

Editorial

The RSNA Learning Center and Home Page

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At the 80th Scientific Assembly and Annual Meeting (RSNA '94), the Radiological Society of North America showcased two new learning resources: the RSNA Home Page on Internet and the CD-ROM version of the 1994 Special Course in Neuroradiology. These resources signal the debut of RSNA's Learning Center and a new direction for the Society's commitment to education.

THE LEARNING CENTER

Mindful of the increasing need for continuing medical education, on the one hand, and the decreasing financial resources and time available for travel to meetings, on the other, the RSNA Board of Directors decided to establish a learning center at its Oak Brook office. In the year and a half following its decision, the Board gathered information on the learning centers of other medical associations, surveyed RSNA members about their educational needs today and in the future, planned the center's general programs, and appointed an editor and editorial board (see insert). As with all RSNA programs and activities, the ultimate goal is to improve patient care by improving the continuing education of practicing radiologists and trainees. However, the Learning Center is specifically dedicated to providing "distance learning" resources—that is, learning resources in electronic formats such as CD-ROM and the Internet—and to stimulating their use for CME.

In fact, while today only 8% of RSNA members use Internet and 21% use CD-ROM for their education, in the future, 57% plan to use Internet and 79% plan to use CDs.

LEARNING WITH CD-ROM

Over the years RSNA has not only developed educational programs and resources but has also explored many ways to produce and distribute them to the radiology community, from print to slides to audiocassettes and videocassettes. Because our specialty is so

integrally related to technology, we have not shied away from using new technology in our education. Attracted by the number of images that could be contained on one disc (54,000), we produced a pilot videodisc of exhibits from the RSNA scientific assembly. However, CD-ROM technology has outstripped videodiscs in availability and ease of use, and continues to improve in quality while decreasing in price. Thus, the Learning Center produced the 1994 Special Course in Neuroradiology on CD-ROM and will also produce the 1995 Categorical Course in Breast Imaging on CD-ROM, adding features that are not possible in the printed version (especially more images). RSNA's pioneer CD-ROM resources are the 1992 and 1993 selected scientific exhibits on CD-ROM, produced as supplements to *RadioGraphics*. In future projects, the Learning Center will collaborate with *RadioGraphics* to develop other educational resources on CD. (A list of available products appears at the end of this editorial.)

LEARNING ON THE INTERNET: THE RSNA HOME PAGE

In recognition of the growing use of the global Internet computer network by radiologists, the RSNA has established a site on the World Wide Web—the vast electronic publishing medium that is part of the Internet—to help radiologists gain access to medical information quickly and easily. Called the RSNA Home Page, this service is designed to simplify searching for images and information of interest to radiologists on the Internet. (See the related article on the Internet that follows this editorial.)

From computers at their home or practice site, members of the radiology community can now access information about the Society and the annual meeting, as well as resources for radiologic education, practice, and research. Among the resources are scientific assembly program information, notice of journal contents, information about learning resources, technical products and services, and information on the Research and Education Fund. Under development are databases of funding sources for research and learning resources themselves—such as case conferences. In addition, the RSNA Home Page is the gateway to other Internet resources for radiologists. At this time RSNA can direct you to more than 300 other Internet resources; since RSNA '94, more than 522 requests have been made to this section of the RSNA Home Page. (See the partial list at the end of this editorial.) Overall, more than 25,000 requests

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Comments and questions about the Learning Center and the Home Page may be directed to Roberta Arnold (708 368-3750; arnold@rsna.org) or Ken Schulze (708 368-3752; schulze@rsna.org).

To Access the RSNA Home Page...

radiologists need a high-speed modem (14,400 BPS or greater), a computer (preferably a Macintosh, Windows-compatible PC, or UNIX workstation), Web browser software (eg, Mosaic), a phone line, and connection to the Internet. RSNA's Internet address to its Home Page is <http://www.rsna.org>.

For more details about the Internet and "getting connected," see "The Internet and Radiologists" following this editorial

have been directed to the RSNA Home Page in the first 2 months since RSNA '94.

The RSNA Home Page uses Mosaic software to display files for users in a graphical format. The user points a mouse cursor at "hot buttons" or links (either a section of text or an image) and clicks to access other information, whether it's on the RSNA Home Page or anywhere else on the World Wide Web.

The RSNA Home Page is continuously updated and expanded. In the near future, it will include the following:

- A database of continuing medical education courses similar to the listing of CME courses found in *Radiology* but formatted so that users can search the database for specific areas of interest.
- Interactive electronic application forms for membership and grants. Users could apply for membership or grants by computer. This year, those who wish to submit an abstract for an exhibit in the *infoRAD* area of the RSNA meeting may do so by filling out the form on the Home Page and sending it to RSNA over the Internet.
- Educational programs that will also appear on CD, such as the Radiologic Pathology Seminars, produced by the AFIP and RSNA.
- On-line order forms for products and services from the RSNA Learning Center, such as CD-ROMs, videotapes, and audiocassettes.

In his President's Address in 1978, Dr Henry Pendergrass wrote, "The central theme throughout the Society's history is the demonstrated desire of a group of professionals to share knowledge and experiences." In 1995, this volunteer commitment to sharing knowledge and experiences is as strong as ever. The Learning Center will strengthen and extend the work of this volunteer network for the benefit of our specialty and the patients we serve.

Learning Center Resources on CD-ROM

The 1992 and 1993 Selected Scientific Exhibits	\$159.00
The 1994 Selected Scientific Exhibits	\$150.00
The 1994 Scientific Exhibits on Neuroradiology	\$125.00
The 1994 Special Course Syllabus in Neuroradiology	\$70.00
To order the Scientific Exhibits on CD, call 1-800-644-8766 .	
To order the Neuro Syllabus on CD, call 708-571-7875 .	

