



# INTERFACE

SOCIETY FOR TECHNOLOGY IN ANESTHESIA

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A P R I L 1 9 9 1 • V O L U M E 2 • N O . 2

## HIGHLIGHTS OF STA '91 MEMBERSHIP MEETING

### *Richard J. Kitz, MD Charts Course for STA*

In his lecture to those gathered at the First Annual STA Scientific Meeting, Richard J. Kitz, M.D. helped STA chart its future directions. Dr. Kitz is co-director of the Harvard-MIT Division of Health Sciences and Technology, a program which draws on the resources of the Massachusetts Institute of Technology and Harvard Medical School, granting Ph.D. degrees in Medical Engineering and Medical Physics (MEMPH) as well as the MD degree.

Dr. Kitz stated that the STA mission must respond to the needs and desires of society. He mentioned the current phenomenon of "Bio-narcissism" wherein many Americans are now absorbed with their own sense of physical well-being. This societal absorption with wellness will stimulate support for health care technology. Dr. Kitz noted that STA



Richard J. Kitz, MD presents STA-SpaceLabs Distinguished Lecture

The meeting was called to order by N. Ty Smith and the minutes of the meeting of 20 October 1991 were approved. Due to outstanding figures on the cost of STA '91, the treasurer's report was deferred and will be submitted by mail. Jeff Feldman reviewed the goals of the newsletter and invited feedback and contributions from the membership to enhance its content. An upcoming feature of the newsletter will be to publish incident reports in which technology caused or solved problems, as a means of evaluating the efficacy and risk of technology. These reports would be published anonymously after a review committee documents the accuracy of the reports. A suggestion was made to supply the July issue free to newly graduated residents as a means of introducing potential new members to the society.

#### STA and Computer Networks

Frank Block introduced the STA forum now available on CompuServe and commented upon some of the uses of that network. A suggestion was made to demonstrate the use of electronic mail (E-mail) and CompuServe which Dr. Block agreed to arrange for STA '92. Ira Rampil spoke about the ability to store references on networks for rapid access such as the Society for Neuroanesthesia and Critical Care (SNACC) book which is available on the Internet computer network. Ty Smith suggested that a technology bibliography could be prepared and made available on the STA CompuServe forum.

#### ASA Plans

STA plans for the upcoming American Society of Anesthesiologists annual meeting to be held in San Francisco were outlined. The STA dinner will be held on Sunday night, October 27 and will include a presentation

from James L. Adams of Stanford University, author of the book "Conceptual Blockbusting." The STA Breakfast Panel entitled "When the Lights Go Out," scheduled for Wednesday, October 30, will address various aspects of electrical power failure in the operating room.

