INTERFACE

SOCIETY FOR TECHNOLOGY IN ANESTHESIA

P.O. Box 5257 • PHOENIX, AZ 85010 • (602) 267-5366 • E-MAIL BAnderso@AzMedEd.org

SEPTEMBER 1998 • VOLUME 9 • NO 2

STA in the Forefront of Education

Steven J. Barker, PhD, MD STA President

FROM THE PRESIDENT

The coming six months will be an exciting period for STA. At the annual meeting of the ASA in Orlando, STA will provide two functions of interest to all anesthesiologists. On Sunday, October 18, we will hold our annual ASA Dinner at the Omni Rosen Hotel. The after dinner speaker will be Martin Bowen, who was one of the first explorers of the wreck of the liner RMS Titanic. His talk promises to be one of the highlights of the ASA meeting and is obviously of interest to spouses as well. The other ASA function is the breakfast meeting to be held on October 21 at 7:30 am at the Omni Rosen. The topic of this session will be Information Management. Both these functions have been organized by Charlotte Bell and the Education Committee, who have done an outstanding planning job.

Steve Barker, President

The 1999 Annual Meeting will be a revisit to the picturesque Hotel del Coronado in San Diego, where we held a very successful meeting in 1995. David Seitman and his group have assembled an exciting and topical meeting as you can see by the program outline. In addition to the lecture sessions and poster papers, we will again have the opportunity to gain hands-on experience with the latest breeds of patient simulators, as at last year's meeting in Tucson. Thanks to Matt Weinger, we will be offering an exciting variety of tours, which are unique to the San Diego area. STA would like to get YOU involved in the excitement of technology in anesthesia in the year 2000. If you are not a member, consider the many benefits of membership and fill out the attached application form. If you are a member, how about serving on one of our committees? Please tell me by E-mail at *sjbarker@u.arizona.edu* or phone at (520) 626-7195 what your primary interests are and I will be happy to appoint you to the committee that bests represents them.

By definition, STA is a society that embodies continual change and development. Give me your ideas about the directions our growth should emphasize and help STA remain responsive to the always changing needs of its membership.

Don't forget STA at the ASA

INSIDE THIS ISSUE:

INTERFACE

SOCIETY FOR TECHNOLOGY IN ANESTHESIA

INTERFACE is the official newsletter of the Society for Technology in Anesthesia. The Newsletter is published quarterly and mailed directly to the membership of the society. The editors invite suggestions, contributions and commentary about published items. Please send all correspondences to:

George Blike, MD
Editor, STA Interface
Assistant Professor of Anesthesiology
Lahey Hitchcock Clinic
One Medical Center Drive
Lebanon, New Hampshire 03756-0001
Phone: (603) 650-6823
FAX: (603) 650-8980
Internet:
george.t.blike@hitchcock.org

Chris Wiley
SIGnatures Editor
Dartmouth-Hitchcock Medical Center
Phone: (603) 650-5922
christopher.wiley@hitchcock.org

International Editors
Naosuke Sugai, MD, PhD - Asia
Tokyo, Japan

John Zelcer, MD - Australia
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Andre Dellermalm, MD - Europe
Uddevalla, Sweden

STA Membership Notes

David Feinstein, MD • dfeinste@bihmc.harvard.edu

Early October all current STA members will be receiving a personalized invoice for their 1999 dues. In order to insure that the Journal receives an accurate list of current members, we hope that renewals will be received before February 1. By renewing on time, you guarantee that the Journal and your newsletter subscriptions continue uninterrupted. As a special for current members, dues paid at the ASA will be discounted. This offering was a great success in 1998 and resulted in an early renewal rate of 80%. If you are attending the ASA meeting and one of the STA activities, you will receive a special flier delineating the $20 discount. This discount is our way of saying thank you.

