across the entire spectrum between awake and deeply asleep. The BIS numbers themselves are selected to create a linear scale between the two extremes.

Obviously, the summary described is a gross oversimplification. Nevertheless, it is important to understand that there is no simple mathematic relationship between the parameters that "add up" to the BIS. A skilled engineer could build some variation of the processors that reside within the Aspect unit (or might even build a device that calculated 3, 4, or 5 parameters totally different from the ones used by Aspect). However, without the EEG library and its behavioral and functional correlates, the processors will yield nothing of value. Conversely, anyone willing to spend the time, the effort, and the money to collect, analyze, and correlate this information can construct a device that might perform as well as or better than the BIS.

Similar to Dr. Rampil, I want to avoid a discussion of how well the BIS works. A large body of literature

exists, and new articles are appearing daily. Anesthesiologists are purchasing the Aspect device and will judge for themselves whether the system provides useful information. The purpose of the article in this month's issue is to provide readers with an understanding of EEG signal processing, including the BIS. Such understanding should be a part of our assessment of any new technology.

Michael M. Todd, M.D.
Editor-in-Chief, ANESTHESIOLOGY
Department of Anesthesia
The University of Iowa
Iowa City, Iowa
anesthesiology@uiowa.edu

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The Internet: Where Do We Want to Go Tomorrow?

THIS issue contains a review for anesthesiologists of the Internet as a tool for improving patient care, medical education, and research. The November issue will contain a complementary review of the Internet by Dr. Rampil, intended largely to help anesthesiologists find information. Why bother with these primers and this editorial when we are bombarded daily in the lay and

medical press and in conversations with references to and information found on the Internet? Really, it is for two reasons: to underscore the differences between how we use the Internet for our profession, as opposed to other subjects, and to highlight how this journal is trying to help the anesthesia community by providing expert opinions and help in its use.

The Internet and Access to Information

The mere existence of the Internet does not universally increase access to information, contrary to what is often heard, read, and expected. Some reasons for this can be shown by examining the evolution of communication during the past century (table 1). The rapid evolution of a unified postal system more than a century ago led to easy and fast communication. The costs of the network were borne primarily by the government, and there was open access to anyone with the ability to read and write. Costs of the technology to the end-user were minimal (paper, stamps, ink), there were few technologic hurdles, and access was personal—from the personal nature of letters and early scientific journals to the ease of face-to-face communication with postal workers

◆ This Editorial View accompanies the following articles: Ruskin K: The Internet: A practical guide for anesthesiologists. ANESTHESIOLOGY 1998; 89:1003–14; and Rampil IJ: Medical information on the Internet. ANESTHESIOLOGY 1998; 89(5).

🌐 This article appears in full text on the ANESTHESIOLOGY Web Site. Go to the following address, and then scroll down to find the title link for this article.
http://www.anesthesiology.org/tocs/v89n4-TOC/cfm

EDITORIAL VIEWS

Table 1. Development of and Access to Communication in the Last Century

	1800s–Postal Mail	1930s–Telephone	1990s–Internet
Network construction	Government	Government	Government
Individual's access costs	Small (stamps/paper)	Moderate (telephone)	Large (personal computer)
Use of technical language/abbreviations	Minimal (zip code)	Minimal (phone number)	Large (addresses, software, technical language)
Ease of getting lost in the information system	None	Little	Great
Relevance of information	Great	Usually good	Requires digging
Access quality	Personal	Personal	Impersonal

to answer any questions. Simplicity and this personal nature remained as communication moved from mail to the telephone. Networks were furnished with government support with private corporations, but with fairly minimal costs to the end-user. The initial switchboard interfaces ensured direct contact with a telephone worker to answer questions and provide help. Although switchboards are a thing of the past, help in finding access to individual or corporate contacts remains simple, only a phone call (three digits to remember) or a printed directory away. Even as telephone communication progressed to facsimile transmission of documents, simplicity and help in obtaining the communication remained.

The Internet is a radical change from these traditional methods of long-distance communication and raises many barriers that have been difficult to overcome. Despite moves to provide access devices at minimal cost to the public and to develop cheap Internet-access-only devices, the majority of users access the Internet using personal computers, which are costly and often difficult or complicated to setup and to update with newer equipment. Simple, personal interfaces have been replaced with a plethora of jargon and abbreviations that can only partially be avoided using point and click methods. Users are also plagued by the the relative ease of getting lost in the search for information, meandering through pages and pages of irrelevant, often distracting information. Within our professional community, such as in this society as a whole, these barriers of a costly, impersonal, and jargon-filled access to an apparently endless bog of irrelevant information stops many from enjoying the very real professional and personal benefits (and there are many, as reviewed in these articles) of Internet access.

Confidence in Medical Information on the Internet

Perhaps the major concern for health professionals using the Internet to help in patient care, education, and research is confidence in the veracity of the information obtained. Anyone can cheaply post nearly anything on the Internet, often in a form that inspires confidence or a semblance of official status. This offers opportunities for rapid and wide dissemination of new information, but does the uncertainty of the veracity of such information outweigh these advantages? Contrasting how information reaches us in final form in books, journals, abstracts, and the Internet exemplifies these advantages and disadvantages (table 2).