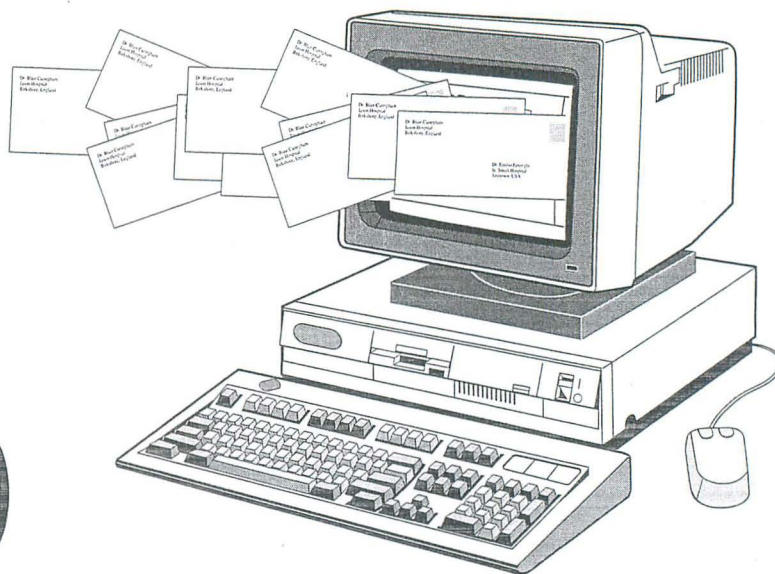
#### STA '92: San Diego

STA '92 will be held January 29 - February 1, 1992 at the US Grant Hotel in San Diego. Jerry Calkins is responsible for organizing the meeting and outlined the preliminary plans. The theme will be "Decision Making in Anesthesia and Design of the Anesthesia Workstation." The plan is a 2.5 day meeting, to start on Wednesday night, January 29, with registration and a reception. The next two days would be devoted to tutorials and discussions on various aspects of the workstation design such as data acquisition, human factors and information management. The goal of these tutorials will be to develop, as a group, a workstation design concept on the last day of the meeting. Debates would then be held on various design controversies. The STA Distinguished Lecture will be given by Donald A. Norman, Ph.D., Chairman of Cognitive Science at the University of California at San Diego. He is a Human Factors expert and author of the book "The Psychology of Everyday Things." The meeting would conclude with a luncheon and business meeting. Instead of oral scientific presentations, accepted papers will be presented in poster format. A brief oral presentation of each poster topic may be scheduled into the meeting if time allows.

Ty Smith reminded everyone about the 6th ISCAIC meeting to be held this April in Hamamatsu, Japan. The 7th ISCAIC meeting will be in Europe, probably in conjunction with the World Congress meeting in The Hague in 1992. The 8th ISCAIC and STA 93



# E-Mail EXPLAINED



Let's face it, there are many computer applications that are overrated. E-mail is not one of them. If you are an E-mail user, you understand this statement and need not read the rest of this article. If you have not yet used E-mail you undoubtedly are wondering - What is E-mail? Do I need to have some special computer savvy to use it? Why does it make people smile?

E-mail is a shortened term for Electronic Mail and refers generically to software that allows computer users to send messages directly to one or more other users. The addressee can be in the same institution or at another institution with access to a computer network. The most extensive E-mail system is implemented using Internet which connects governmental institutions, military branches, educational institutions and commercial companies. In some cases, the users computer may be part of another network such as Bitnet which is connected to Internet. Internet is currently so extensive that personal messages can be sent worldwide in a matter of hours.

Using E-mail to send messages via Internet is not difficult. One needs only to have a computer with a modem or other connection either directly to a network or to another computer system capable of sending your message to the network. An address of the person you are sending to is also required. The address will usually take the form "user@organization.domain." For example,

sending a message to JMF@YALEMED.BITNET will send the message to Jeff Feldman at Yale University School of Medicine which has a VAX system with a connection to BITNET. When I sign on to that VAX system I am notified of any messages waiting. Many of the items in this newsletter were sent via E-mail which made editing and communication with the authors quick and easy.

The software implementation of E-mail will vary but in general all one needs to specify is the address, the subject of the message and the message itself. The message can be entered just before sending or may be a file previously created and stored. The computer system you use to send messages will typically have on-line help to guide the use of E-mail.

STA members that work at educational institutions should have ready access to Internet through campus networks or larger computer systems. Membership in CompuServe, a commercial information service, is available to anyone and offers the capability to send messages via Internet (see article page 12).

If you are at all curious about E-mail and its capabilities, give it a try. You will soon learn what all the smiling is about.

- J. Feldman

*"Internet is currently so extensive that personal messages can be sent worldwide in a matter of hours."*

**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. Copies are also distributed to companion societies in Europe and Japan. The editor invites suggestions, contributions and commentary about published items. Please send all correspondence to:

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# PERSPECTIVES ON TECHNOLOGY

## TOPIC: CLOSED-LOOP DRUG DELIVERY

■ "...studies are necessary to ascertain whether the closed-loop system provides convenience or improves patient outcome."

### The Industrial Perspective

James F. Martin, Ph.D.

Principal Research Engineer

Department of Cardiovascular Systems and Control

IVAC Corporation, San Diego, CA

Although research in closed-loop drug delivery has been ongoing since the 1950s, only two devices have obtained Premarket Approval (PMA) from the United States Food and Drug Administration (FDA). In 1980, a system for controlling blood glucose levels in diabetics by the infusion of insulin was approved. More recently, a device was approved for closed-loop infusion of sodium nitroprusside (SNP) in adult patients to control blood pressure following cardiovascular surgery.