1999 Membership & Meeting fee

Big savings for both if paid together at ASA

	Regular fee	Amount if paid by 11/1/98
Individual Membership	$200	$180
1999 STA meeting	$320	$300
Total	$520	$480

1998 Officers and Board of Directors

President	Steve Barker, PhD, MD *sjbarker@u.arizona.edu*
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	John Robinson *jrobinson@hp.com*
	Richard Bartkowski *Richard.Bartkowski@mail.tju.edu*

Easy ways to register for STA meetings:

New Phone (602) 267-5784 or FAX (602) 306-2989
E-mail CourseCo@AzMedEd.org Attn: STA
Webpage: *http://www.groucho.med.yale.edu/socialites.sta*

STA '99 - A Window to the 21st Century

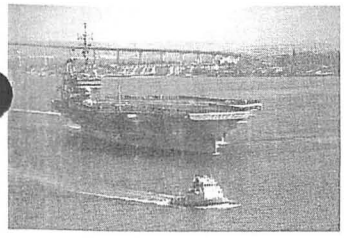
January 20 - 23, 1999

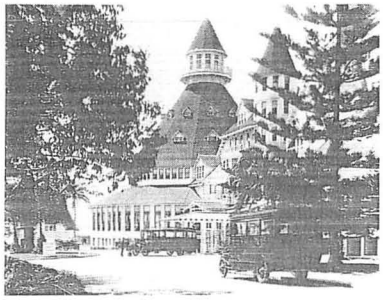
Hotel Del Coronado San Diego, California

David Seitman, M.D. • Program Chair, STA '99 • SeitmanD@pol.net

A Note from the Program Director

Come join us at the famous Hotel del Coronado for the 9th Annual STA Meeting. The word from a very reliable source is that: the weather will be picture perfect (not too hot, not too cold, and definitely NO RAIN); the lectures will be excellent (not too simple, not too esoteric, and definitely NOT BORING); the internet classes will be practical and informative (four classes geared for varying levels of expertise and interest); AND the workshops will be a unique experience (get hands-on training you might not be able to find anywhere else); Don't forget the Annual STA debate, the keynote speech on Biological Weapons, the excellent field trips, the banquet, and the other activities geared not only for the meeting attendee but also for the spouse, guest, and family. Bring your family or bring just yourself. Either way you'll have a great time as you learn about cutting-edge technology for the 21st century.





David Seitman, M.D.

Associate Professor of Clinical Anesthesiology
UMDNJ

Robert Wood Johnson Medical School
New Brunswick, NJ USA 08901

E-mail: *SeitmanD@pol.net*
Program Chair, STA'99

Field Trips

Point Loma Naval Base Submarine Training Base and Submarine Tour: If you're over 6'5" this may not be for you. As you tour the sub, keep in mind that it is someone's home for 6 months at a time - under water.
Http:/www.navy.mil

Navy Seals Warfare Training Facility: You won't be required to compete with either GI Joe or Jane, but be prepared to get your feet wet.
Http://webix.nosc.mil/seals/
Http://www.usmc.mil/

Miramar Marine Air Base Southern California Air Traffic Control. High-tech. High-stress work environment where much of Southern California's aviation is orchestrated.

Catepillar's Solar Turbine fabrication plant. These high-powered gas turbines, some as big as a house, are constructed & assembled at the plant located at Lindberg Field.

San Diego Aerospace Museum in Balboa Park. More than 65 air and space crafts and thousands of artifacts bring to life significant events in flight and space exploration.
Http://superbowlhost.org/visitors/Ut/aerospace.html

Naval Hospital Ship: This is a tour of a 1,000 bed acute care floating hospital which has seen duty around the world. Jogging shoes required of all health care providers.

THE ANNUAL STA DINNER at the ASA

Sunday, October 18, 1998
Omni Rosen Hotel
Salon 20-21

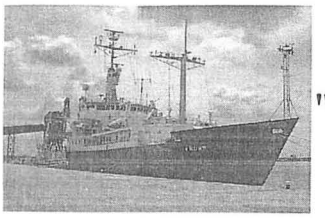


Photo credit: D.R.Yoerger, © 1996

"The First Expeditions to Film the Sunken Luxury Liner RMS TITANIC"

Presented by Martin Bowen

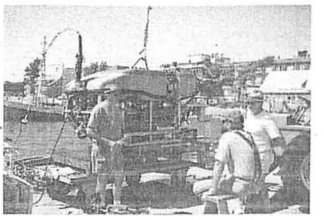


Photo credit: C.J.Sellers, © 1995

Martin Bowen explores deep-sea shipwrecks. He was underwater photographer for the discovery expedition to RMS TITANIC in 1985. The following year he made six dives to the wreck inside the submersible, ALVIN, to a depth of two and one half miles. He was the fourth person to view the ship up close since its loss in 1912. He was also the first diver to pilot a robot camera system, called JASON JUNIOR, from inside the three-man submersible ALVIN and down TITANIC's grand staircase.