Textbooks, both in print and in CD-ROM form, are indisputably the prime source of formal medical education in medical school and during residency, and to a lesser extent, after completion of training. These usually are written by a carefully chosen group of experts in the fields to be learned, with varying degrees of editing and review for clarity and veracity to the published experimental or experiential literature. Because the purpose of such works is to provide accepted information regarding the topic, there is tremendous resistance to new ideas in textbooks. Because of logistic hurdles and publication delays, more than a year is necessary for most textbooks to be written and published, and new editions rarely are published at more than 3-year intervals.

Journals aim to provide a different type of education, with primary experimental results mixed with varying amounts and quality of general review material. For most journals, editorial boards of acknowledged experts in their field of practice/research ensure a critical review of submitted work, and several steps in the publication chain enhance the chance that the material will be writ-

Table 2. How Professional Information Is Processed and Presented

	Book	Journal	Abstract	Internet
Peer review by experts	+	+++	±	±
Editing for clarity	++	+++	0	±
Delay to publication	Years	Months	Weeks	Days
Resistance to new ideas	++	++	+	0

0 = none; ± = variable; +, ++, +++ = progressive increases.

ten clearly. However, the process of becoming an expert often leads to a reluctance to accept nontraditional ideas and approaches, squelching innovative ideas or controversial observations. From a long-term view, journals are similar to textbooks regarding comprehensiveness, but traditionally, it is much more difficult to search for information regarding a particular in a journal. The recent advent of multiple years of multiple journals on CD-ROM with simple electronic searching has only somewhat obviated this problem.

It is perhaps safest to consider medical information on the Internet (aside from its access to traditional textbooks and journals) to be similar to what is expected from scientific abstracts (table 2). One cannot be assured, and it is often difficult to ascertain, that an expert and independent review of the information has been obtained. There is minimal resistance to new ideas (anyone can write anything), and publication can be very rapid (minutes to days). These advantages fit the need for an information exchange regarding clinical problems or research ideas (discussion groups), but the role of this unfettered and unreviewed communication in forming and advancing clinical practice and scientific investigation remains uncertain at best. No information usually is considered preferable to wrong or misleading information.

ANESTHESIOLOGY, often perceived as a relic of old-style communication and change-resistant peer review, can honestly serve its readership in understanding and exploring the use of the Internet by first Identifying the barriers to access of this world of information and to help minimize these barriers. Both reviews contain a glossary of terms applied to the Internet, explain in simple terms how to achieve access to the Internet, and begin to explore it. Second, ANESTHESIOLOGY can help by identifying sources of reliable information and search tools to simply seek out relevant information. Both reviews contain a list of such sites and tools and the strengths and weaknesses. The full text of both reviews—with "live" links are also available at the ANESTHESIOLOGY Web site (www.anesthesiology.org/). In addition, in 1997 we began a monthly review of Web sites of interest to anesthesiologists. The goal is not simply to "advertise" such sites, but to provide readers with a modicum of guidance through the maze. To help readers

with this process, a list of published reviews (with links to the reviewed sites) can be found at www.anesthesiology.org/tocs/v89n1-TOC/cfm). This page provides readers with an opportunity to recommend sites for future "in print" reviews, either because they have proven useful or perhaps because they contain misleading information.

The journal ANESTHESIOLOGY (and the American Society of Anesthesiologists) also is moving further into this electronic world. Authors can automatically check the status of manuscripts *via* the Web (updated daily), reviewers can fill out review forms on-line or download them to their computers, letters to the editors can be submitted electronically (and we have developed the mechanisms to very quickly process those letters that do not relate to an already published article), and we have taken the first steps to permitting full original manuscripts to be submitted electronically. In addition, we are trying hard to use the Web as a means of publishing "novel" material, including video clips, color photographs, study data, survey forms, and others—material that cannot easily be handled by print media. Within a year or two, we anticipate that the entire contents of the annual meeting (abstracts, workshops, possibly refresher courses, and others) will be available *via* the Web in an easily searchable format. (See either www.anesthesiology.org/services.cfm or www.asahq.org/AnnMtg/homepage.html)

Our specialty and ANESTHESIOLOGY, similar to the Society, is grappling with how to harness the tremendous potential of the Internet. Moving forward, rather than getting lost, necessitates that we define what we are seeking and where indeed we want to go. We look forward to this exploration together.

James C. Eisenach, M.D.
F.M. James, III Professor of Anesthesiology
Wake Forest University School of Medicine
Winston-Salem, North Carolina
eisenach@wfubmc.edu
Michael M. Todd, M.D.
Professor of Anesthesia
Editor-in-Chief, ANESTHESIOLOGY
Department of Anesthesia
The University of Iowa
Iowa City, Iowa
anesthesiology@uiowa.edu