#### Factors Limiting Commercial Devices

Several factors have contributed to this dearth of closed-loop drug delivery devices. First, closing the loop on drug infusion requires an accurate and reliable feedback signal. Current sensor technology cannot provide such a feedback signal for most drugs, thus limiting the potential applications of automated drug delivery. Second, until the late 1970s small, inexpensive microprocessors weren't powerful enough to handle the required closed-loop algorithms, thus limiting commercial development. Third, closed-loop drug delivery systems are classified by the FDA as Class III devices. Devices in this category require PMA to insure their safety and effectiveness. The following steps are required to gain FDA approval: 1) Obtain an investigational Device Exemption (IDE) from the FDA to conduct clinical studies on humans, 2) Perform clinical studies according to the approved IDE which can take up to 2 years depending on the study design, and 3) Obtain PMA from the FDA a process requiring 6 months to 1 year, barring any significant delays. Complying with these FDA regulations can add up to 3 years to development time at significant cost.

#### Evaluation of Clinical Value

Clinical perceptions of closed-loop drug delivery devices can range from "providing significant impact on patient outcome" to viewing the device as a "high featured pump merely providing additional convenience." The time and cost of researching and developing a closed-loop drug delivery device, coordinating subsequent clinical evaluations, and complying with FDA requirements for a "significant risk device" can be quite large. If the device is perceived as merely providing additional convenience, rather than clinical value, the potential return on investment may not justify its

see next page

■ "New developments in closed-loop delivery must demonstrate obvious benefit to be accepted into clinical practice."

### The Clinical Perspective

Gavin NC Kenny, BSc (Hons), MD, FFARCS

University Department of Anaesthesia

Royal Infirmary, Glasgow, UK

In order for a new technology to be accepted into clinical practice it must either perform a task which would otherwise be impossible, or, it must perform the task better than existing technology. The question I will consider is "How does closed-loop drug delivery benefit the patient, nurse and physician?" Two examples of closed-loop drug delivery systems will be used to highlight the important issues.

#### Closed-Loop Control of Blood Pressure

These systems utilize blood pressure measured using an arterial catheter as the input signal to alter automatically the infusion of a vasodilator so that a certain desired blood pressure is maintained. Initial work by Sheppard demonstrated that improved quality of blood pressure control could be achieved compared with manual control of the infusion rate. These results have since been corroborated by other investigators. Despite these promising results, progress in expanding the use of these systems has been slow due to a lack of obvious patient benefit resulting from the improved quality of control. In our own cardiac intensive care unit, the target systolic blood pressures requested by surgical staff can vary widely for similar types of patients and there have been no definitive evaluations to demonstrate improved patient outcome associated with different levels of control.

In addition, the complexity of equipment and high turnover of nursing staff require frequent teaching sessions. Most of our nurses consider closed-loop blood pressure control to be more accurate than manual control but they also regard the need for instruction and in-service training as major disadvantages

#### Patient-Controlled Analgesia

Patient controlled analgesia (PCA) can be considered a type of closed-loop infusion system where the patient provides the input signal controlling administration of the analgesic drug. Although this approach has been under investigation as long as closed-loop drug delivery, acceptance of PCA is now widespread. PCA performs a task that was previously impossible and offers obvious benefits - 1) Patients control their level of comfort and are not dependent on busy ward staff and 2) Nurses care for patients who are comfortable and

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## The Industrial Perspective

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research and development.

Most clinical studies of closed-loop SNP delivery have focused on the relative ability of the clinician and the closed-loop drug delivery system to maintain a desired blood pressure. It is not clear however that tighter control of blood pressure has a significant impact on patient outcome. Data relating to mortality, morbidity, length of stay, additional required therapeutic agents and emergency interventions are required to fully understand the impact of closed-loop drug delivery on patient outcome.

To determine the clinical value of a closed-loop SNP delivery device, a prospective multicenter evaluation (over 1000 post-cardiovascular surgery patients) comparing traditional manual control of blood pressure with closed-loop control has recently been completed. Results of the study indicate that automated control using the current FDA approved device significantly decreased both hypotensive and hypertensive events. In addition, blood products transfused, chest tube drainage, and length of ICU stay were decreased significantly ( $p < 0.05$ ). This is the type of

information needed to accurately assess the value of closed-loop drug delivery devices.

### The Future

As improved sensor technology provides accurate and reliable feedback signals for more drugs, the number of possible closed-loop drug delivery devices will increase. Examples are automated control of the depth of anesthesia, ambulatory control of blood glucose levels in diabetics, and simultaneous closed-loop delivery of multiple cardiovascular drugs such as SNP and dopamine. While new sensor technologies are being developed, there is a need to continue evaluating the clinical value of closed-loop drug delivery systems. These studies are necessary to ascertain whether the closed-loop system merely provides convenience or significantly improves patient outcome. ♦

### The Clinical Perspective

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do not require as much nursing intervention. In our experience, physicians value the concept sufficiently that they frequently request the technique when submitting themselves for surgery.