Bowen is currently a senior designer and operator of unmanned underwater robots for the Deep Submergence Laboratory of the Woods Hole Oceanographic Institution.

Bowen has been participating in deep-sea expeditions for twenty five years (twelve years with Dr. Robert Ballard) and has visited a dozen shipwrecks including the LUSITANIA, the BISMARCK and vessels lost in Guadalcanal. He has helped design, build and operate various robotic vehicle systems used to provide film for documentaries by National Geographic Television, Turner Broadcasting, Discovery Channel and A&E Network.

Some URLs describing the work he has been doing recently which may be of interest are:

http://www.dsl.whoi.edu/ *http://cook.mit.edu/~auvlab/*
http://gasnet.med.yale.edu/societies includes STA 99 meeting information

RESERVATION FORM

Seating is limited. Please send your reservations immediately. Spouses & guests welcome.

Please print
Name _____
Degree
Confirmation address: _____
City/State/Country/Zip: _____
Phone: _____ E-mail _____

_____ Number of Dinner tickets $50 each $_____

❑ Check payable to STA and mail
❑ Credit Card Charge (circle one) Visa MasterCard
CC Number _____ Exp. Date_____
Signature of cardholder _____

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SIGnatures

3D visualization and the web using Virtual Reality Mark-up Language (VRML) Part II

Editors Note: This is the second of three articles on the state of the art regarding 3D visualization and the web using Virtual Reality Mark-up Language (VRML). The basic principles introduced by Dr. Wiley in the first and second installments will allow for better insight of what the future might hold for internet applications. (I would like to invite members of STA who have expertise regarding the power or limitations of the web to forward their ideas for future SIGnature columns to Dr. Wiley or myself.)

SIGnatures
Christopher Wiley, MD
Assistant Professor of Anesthesiology
Dartmouth-Hitchcock Medical Center
(*christopher.wiley@hitchcock.org*)

Virtual Reality, Medicine, and the Web Part II - Exploring the Visual Human

Part I of this series introduced the concept and basic principles of 3D visualization on computers. The fundamentals of the computer display were discussed along with the two major techniques currently used for displaying 3-dimensional objects onscreen: surface rendering and volume rendering. The former uses pre-calculated surface meshes and thereby trades interior detail for speed and reduced memory requirements. In contrast, volume rendering retains all information present in the dataset but requires a supercomputer to achieve the rendering speeds needed for interactivity.

In this installment we'll examine some current efforts to apply these techniques to the fascinating problem of visualizing medical and anatomic data. The tremendous increases in compute power now available in affordable systems means that PC's may be reasonably used for some of these applications, and we will concentrate on these.

Data

Both surface and volume rendering techniques require the underlying dataset to consist of a series of parallel images or slices spanning the entire structure or object of interest. CT and MRI scanners are capable of producing such datasets, but in clinical settings time and cost constraints usually mean that only partial studies are performed zeroing in on the patient's pathology. As a result, clean datasets of entire regions of normal anatomy have been essentially non-existent.

An additional problem arises from the fact that CT and MRI produce greyscale images only. In such images it can be difficult to distinguish between certain soft tissues which can be readily identified on cut section or in surgery due to their color difference. Thus, the ideal anatomic dataset would consist of a series of parallel full-color sections at the smallest possible interval extending from head to toe on an anatomically normal and representative specimen.

Fortunately, thanks to the National Library of Medicine's Visual Human Project (*www.nlm.nih.gov/research/visible/visible_human.html*), such a dataset is now available. In 1993 a convicted murderer was executed by lethal injection, and his body was flown by Lear jet to Denver, Colorado for processing. The cadaver was completely scanned with CT and MRI, then immersed in a gelatin bath, frozen, rescanned, and finally fed into a precision grinder that sequentially removed 1 mm "slices." The exposed "slice" was then polished and photographed with a high-resolution camera, and the process repeated. The resulting 1878 full-color images (each requiring over 7.3 megabytes of storage!) were digitized and stored constituting the most complete and accurate representation of the human male anatomy ever produced. Two years later an adult female was processed in a similar fashion although at 3x higher resolution (0.33 mm slices instead of 1.0 mm).

