and Visualization, a research consortium including Brown, Caltech, Cornell, North Carolina (Chapel Hill), and the University of Utah. Professor van Dam 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. His research has concerned computer graphics, text processing and hypermedia systems. He has been working for over thirty years on systems for creating and reading electronic books with interactive illustrations for use in teaching and research. In 1967, Professor van Dam co-founded ACM SIGGRAPH and from 1985 through 1987 was Chairman of the Computing Research Association. He has been Associate Editor of the "ACM Transactions on Graphics" (1981-1986), Editorial Board Member of "Computers and Graphics", Pergamon Press (1983 -1994), Advisory Editor, "Journal of Visual Languages and Computing", Academic Press (1989-1998), and Editorial Board Member of the "IEEE Transactions on Visualization and Computer Graphics", (1994-1998). He is currently Chairman of the Rhode Island Governor's Science and Technology Council, a trustee of RISD (Rhode Island School of Design), heads the Technical Advisory Boards of the Providence Fraunhofer Center for Research in Computer Graphics and ContextMedia, and is on the Technical Advisory Board for Microsoft Research. He is the Chairman of the IEEE James H. Mulligan, Jr. Education Medal committee.

ROSS T. WHITAKER is an assistant professor in the School of Computing at the University of Utah. He has interests in computer vision, visualization, and image processing. In the area of medical image processing, Dr. Whitaker is a codeveloper of the "Insight" toolkit for segmenting and visualization the 3D color data associated with the Visible Human Project. Dr. Whitaker is also working on new, statistics-based methods for building surface models from noisy range measurements, such as those from laser radar and ultrasound. In the area of visualization, Dr. Whitaker is developing new methods for visualizing biological volume datasets and for processing the surface models that are derived from these datasets. He received his B.S. degree in electrical engineering/engineering physics from Princeton University, and his M.S. and Ph.D. degrees in computer science from the University of North Carolina.

TURNER WHITTED is a senior researcher in Microsoft Research's hardware devices and graphics groups. He has been an adjunct professor of computer science at the University of North Carolina at Chapel Hill since 1983 as well as a co-founder and director of Numerical Design Limited. Prior to that,

he was a member of the technical staff in Bell Labs' computer systems research laboratory. He earned BSE and MS degrees in electrical engineering from Duke University and a PhD from North Carolina State University. He is an Associate Editor-in-Chief of IEEE Computer Graphics and Applications, was papers chair for SIGGRAPH 97, and is an ACM Fellow.

MICHAEL ZYDA is the Director of The MOVES Institute, located at the Naval Postgraduate School, Monterey, California. He is also a Professor in the Department of Computer Science at NPS. Professor Zyda's research interests include computer graphics, large-scale, networked 3D virtual environments, agent-based simulation, modeling human and organizational behavior, interactive computer-generated story, and modeling and simulation. He is a pioneer in the fields of computer graphics, networked virtual environments, modeling and simulation, and entertainment/defense collaboration. He is the principal investigator of the America's Army PC game funded by the Assistant Secretary of the Army for Manpower and Reserve Affairs. Professor Zyda was a member of the National Research Council's Behavioral and Social Sciences Commission Committee on "Virtual Reality - Scientific and Technological Challenges". Professor Zyda was the chair of the National Research Council's Computer Science and Telecommunications Board Committee on "Modeling and Simulation: Linking Entertainment & Defense". From that report, for the Deputy Assistant Secretary of the Army for Research and Technology, Professor Zyda drafted the operating plan and research agenda for the USC Institute for Creative Technologies (ICT). Professor Zyda was a member of the National Research Council's Aeronautics and Space Engineering Board Committee on Advanced Engineering Environments. Professor Zyda is chair of the National Research Council's Aeronautics and Space Engineering Board Panel on Computing, Information, and Communications Technology (CICT) and member of the parent NRC Committee for the Review of NASA's Pioneering Revolutionary Technology Program. Professor Zyda is a member of the NRC's Aeronautics and Space Engineering Board Vehicle Systems Panel that is part of the Committee for the Review of NASA's Revolutionize Aviation Program. Professor Zyda is a member of the National Research Council Naval Studies Board Committee on FORCEnet Implementation Strategy. Professor Zyda is also a Senior Editor for Virtual Environments for the MIT Press quarterly PRESENCE, the journal of teleoperation and virtual environments. Professor Zyda has consulted for the White House Office of Science and Technology Policy, the Ministry of Industrial Development Sabah Province, Malaysia, Japan Tech Services Corporation, Tokyo, Hitachi Plant Construction & Engineering, Ohtsuka, SimGraphics Engineering, Pasadena, BBN, Silicon Graphics International, Geneva, Nihon Silicon Graphics KK, Advanced Telecommunications Inc., TecMagik, Muse3d.com, Time Warner, and Paramount Digital Entertainment, among others. He is a speaker with Celebrity Speakers, International. Professor Zyda began his career in Computer Graphics in 1973 as part of an undergraduate research group, the Senses Bureau, at the University of California, San Diego. Professor Zyda received a BA in Bioengineering from the University of California, San Diego in La Jolla in 1976, an MS in Computer Science from the University of Massachusetts, Amherst in 1978 and a DSc in Computer Science from Washington University, St. Louis, Missouri in 1984.