The different successes of these two

closed-loop techniques demonstrate the requirements for acceptance of a new technology. Closed-loop blood pressure control has not been clearly shown to provide better outcome compared with manual control of vasodilators. In contrast, PCA has been recognized as a superior technique to the conventional alternative of intramuscular analgesic administration.

### Future Applications

Closed-loop drug delivery can potentially be applied to many different drugs. Automatic control of neuromuscular blockade is possible, but the added cost of equipment and increased set-up time have limited its widespread use. The use of respiratory information to control PCA systems would be a valuable contribution to improved patient safety. If we can identify a reliable index of anesthesia depth, closed-loop control of anesthesia could become a widely used tool to minimize the possibility of awareness. In summary, new developments in closed-loop drug delivery must have a reliable input signal, insure simplicity of operation and demonstrate obvious benefit to the patients and staff in order to be accepted into clinical practice. ♦

# STA SPECIAL INTEREST GROUP ON COMPUERVE

Arrangements have now been completed with CompuServe, the world's largest on-line consumer information service, to operate the STA electronic bulletin board or Special Interest Group (SIG) as part of the MEDSIG forum. The CompuServe Information Service has more than 750,000 members, with new ones added at a rate of about 10,000 per month. The new forum section offers the opportunity to post messages for others interested in technology, and the ability to upload both text and program files for downloading by other users. CompuServe also offers electronic mail, both within CompuServe and with a link to the Internet-Bitnet-Arpanet system which links computer users worldwide.

Additional features of CompuServe include on-line shopping, travel reservations, games, on-line stock trading, Medline access through PaperChase, various other information databases, news and weather, the CompuServe "CB Simulator," and dozens of other forums for special interest groups.

Access to CompuServe requires a computer, a modem (a device to communicate with other computers via telephone lines), a "communications software program" (several kinds are available for various brands of computers), and a telephone line (WITH-OUT call waiting, which will disconnect you). CompuServe can be reached by 90% of the US population with a local telephone call. In addition, CompuServe can be reached from more than 100 foreign countries either via the national data networks or via special dial-up computer networks with access to CompuServe. The basic rate for CompuServe is currently \$12.50/hr. Communications access via the CompuServe network in the US is \$0.30/hr (yes, 30 cents per hour). The price of overseas access varies but typically runs between \$8.00 and \$20.50/hr surcharge.

### STA SIG

The STA SIG will use the Anesthesiology section of the MEDSIG Forum on

CompuServe. After you log on to CompuServe, type GO MEDSIG at any "!" prompt and follow the menus. You will find the STA SIG in Section 9 - Anesthesiology. To learn the commands for the MEDSIG type GO PRACTICE which provides access to the "practice" forum. PRACTICE allows you to learn to read and post messages, upload and download files, etc., at no cost other than the communications surcharges.

For members of the STA, CompuServe offers a free "Introductory Membership." This includes a \$15.00 credit for on-line time. Additional charges can be billed to your credit card or debited from your checking account at your discretion. For a membership kit (while supplies last) please write to **Dr. Frank Block**, OSU Dept. of Anesthesiology, 410 West 10th Avenue, Room N-429, Columbus, Ohio 43210, or, you can use FAX or electronic mail (E-mail): **FAX: 1-614-293-8983**, E-mail: **70147.440@compuserve.com** (note period), CompuServe mail: **70147,440** (note comma). ♦





### ESCTAIC Annual Meeting:

*Second Annual Meeting of the European Society for Computing and Technology in Anesthesia and Intensive Care. October 9 through 12, 1991. Goldegg Castle, Salzburg, Austria. Contact:*

Dr. Leo Moser  
Anaesthesiologie  
PO Box 30  
A5014 Salzburg, Austria

### ASA Annual Meeting:

*American Society of Anesthesiologists Meeting. October 26 through 30, 1991. San Francisco, California. Contact:*

American Society of Anesthesiologists  
515 Busse Highway  
Park Ridge, Ill 60068  
(800) 562-8666

### STA '92:

*Second annual meeting of the Society for Technology in Anesthesia, January 29 through February 1, 1992. US Grant Hotel, San Diego, CA. Abstract Deadline August 1, 1991. Contacts:*

