



INTERFACE

SOCIETY FOR TECHNOLOGY IN ANESTHESIA

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STA Continues to Mature

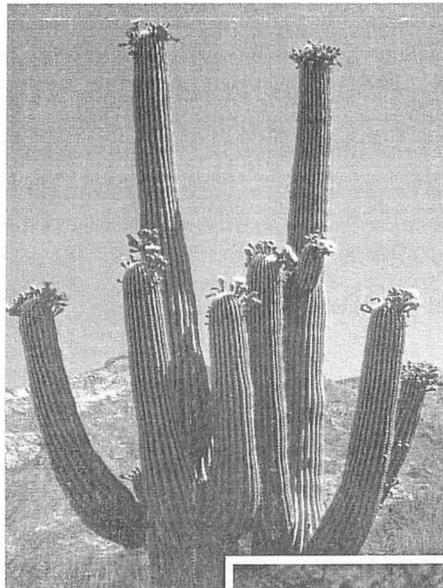
Jan Ehrenwerth, M.D. STA President

The Society for Technology in Anesthesia had a marked presence at this year's ASA meeting in San Diego. Many of the committees met and developed plans for future activities and the Board of Directors had an extensive and productive meeting. We had two educational events. One was the annual dinner which featured Dr. Pauline Wong who gave a very interesting talk on veterinary anesthesia. The second was the annual STA breakfast which was organized by Alan Grogono and Keith Ruskin and once again drew a very large crowd. Not only were these events well attended, but we were able to obtain the names of many new potential STA members.

The research committee, under the direction of Fritz Stawitcke, reviewed all the abstracts dealing with technology and awarded two prizes for the best abstracts. This year the winners had their choice of a free registration at the annual meeting or a one year free membership in STA. I want to thank Fritz and the committee for all their

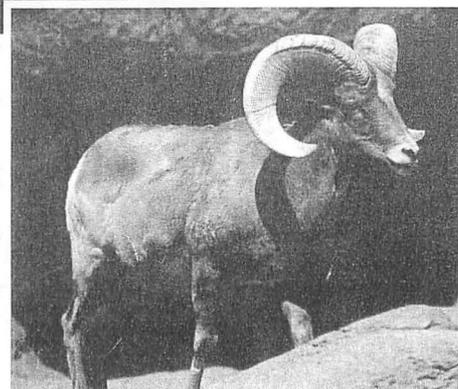
hard work.

The 1998 annual meeting under the direction of Dan Raemer is shaping up to be a truly outstanding event. With the addition of the Rochester Simulation Group, we are expecting a



The Sonoran Desert is the only place in the world where saguaro cactus grow. The Arizona Sonora Desert Museum is just one of the optional tours for the 1998, Annual Meeting. And don't be fooled by the name. It's the most distinctive zoo in the US combined with botanic garden, nature trail, and museum.

potential record turnout. Also, Steve Barker and Butch Loeb have organized so many activities that it will be very hard to choose which ones to attend. I'd like to encourage all of you to attend the annual meeting and to *please register and make your hotel reservations early*. Since we have obtained such an outstanding room rate, once the deadline passes, we will not be able to obtain rooms at this rate. Also, we have the potential of exceeding our allocated rooms, and I fear that some people who register late will be shut out. The membership committee under Charlotte Bell and Chuck Brindis is offering STA mini flashlights for those of you that pay your dues for 1998 early. We are desperately trying to get all the dues collected before the first of the year so that we will have an accurate count to give to the publishers of the journal. In the past, we were collecting dues



through April and this made it impossible to get the journal out in a timely fashion. I realize that some of you paid your dues for 1997 in April or May, but please bear with us during this transition year. We will plan to collect dues in *continued on page 6*

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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 correspondence to:

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Election of Officers

You should have received your ballot in the mail. Be sure to make your selection and fax or mail it back to the STA office. Phone or e-mail votes are not acceptable. New officers will be recognized at the annual meeting in Tucson.

DIRECTOR-AT-LARGE

One to be Elected

Michael W Jopling, M.D.