Not surprisingly, these datasets have provided the starting point for the applications we will be discussing next. Prior to use for either surface or volume rendering the data must be "classified" or "segmented." This means that all pertinent anatomic structures must be identified and marked in such a way that the software can distinguish them. Since even with the color sections, automated techniques are unable to reliably classify all structures; this step is very laborious requiring highly-trained personnel to examine each slice and outline the borders of any given structure. This allows the incremental construction of either a mesh or volumetric database in which every structure is uniquely identified.

This expensive and time-consuming process has been undertaken by at least two groups: Members of the original group that created the Visual Human dataset have produced a fully classified volumetric dataset (with over 3.3 billion voxels and 1200 anatomical names) which has been licensed to Gold Standard Multimedia, Inc. This dataset can be used for volume rendering or as a starting point for surface mesh creation and rendering. A different group at Visible Productions, Inc. have undertaken the creation of very high resolution surface meshes, which, while exquisitely detailed, do not yet encompass the entire Visual Male.

(Continued on page 6)

SIGnatures *(Continued from page 5)*

Both these processed datasets are commercially available and form the basis for the two applications we will consider next.

Virtual Human Atlas

This is a commercially available product from Gold Standard Multimedia (Windows 9x/NT or Macintosh PPC, CDROM, $195. www.gsm.com) which allows the user to create their own 3D views of the Visual Male. A tabular anatomic structure selection screen allows the user to select specific structures, systems, regions, or arbitrary blocks for display using a small palette of user-assignable colors and variable transparency. The choices are then fed to a volume-rendering engine that produces the image. Since even this relatively fast volume renderer may take many hours to render a complex image at high resolution, the program allows the selection of lower resolution for initial trial rendering until the desired set of parameters have been discovered at which time a high resolution rendering may be started if desired.

It is possible with this program to create beautiful, static 3D images of human anatomy. Specific structures or systems can be highlighted with color, labeled, and shown in-situ with surrounding tissues made nearly transparent. The resolution of the images can be very good, although for the highest possible resolution one must purchase the Studio version for $1250. The major drawback of this program is that it is not really interactive. Even at the lowest resolution settings a typical image takes many seconds to render, so the process of exploring the anatomy can be slow and frustrating. Nevertheless, as a tool for producing unique and compelling images for later study or teaching the Virtual Human excels.

Needleman

For the past several years my group at Dartmouth has been developing a PC-based simulator for regional anesthetic techniques (needle insertions). The goal is an interactive, affordable system allowing the user (student, resident, or practitioner) to explore a realistic 3D "virtual patient" with a "virtual needle" while providing both visual and tactile feedback. The user can then form for themselves an accurate mental map of the underlying 3D anatomy and proper needle paths for various blocks correlated with the "feel" of the needle as it passes through the tissue.

An interactive and affordable system is only possible using surface rendering. Therefore we have elected to use data from Visible Productions for the creation of our anatomic datasets. Various regions of the body, including to date the right shoulder and neck, lumbar spine, and right knee have been prepared. Each regional dataset contains a separate surface mesh for each pertinent anatomic structure. When a region is loaded into the simulator, the meshes are indexed, loaded into memory, and rendered on the screen. The user is then free to move, rotate, and zoom the "patient" into any desired view. Soft tissues can be made variably transparent or removed entirely either singly or in groups. Structures are colored using a conventional scheme: arteries are red, veins blue, nerves yellow, etc.

The "virtual needle" is manipulated either with onscreen controls or using a specially designed force-feedback device that provides resistance to the needle's insertion based on the tissue(s) through which the needle is passing. Thus, if bone is contacted a complete stop is encountered, while other tissues offer less resistance based on their type.

The system is reasonably fast. On a 300 mHz Pentium system with a 3D-accelerated video card the screen updates at 2-3 frames per second which is fast enough to be interactive. The steady advance in processor speed and capabilities will only improve the situation. Additional speed will allow a true stereoscopic display with LCD shutter glasses that produce a seemingly solid 3D image floating in space in front of the monitor. Other anatomic regions will be added eventually encompassing the entire Virtual Male.