#### Meeting Information:

Ms. Gerri Kuzawa  
PO Box 382  
Hastings, MI 49058  
1-800-875-2525

#### Abstract Submission:

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## Anesthesia Techs Form National Society

**Dennis McMahon**

ASATT President  
Virginia Mason Clinic  
Seattle, WA

In conjunction with the annual meeting of the ASA, the American Society of Anesthesia Technologists and Technicians (ASATT) held its first annual meeting at the Desert Inn in Las Vegas on October 21. The ASATT formed in late 1989 as an educational organization whose goal is to improve and eventually standardize the training and skills of anesthesia technical personnel - i.e. those who support, but do not perform, anesthesia patient care. It is intended to serve as a national network for individual technicians, as well as for the state and regional societies of anesthesia technologists that have formed within the past six years.

The principal focus of the leadership this coming year will be to increase membership and promote communication among anesthesia technicians nationally. These goals will be met through the publication of a quarterly newsletter, beginning in January.

■ *"The ASATT goal is to improve and standardize the training of anesthesia technical personnel."*

The newsletter will provide reviews of current technology and new equipment, abstracts of problems with specific devices, announcements of meetings or seminars on anesthesia technology, and reports on progress toward the standardization of technical personnel.

Liaison with the ASA and other organizations has been an important goal of ASATT that was realized at the ASA meeting in Las Vegas. The ASA's House of Delegates approved a recommendation from the Committee on the Anesthesia Care Team, chaired by I. Cary Andrews, MD, which officially recognized the ASATT.

Anesthesia clinicians who would like to foster education among their technical support staff are encouraged to contact the society.

ASATT, P.O. Box 22492  
San Francisco, CA 94122

# STA '91 Meeting Report

**T**he first annual meeting of the Society for Technology in Anesthesia was held in Orlando, FL from January 18-20, 1991. Almost 200 people attended the meeting despite the onset of conflict in the Persian Gulf which interfered with many international travellers. The meeting schedule was packed with panel discussions, tutorials, scientific presentations and social activities. The activities began before the official first day of the meeting with a tour of the Kennedy Space Center.

## DAY 1

N. Ty Smith, MD, the president of STA, began the meeting with some introductory remarks. The first panel discussion examined the topic "What's Next in Monitoring" with lectures on Intraoperative Echocardiography (M. Cahalan), CNS Monitoring (Ira Rampil) and Intravascular Blood Gas Electrodes (Kevin Tremper). All



*N. Ty Smith, MD, STA President,  
Opens First Annual Meeting*

three lecturers provided a fascinating glimpse into the future of clinical monitoring in these areas. In the afternoon, the Closed and Low-Flow Anesthesia Systems Society (CLASS) held a tutorial entitled "The New Image of Closed Circuit Anesthesia." The equipment and approach to closed-loop anesthesia were reviewed, and the needs for improved equipment to facilitate closed-loop anesthesia discussed. Scientific sessions and poster presentations were also held. An informal

reception and dinner allowed old and new acquaintances to relax and exchange ideas.

## DAY 2

A tutorial panel entitled "The Uncertainty Surrounding Clinical Measurements: How Accurate Do Our Measurements Need to Be?" started the second day of the meeting. Several experts addressed topics of clinical importance including Blood Pressure (Allen Ream), Pulse Oximetry (John Severinghaus), Gases and Agents (Dave Swedlow) and Electrolytes (Terry Vitez). The highlight of the meeting was the STA-SpaceLabs Distinguished Lecture given by Dr. Richard J. Kitz, Henry Isaiah Dorr Professor of Anaesthesia, and Co-director of the combined Massachusetts General-MIT Health Sciences Technology program. Dr. Kitz outlined the status of medical technology, and proceeded to lay down some challenges for STA in the 90s (see article page 1). The STA board of directors has already begun to respond to one of those challenges by forming a task force to examine the information and experience residents should acquire concerning medical technology. Additional scientific and poster presentations concluded the day.

## DAY 3

The final session of the meeting was an opportunity for the STA membership to meet as a group, hear reports from the committees and voice individual ideas about the direction of the society. Since STA is still young there is much to do and many decisions to be made. The membership meeting offered everyone an opportunity to participate in the growth and direction of STA. It was empha-



sized that there is a pressing need for members to become involved in the various committees and that anyone interested should contact the committee chairman or the members of the board of directors.

An enthusiastic group enjoyed a behind-the-scenes tour of EPCOT center the day after the official end of the meeting.