Michael Jopling is a Clinical Assistant Professor in Anesthesiology at Ohio State University in Columbus. Mike has been an active STA member, attending all the annual meetings and STA-sponsored sessions at the ASA over the past four years. He has been active in the Education Committee of the STA over the past three years and wants to look for ways to expand opportunities for member participation.

His research interests include medical device design, clinical decision making, anesthesia information management, and new monitoring technique/algorithm development. Mike has worked with many medical device and pharmaceutical companies in new product development and testing. Current active projects include two on new cardiac output measurement techniques and application of automatically run scripts on a departmental web server to search and reformat patient information to assist in the anesthesia preoperative evaluation. His hobbies of being an IFR certified pilot, SCUBA diver, amateur radio operator (K8MJ) and computer hacker mix well with his day job of clinical anesthesia and equipment research.

David Wong, M.D.

David Wong is a Clinical Professor in Anesthesiology at the University of California Irvine. He has done

evaluation/research of different physiologic monitors. Although modern technology and medical technology are attractive for their own sake, he particularly believes that technology can and should be used to help us deliver better quality and more cost-effective patient care. Being a member of STA has been particularly satisfying for him because he believes that this is a common philosophy amongst the members of STA. As an organization, Wong thinks that STA can help bring about the introduction of new technology into anesthesiology faster by coordinating discussions of hardware and software standards, than by relying on the marketplace alone.

PRESIDENT ELECT

One to be Elected

James H. Phillip, ME(E), M.D.

James Phillips seeks the office of STA President to help our society, its mission, and its members gain better acceptance in the anesthesia community. He has focused his medical career on teaching, designing and applying technology solutions to anesthesia and medical problems. As examples, he wrote "Gas Man" to teach inhalant kinetics as "engineering science." He created the clinical measurement of "hydraulic resistance" as an engineering-based clinical monitoring tool for infusion therapy. He has served STA as a member of the Board of Directors and as Chairman of the Committee on Educating Physicians about Technology.

Jim is an Anesthesiologist and Director of Bioengineering (Anesthesia) at Brigham and Women's Hospital and Associate Professor of Anesthesia at Harvard Medical School. He holds a Bachelor's and

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● 1998 Society for Technology in Anesthesia joined with the 3rd Rochester Simulator Meeting

<http://gasnet.med.yale.edu/sta/sta98K.html>

The 1998 program is slated to be the largest ever. Dan Raemer, with the support of his committee, has finalized the plans for the Scientific Sessions, Poster, Simulator Workshops, and Software Exhibition sessions. Steve Barker and Butch Loeb combed the desert to arrange field trips which are described on page 5. Six simulator workshops coordinated by Dwayne Westenskow are anticipated to be the highlight of the meeting.

Be sure to register early as January is high season in Tucson and hotels book early. The hotel's special STA rate (\$119 single or double) is only available until December 30, 1997. After that, you're on your own. If you fly into Phoenix, check out the Arizona Travel web page, www.arizonaguide.com, to map out an interesting trip south to Tucson.

Easy ways

to register: Phone 602-267-5845 or Fax 602-306-2989
E-mail courseco@mmcaamss.maricopa.gov Attn: STA
Webpage <http://gasnet.med.yale.edu/sta/sta98k.html>

● ELECTION OF OFFICERS *continued from page 2*

Master's degrees in EE from Cornell University, MD degree from SUNY Syracuse, and is a Certified Clinical Engineer (CCE). Throughout his engineering and medical education, he has worked as an R&D engineer for Hewlett Packard Medical Division. Currently, he directs a hospital-based technology R&D laboratory, manages the anesthesia clinical technology for Brigham & Women's Hospital, and practices clinical anesthesia.

Matthew B. Weinger, M.D.

Matthew (Matt) Weinger is an Associate Professor of Anesthesiology at the University of California in San Diego and a Staff Physician at the San Diego VA Medical Center. He is a Charter Member of STA but was, in fact, involved even earlier as the Director of Workshops for the Fifth International Symposium of Computing in Anesthesia and Critical Care in San Diego in 1988.

