



## Tutorial: Interactive Tools for Scientific and Medical Illustration Composition

**Date:** Tuesday, April 15<sup>th</sup>

**Time:** 14:00 - 17:30 (Half-day Tutorial)

### Presenters:

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**Abstract:** The area of illustrative visualization is concerned with developing methods to enhance the depiction of scientific data based on principles founded in traditional illustration. The illustration community has century-long experience in adapting their techniques to human perceptual needs in order to generate an effective depiction which conveys the desired message. Thus, their methods can provide us with important insights into visualization problems.

In this tutorial, the concepts in illustrative visualization are reviewed. An important aspect here is interaction: while traditional illustrations are commonly only presented as static images, computer-assisted visualization enables interactive exploration and manipulation of complex scientific data. Only by coupling illustrative visualization with effective interaction techniques its full potential can be exploited.

The tutorial starts with a detailed description of the entire traditional medical illustration production pipeline (techniques, tools, etc.) describing limitations and specific features to be researched and developed for more advanced tools. We then proceed discussing the importance and power of abstraction and interface issues in illustrative visualization. We present different ways of achieving abstraction in interactive settings discussing flexible representations for representing artistic visual styles. Next, we introduce the importance of intuitive interaction for illustrative visualization describing sketch-based approaches as an intuitive way of manipulating and exploring volumetric datasets. In the last part of the tutorial we present techniques for deforming volumes in various ways inspired by traditional illustration techniques such as the depiction of surgical procedures. We also describe how to deform and render in an illustrative fashion using by-example approaches.



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**Bill Andrews** received his BA in Art from the Univ. of Texas at Austin and his MA in Biomedical Communications from the Univ. of Texas Health Science Center at Dallas. Bill has been a Certified Medical Illustrator since 1993. He is currently pursuing a PhD in Health Promotion, Education and Behavior at the Univ. of South Carolina, Columbia. Bill joined the faculty of the Medical College of Georgia in 1999, where he is currently an Associate Professor in the Medical Illustration Graduate Program. He also serves as Education Program Coordinator and Gallery Director. Bill has won numerous professional awards and has had works included in juried exhibits around the world. Bill has presented numerous seminars and workshops across the United States and in Canada, England, France, Italy and the Netherlands. He has been an active Professional member of the Association of Medical Illustrators (AMI) for twenty-five years. He has served as President of the AMI and on the Board of Governors, and is a Fellow of the AMI. Bill has been Editor of the national newsletter and Editor for the Source Book of Medical Illustration. Bill has been a Certified Medical Illustrator since 1993. He is currently the Commissioner for the AMI to the Committee on Accreditation of Allied Health Education Programs (CAAHEP). In 1988, Bill became the founding President of the Vesalius Trust, an educational foundation supporting research and education in visual communications for the health sciences. He is currently Vice-President and Historian of the Trust.

**Stefan Bruckner** graduated from the Vienna University of Technology, Austria in 2004 with a Dipl.-Ing. (MSc) degree in the field of computer graphics and visualization. Since then, he has been a research assistant and Ph.D. student in the Visualization Group of the Institute of Computer Graphics and Algorithms at the Vienna University of Technology. He has authored several peer-reviewed articles on illustrative volume visualization focusing on the application of abstraction techniques in the context of interactive visualization systems. His research interests include scientific visualization, computer graphics, and human computer interaction.

**Wei Chen** is an associate professor in the State Key Lab of CAD&CG at Zhejiang University. He had been in Fraunhofer Institute of Computer Graphics, Germany as a joint-education Ph.D. student for two years. He has performed research on interactive modeling and volume visualization in the past five years. Since July, 2006, he has been a visiting scholar at Purdue university and worked on illustrative visualization. Currently, he focuses on incorporating shape styles and texture patterns into efficient illustrative modeling and rendering. He has co-authored several papers on illustrative visualization.

**Carlos Correa** is a postdoctoral researcher in the Visualization and Interface Design Innovation group at University of California, Davis. He received his Ph.D degree in Electrical and Computer Engineering from Rutgers University in May 2007. He received his master's degree in 2003 from the same University. In his doctoral dissertation, he explored the use of Illustrative Deformation of Volumetric Objects and other graphics models, as part of the visualization process. His current research interests include the exploration of a more active approach to scientific visualization, where the user's role is no longer passive, and data can be manipulated and deformed interactively to provide a better understanding.

**David Ebert** is a Professor and University Faculty Research Fellow in the School of Electrical and Computer Engineering at Purdue University and directs both the Purdue University Rendering and Perceptualization Lab and the Purdue University Regional Visualization and Analytics Center. His research interests are scientific, medical, and information visualization, visual analytics, computer graphics, animation, and procedural techniques. Dr. Ebert performs research in volume rendering, illustrative visualization, realistic rendering, procedural texturing, modeling, and animation, and modeling natural phenomena. Ebert was one of creators of the subfield of illustrative visualization, applying the principles of illustration to the problem of visualizing scientific data. Ebert has been very active in the graphics community, teaching courses, presenting papers, serving on and co-chairing many conference program committees, serving on the ACM SIGGRAPH Executive Committee and serving as Editor in Chief for *IEEE Transactions on Visualization and Computer Graphics*. Ebert is also editor and co-author of the seminal text on procedural techniques in computer graphics, *Texturing and Modeling: A Procedural Approach*, whose third edition was published in December 2003.



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**Mario Costa Sousa** is an Associate Professor of Computer Science at the University of Calgary and coordinator of the Render Group, the Illustrative Visualization/NPR research wing at the Computer Graphics Lab at the University of Calgary. He holds a M.Sc. (PUC-Rio, Brazil) and a Ph.D. (University of Alberta) both in Computer Science. His current focus is on research and development of techniques to capture the enhancement and expressive capability of traditional illustrations, leading to a comprehensive formal illustrative visualization framework, methodology and software environment for computer-generated medical and scientific illustrations. This work involves topics centered on interactive modeling, shape analysis and expressive rendering for illustrative volume visualization and interactive simulations. Dr. Sousa has active collaborations with illustrative visualization research groups, medical centers, and scientific institutes and with illustrators/studios affiliated with the Association of Medical Illustrators and the Guild of Natural Science Illustrators.

**Ivan Viola** is a Post Doctor research associate at University of Bergen, Norway. He was formerly associated with Vienna University of Technology, Austria, where he received M.Sc. in 2002 and Ph.D. in 2005. His research is focused on development of novel methods for automatically generating expressive visualizations of complex data. Viola co-authored several scientific works published on international conferences such as IEEE Visualization, EuroVis, and Vision Modeling and Visualization and acted as a reviewer and program committee member for conferences in the field of computer graphics and visualization. He has co-organized series of tutorials on illustrative visualization.