There were several major reasons for the success of STA 91. The invited speakers gave outstanding talks and the scientific presentations were well done and exciting. The other important ingredient was a low registration fee thanks to the generosity of our sponsors and friends. These generous patrons include STA's Founding Sponsor, Diatek, Inc. and Corporate Sponsor, SpaceLabs, as well as Meeting Sponsors Anaquest, Applied Biometrics, Becton-Dickinson, Datex, Deseret, Drägerwerk, Fiberoptic Sensor Technologies, IVAC, Kendall Health Products, Medasonics, Nellcor, Organon, Ohmeda, and VIA Medical.

Abstracts of the scientific presentations of STA '91 were published in the January '91 issue of the Journal of Clinical Monitoring. Dr. Kitz's talk and the tutorial sessions will appear in subsequent issues of the Journal.

Make plans now for STA '92 to be held in San Diego, CA, January 30 through February 1, 1992! ♦

## HIGHLIGHTS OF STA '91 MEMBERSHIP MEETING

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will have a combined meeting in New Orleans. The STA 93 meeting originally planned to coincide with the annual New Orleans Jazz Festival was discussed. The timing of the Jazz Festival in late April and early May poses conflicts with other anesthesia meetings. Several members felt that the STA meeting should be at a consistent time each year, in January or February. Alan Grogono will investigate the possibility of holding the meeting during Mardi Gras.

### STA Agenda

Ty Smith discussed the STA agenda for the 90s, based upon the challenges raised by Dr. Kitz during his luncheon address. The need to stimulate medical students interested in technology and anesthesia was discussed. Frank Scamman proposed a goal of having an STA member at every medical school. Wes Frazier described the Anesthesia Assistant program at Emory University which has now graduated its 20th class. This program confers a master's degree and many graduates go on to Medical school and most of these then go into Anesthesiology.

### ECRI Concerns

John Severinghaus raised concern about ECRI which evaluates equipment without peer review. He asked if the STA could serve as a consultant to help insure the accuracy of these equipment reviews. In any case there was a need for a publicity campaign about what ECRI was doing. The writing of letters to Anesthesiology was discussed. Ira Rampil noted that letters to hospital administrators which explained the limitations of what ECRI was doing would perhaps be more effective. Frank Block noted that there will be a major discussion of the ECRI at the Vail meeting in March, 1991. ♦

## Richard J. Kitz, M.D. Charts Course for STA

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should be prepared to take a leading role in the development and application of this technology.

Kitz asked that STA set two objectives for the 90s: 1) Define the role of technology in anesthesia education and 2) Define the role of technology in the future of anesthesia practice. With respect to technology in medicine, Kitz noted that "Influencing young people early is the way to go." He went on to suggest that the following actions be taken at the medical school level:

1. Recruit medical school entrants from physical science backgrounds.
2. Participate on admissions committees.
3. Keep medical students with technical educations interested in technology.
4. Spend time and effort to encourage students during the first 2 years of medical school.
5. Create 3rd and 4th year technology electives.
6. Counsel medical students on how to parlay a technical background into a medical career.
7. Encourage post-graduate career programs.
8. Add technology into medical school courses.
9. Identify the essential technical background for a medical student.
10. Direct technically facile medical students into Anesthesiology.

Kitz also identified anesthesiology residency training as a time when education about technology is important. Towards these ends STA was given the following tasks:

1. To identify and promulgate what residents should know about technology.
2. To determine how best to teach technology to residents.
3. To actively teach technology to residents.
4. To help the ABA modify CONTENT

OUTLINE to include technology.

5. To draft a technology booklet to distribute to program directors.
6. To promote the use of simulators to teach anesthesiology.
7. To collaborate with APSF in research and other common goals.

STA was also directed to assume a variety of roles within the anesthesia community:

1. To educate clinicians to use technology.
2. To create educational resources for practicing clinicians to learn about technology.
3. To create educational resources for anesthesia clinicians who lack a formal technical background.
4. To develop a program with APSF to critically assess the cost effectiveness of current technologies.

The industrial liaison was also emphasized:

1. Create an Industry-STA Forum (INDUSTA) to define the future of technology in anesthesia care.
2. Provide a Prize for Excellence In Anesthesia Technology for technological innovation.
3. Make STA better known throughout industry.

- JH Philip, MD

■ *"Influencing  
young people early is the  
way to go."*

— Richard J. Kitz, M.D.