Matt has served STA in multiple capacities over the years: as Secretary and Member of the BOD from 1993 through 1995, as a member of the Education, Finance, and Annual Meeting Committees, Program Chairman of the 1993 annual meeting in New Orleans, Program Co-Chair and Social Chair of the 1996 annual meeting in San Diego, as well as a member of the Program Committees for the 1998 and 1997 meetings. He was also part of the academic program at the 1992 and 1993 meetings.

Matt is currently the User Co-Chair of the AAMI Human Engineering Committee which is developing a national (ANSI) human factors standard for the design and use of medical devices. His research interests include human factors, clinical decision making and medical device design. He is currently conducting research, funded by the Anesthesia Patient Safety Foundation on the "Scientific measurement of anesthesiologist performance". He has over 50 research articles and book chapters to his credit.

Schedule at a Glance

Wednesday, January 14

4:00-6:00 pm Early Registration
6:00 Welcome Reception

Thursday, January 15

8:00 am Simulator Panel I Human Performance Aspects
10:15 Simulator Panel II Simulators in Education
12:00 pm Luncheon Buffet and Keynote
1:45 Scientific Posters & Discussion
3:00 Simulator Workshops

Friday, January 16

8:00 am Technology Panel I: Anesthesia in Remote Locations
9:15 Scientific Posters & Discussion
10:15 Simulator Workshops
12:15 pm Luncheon Buffet and Keynote
2:00 Field Trips
6:30 STA at Arizona Historical Society Museum

Saturday, January 17

8:00 am Simulator Panel III: Simulation in Anesthesia Pharmacology Development
10:00 Technology Panel II: Computer Education to Teach Technology
11:30 Lunch on your own
1:00 pm STA Business Meeting
1:45 Anesthesia Software Exhibition
3:00 Simulator Panel IV: The European Simulation Experience

SIGNatures

Christopher Wiley, MD, Assistant Professor of Anesthesiology

Dartmouth-Hitchcock Medical Center

(christopher.wiley@hitchcock.org)

Virtual Reality, Medicine, and the Web

Part I—Introduction to 3D Rendering

As human beings we exist in 3-dimensional space, and evolution has shaped our bodies, and more importantly our brains, accordingly. Our perceptual systems are particularly suited to detecting and interacting with objects in 3D space, and this largely determines the fundamental way we think about many things. In fact, most of us would consider "3-dimensionality" an essential attribute of reality and have difficulty when asked to consider spaces or objects of greater or lesser dimensionality.

As a result, those seeking to create simulations or models of concrete objects, situations, or processes have usually tried to create, or at least suggest, a 3-dimensional effect. So, for example, an architect designing a new building would start with flat drawings from three points of view (front, side, top) and then add perspective views. In the past, the next step would have been the construction of an actual physical scale model. Now, however, the computer offers a far more flexible and powerful alternative, allowing the viewer to interactively change point-of-view, lighting, materials, colors, shapes, sizes, and even look around *inside* the structure. In this way, the building

can be much better understood and possible problems fixed well before expensive construction begins.

In medicine, of course, we are primarily concerned with the human body, a 3-dimensional object of unrivaled complexity. Ranging from gross anatomic structures and pathology down to the simplest biological and pharmacological molecules, we seek to understand and influence the structure, changes, and interactions of a dizzying number of 3D objects. Activities ranging from learning anatomy, molecular biology, and rational drug design to diagnostic imaging, surgical simulation, and computer-controller radiation therapy all benefit from digital modeling.

So how is it done? The computer, after all, can be thought of as nothing more than a very long series of memory buckets with supporting circuitry and devices for filling, manipulating, and emptying them. When certain memory buckets are filled with values associated with colors, an image appears on the screen. Thus, everything we see on our computer screens is the result of these particular memory locations being rapidly filled with various color values. The flat rectangular array of these memory locations is called a "raster" or bitmap. There are a lot of buckets to fill. The amount of memory required for an 800x600 pixel screen with 24-bit (= 3 bytes of information per pixel) = $800 \times 600 \times 3$ or 1,440,000 bytes, which is exactly the capacity of one 3.5" floppy disk. There are two basic methods for figuring out how to fill the buckets in such a way that a convincing image of a

3D object or scene is produced, and we'll discuss them in order of increasing fidelity to the raw data.