Summary

We have seen how the Visual Human Project has provided a treasure trove of anatomic data for use in medical 3D visualization and simulation projects. A couple of representative applications have been discussed as early examples of the powerful systems to come.

3D visualization can be accomplished over the internet as well using the virtual reality markup language or VRML. This is a standard format for describing 3D objects and their spatial relationship to one another. Since VRML is quite compact, it can be sent over the internet at reasonable speeds. Then the scene is rendered by a plugin for your browser software that knows how to do surface rendering. The results can be impressive, as we'll see in the next part of this series when we examine 3D and the Web. -- *Christopher Wiley, MD*

STA 99

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Simulators - just one of the many things you can try at STA 99

BOARD OF DIRECTORS AND COMMITTEE MEETING SCHEDULE AT ASA
Sunday, October 18, 1998

All committees and Board of Directors meetings will be held in Salons 17,18,19, Omni Rosen Hotel. Check posting for exact room assignment. Refreshments served for Committees. Board of Director's buffet luncheon at 12:30 pm.

Committee schedule

9:00 am	STA 99 Committee - David Seitman
9:30 am	Newsletter Committee - George Blike
9:30 am	Data Retrieval Committee - Gordon Gibby
10:00 - 11:30 am	Education Committee - Charlotte Bell
11:30 - 1:00 pm	Pediatric Subcommittee on Equipment & Monitoring - Charlotte Bell
11:30 - 12:30 pm	Awards Committee - Fritz Stawicke

Board of Directors' Agenda

1:00 - 4:00 pm	Call to Order - Barker
	Approval of Minutes - January 14, 1998
	President's Report - Barker
	Secretary's Report - Weinger
	Treasurer's Report - Gibby
	Executive Director's Report - Anderson
	Discussion: Committee structure and function
	1999 Annual Meeting - Seitman
	2000 Annual Meeting - Bartkowski
	2001 Annual Meeting - Feldman
	ASA Breakfast and Dinner - Bell
	Nominating Committee - Ehrenwerth
	Standing Committee Reports

Upcoming Meetings

ESCTAIC Annual Meeting
October 8 - 10, 1998
contact: "Dr. Andreas TECKLENBURG"
E-mail: *100114.3232@compuserve.com*

SCATA
November 12 - 13, 1998
E-mail: *pradeep.ramayya@hci.co.uk*

American Medical Informatics Association Annual Fall Symposium
November 7 - 11 , 1998
Orlando, Florida
www.amia.org

Society for Computing in Anesthesia Annual Meeting
October 21 - 24 , 1998
Orlando, Florida
http://gasnet.med.yale.edu/societies/scia
E-mail: *scia@AcmeAnesthesia.com*

Japanese Society for Technology in Anesthesia Annual Meeting
November 28, 1998
Tohoku University Faculty of Technology in Sendai, Japan. contact: Masato Kato, M.D.
E-mail: *m-kato@mail.cc.tohoku.ac.jp*

Society for Technology in Anesthesia
January 20 - 23, 1999
SanDiego, CA
http://gasnet.med.yale.edu/societies/sta/html/1999_meeting.html

Computing in Anesthesia and Intensive Care
June 2 - 4, 1999
Rotterdam, The Netherlands
http://www.eur.nl/FGG/Anest/iscaic19/

Electronic Patient Records in Medical Practice Conference
October 8 - 10, 1998, The netherlands
http://www.eur.nl/fgg/mi/eprimp

International Congress on COMPUTATIONAL INTELLIGENCE: METHODS AND APPLICATIONS
June 22 - 25, 1999
Rochester Institute of Technology, Rochester, N.Y., US
http://www.icsc.ab.ca/cima99.htm

International ICSC Symposium on ADVANCES IN INTELLIGENT DATA ANALYSIS
Chair: Erkki Oja, Finland
http://www.icsc.ab.ca/aida99.htm

International ICSC Symposium on SOFT COMPUTING IN BIOMEDICINE
Chair: Eduardo Massad, Brazil
http://www.icsc.ab.ca/scb99.htm