Surface Rendering

Nearly all 3D graphics displayed on personal computers are created using a process called surface rendering. With this technique, objects are composed of pre-calculated meshes of many polygons (usually triangles) representing just the surface of the object. The interior of the objects is completely ignored; they are, in fact, hollow shells. This type of pre-processing means far less data to manipulate resulting in greater speed and much reduced memory requirements at the price of decreased accuracy and increased computation per pixel. Every triangle is composed of three vertices, each of which is an x,y,z triplet specifying a unique point in 3D space. When the object is moved, rotated, or scaled (zoomed); each vertex in the mesh must be multiplied by the 16 values comprising the appropriate transformation matrix to compute the proper new location.

Once all the meshes have been properly located in space, more matrix multiplications are required to properly align the view of the objects or scene with the viewer (or "camera"). Every triangle must be colored or filled with a texture image which must be modified by lighting, transparency, fogging, and/or depth-cueing effects. The final result of this prodigious amount of calculation is a raster image representing the accurately projected image of a seemingly solid object or scene on the computer screen.

Volume Rendering

A technique which utilizes every point, inside and out, of the underlying 3D data but requires tremendous amounts of memory and system speed is known as volume rendering.

For objects where knowledge of the interior is important, the human body for example, the idea is to load into system memory a huge array of numbers representing some scalar value (usually color, intensity, CT, number, etc.) at each 3D point (or "voxel") in the scene. A typical example might be the CT slices comprising a head. For 100 slices at 1024x1024 with 16 bits of intensity at each pixel, the resulting volume takes $100 \times 1024 \times 1024 \times 2 = 200$ megabytes of memory! To translate these voxels into an image on the screen, an approach called ray-casting is used. Here each pixel on the screen is computed as the sum of the influences of all the voxels encountered by a virtual light ray originating beyond the scene, passing through the scene and/or object, and finally "hitting" the screen at that pixel. By varying the attenuation associated with different voxel scalar values, different structures can be highlighted or hidden. Notice that all the preliminary work of computing the surface meshes is unnecessary and the detail inevitably lost with their use is retained. Nevertheless, while volume rendering may well be the gold standard for 3D rendering, it remains too expensive for widespread use.

Interactivity

Of course, a single static image, no matter how beautiful or realistic, isn't enough. In order to understand or appreciate a 3-dimensional shape, most of us need to look at it from different angles. So an important

aspect of 3D computer modeling is interactivity: the user must be able to relatively quickly move either the object(s) or his point of view relative to the object(s). To achieve the illusion of seamless continuous movement, the scene must be updated 30 times per second, but any system that can update several times a second is considered "interactive." If you contemplate the amount of calculation involved for each "frame" even using surface rendering, it becomes obvious why very fast machines are necessary for interactive 3D.

Until quite recently, affordable personal computers simply weren't up to the job. Their CPU's were too slow, their memory inadequate, and their display circuitry unable to spray pixels onto the screen quickly enough. Only very expensive workstations from companies like Silicon Graphics or Sun had any chance of interactively rendering in 3D. Now, of course, with the advent of Pentium-class processors, multi-megabyte system memories, and affordable accelerated 3D display boards, the situation is altogether different. Machines capable of very good 3D performance can now be had for well under \$3000.

The first wave of software taking advantage of these new capabilities is composed mainly of games and tools such as programming languages and libraries as well as editors allowing the creation and animation of 3D objects. A small but growing number of groups are using these tools to begin creating medical and anatomic simulations which can be run on personal computers. In Part II of this series, we'll examine some of these medical applications and the datasets upon which they're based. Finally, we'll look at developing relationship between 3D and the Web.

Meeting Announcements

Japanese Society for
Technology in Anesthesia
Annual Meeting

November 21-22, 1997

Kyoto, Japan

Society for Technology
in Anesthesia

January 15-17, 1998

Tucson, Arizona

<http://gasnet.med.yale.edu/sta/sta98k.html>

18th International Symposium on
Computing in Anesthesia and
Intensive Care

March 18-21, 1998

Hamamatsu, Japan

<http://shr.hama-med.ac.jp/iscaic18/iscaicinfo.html>

Society for Computing and
Technology in Anaesthesia

Fall Meeting

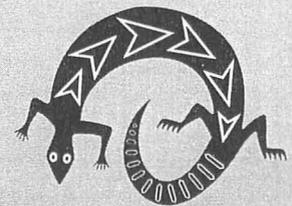
Nottingham, England

November 12-14, 1997

Gateway Hotel

Dr. Andrew Byrne

tel: 0115 924 9924 ext 41195



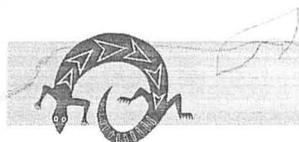
1998 STA Members "See the Light"

New and renewing members for 1998 are receiving a little pen light as a "thank you" and reminder that STA recognizes the value of each member. We will be distributing these with your receipt and confirmation. If you register for the annual meeting and join at the same time, we will deliver your "light" for the pickup in Tucson.

Members who renew before December 30, 1997 for the 1998 year receive a discount of \$20. Our

goal is to have at least 90% of the renewals by that date so that we can advise Kluwer in January of those who will be receiving the *Journal of Clinical Monitoring*.

Please use the form on the back page of the newsletter. In fact, make a copy and give it to a friend and encourage his/her involvement in STA.



Register early!

Why register for the Annual Meeting Early?

- Insure there is a room for you at the inn
- Selection of the field trips is first-come-first-served
- We need to count you for meal functions
- You might need time to select a bola tie, cowboy boots or new jeans

PRESIDENT'S MESSAGE *continued from page 1*

October and November in the future and therefore have an accurate membership database so that there will be no lapses in the Journal subscriptions. Since the Journal is such a large part of our budget, it is vitally important that we do not pay for Journal subscriptions for people who are not members.

As my year as your President comes to a close, I want to say that it was been an honor and privilege to lead this

outstanding society. My goals for the year were to get the Society's membership base and financial status stabilized, to transition to our new management group, and to provide a stable platform on which the Society can grow. I think that we have accomplished these goals and I'm sure that Steve Barker will continue to build on this foundation. There are many, many people who have

worked very hard to make the Society a success. They are too numerous to mention here, but I would like to thank them for making a my job so easy. In the past few years we have overcome amazing adversity and ended up as a unique society that we can all be proud of.

With the many dedicated and hard-working individuals that we have in this Society, I am confident that we can accomplish great things in the future. I'll look forward to being part of the activities as your past president.

— Jan Erhenwerth



◀ You can't arrive in Tucson in one of these, but you can visit one on a field trip.

Friday's great reception will be at the historical museum across the street from the hotel. Tombstone, however, is a bit farther by horse.





Society for Technology in Anesthesia Individual Membership 1998 New & Renewal Application

Please print all information clearly.

Name _____
First Last Degree

Title _____

Department/Institution _____

Mailing Address _____

City _____ State _____ Zip Code _____ Country _____

Telephone _____ Fax _____

E-mail _____

Membership Categories

- Regular member Paid after 1/98 \$200.00
Includes STA newsletter, Interface and discounted annual scientific meeting registration fee
- Student member \$40.00
Includes STA newsletter, Interface and discounted annual scientific meeting registration fee

Payment

Check payable to STA Amount enclosed/charged \$ _____

VISA Mastercard Account Number _____

Expiration Date _____ Signature _____

Return completed application with payment to:

Beverlee Anderson
Society for Technology in Anesthesia
P.O. Box 5257
Phoenix, AZ 85010-5257
phone (602) 267-5366
fax (602) 306-2989
banderso@mmcaamss.maricopa.gov



The Southwest is getting ready for the
 1998 Joint Meeting of
 Society for Technology
 in Anesthesia
 & Rochester Simulator
 Symposium

Simulation in Anesthesia

January 14-17, 1998

Tucson, Arizona

at the NEW Tucson Marriott University Park Hotel

**Society for
 Technology
 in Anesthesia**

P. O. Box 5257
 Phoenix, AZ 85010



IMPORTANT NOTICE

The STA office has moved. Please
 use the above post office box
 mailing address
 Call 602-267-5366 or e-mail
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