The Internet and Radiologists

The Internet, the "network of networks," is a collection of thousands of independent computer networks that allows users to exchange electronic mail (e-mail); gain access to a vast amount of information from individuals, universities, and organizations; download files from other computers; and carry on computer-based conversations with other users. There are an estimated 20 million Internet users worldwide, and the network is growing at the rate of 1,000 computers a day. Predictions are for more than 200 million users by the year 2000. Many users are health care professionals who query research databases and consult with experts on a wide variety of medical topics through the Internet. Most of the sites on the Internet are maintained by scientific organizations, educational institutions, and government agencies, although commercial businesses are increasingly setting up sites, or home pages, on the World Wide Web.

BEGINNINGS IN 1969

The technical foundations for the Internet were built in 1969 by the U.S. Department of Defense under its Advanced Research Projects Agency (ARPA). The agency devised a computer network it called ARPANET to link university research centers in the United States working on sensitive government projects during the cold war. The network initially connected four sites: Stanford Research Institute, UCLA, the University of Utah, and the University of California, Santa Barbara. The number of sites grew to about 24 by 1971, 62 by 1974, and more than 200 by 1981. In the early 1970s, when other countries wanted to join the network, computer scientists at ARPA and Stanford University developed a set of technical standards, or protocols, that computer networks around the world could use to link up. Those protocols laid the groundwork for the Internet.

In 1986, the National Science Foundation estab-

Major Consumer On-line Service Providers

The following companies provide access to the Internet:

America Online	800 827-6364
CompuServe	800 848-8199
Delphi Internet Services	800 695-4005
Interchange Online Network	800 595-8555
InterRamp	800 PSI-0852
Prodigy	800 776-3449

Other tools for connecting to and navigating the Internet:

Internet in a Box (Spry)	800 557-9614 X24
Enhanced Mosaic software (O'Reilly & Associates)	800 998-9938

Glossary of Terms

ASCII—The acronym stands for the American Standard Code for Information Interchange. ASCII is a character code that uses a sequence of binary digits for every letter, digit, and punctuation mark.

BPS—Bits per second.

CD-ROM—A compact disc (CD) with read-only computer memory (ROM) that cannot be changed by the user.

FTP—The file transfer protocol used on the Internet to copy files from one computer to another.

Gopher—An Internet search system that organizes information according to a hierarchy of menus.

Home page—A given site's initial page of information to its hierarchy of resources on the World Wide Web. It can contain text, graphics, and links to other home pages.

HTML—An acronym for hypertext markup language, the computer language used to format a document accessible via the World Wide Web.

HTTP—The hypertext transfer protocol used to gain access to a document via the World Wide Web.

Hypertext—Textual information in computer language that contains embedded references to other information.

Mosaic—A graphical computer program that allows the user to browse Internet services, such as Gopher via the World Wide Web, through a point-and-click interface.

PPP—The point-to-point protocol used to send computer information across transmission lines.

Protocol—The rules by which computers exchange information.

Uniform resource locator (URL)—A string of characters used by Mosaic to locate a home page of information.

UNIX—A computer operating system that was developed by AT&T Bell Laboratories.

World Wide Web—A subset of computers on the Internet that includes text, graphics, and audio documents with embedded references to other documents. A user follows the references to browse for information.

lished a high-speed network known as NSFNET, which now forms the backbone of the Internet. NSFNET began to connect with academic, statewide, and regional networks and many countrywide networks in foreign lands. It is capable of transmitting 45 million bits—the smallest unit of information, expressed as a binary digit of either 1 or 0—per second. In 1990, ARPANET went out of commission, but before it did, the concept of a network of networks gave rise to the Internet, a term coined by ARPA researchers. NSFNET is the largest network in the Internet; more than 30,000 other networks are connected to it. All of the networks connected to the Internet are independent. There is no central authority or government agency responsible for regulating or controlling the Internet.

GETTING CONNECTED

Radiologists and others associated with universities and medical centers can usually log onto the Internet free of charge or for a small charge through their hospital or university. Radiologists who do not have free access must buy access through commercial service providers for a monthly fee. There are more than 100 commercial providers around the country.

For radiologists who do not have access to the Internet through their hospital or university, retail computer stores sell software packages, such as Internet in a Box and Internet Membership Kit, that provide most of the necessary software and instructions. The radiologist then needs to contact an Internet service provider, pay a connection fee, and establish an account to pay for using the connection. Service providers are listed in Internet software packages and in some books about the Internet that are sold at retail bookstores and computer stores; lists of providers are also available on the Internet itself. (See list of service providers.)

NAVIGATING THE NET

For neophytes and even veteran users, one of the problems with the Internet is that there is so much information on line that navigating or "surfing the net," as popular vernacular has it, can be a daunting experience. While most users of personal computers are familiar with DOS or Macintosh systems, Internet computers use UNIX terms to communicate. Because there is no comprehensive listing of the information on the Internet, finding specific sites can be difficult.

To help overcome that problem, the Internet offers a feature called Gopher, which was developed by programmers at the University of Minnesota, home of the Golden Gophers. Gopher is an information browsing program that guides users through the Internet's resources, allowing users to read and retrieve text files on specific subjects. Gopher is menu-driven; that is, it displays a menu of choices on a computer screen from which the user selects what he or she wants.

Gopher, however, is a text-only service. A more ad-

vanced service is available that displays not only text but graphics, photographs, sound, and videos as well. This is the World Wide Web. Created in 1989 at the European Laboratory for Particle Physics to help high-energy physicists around the world exchange information, the Web consists of a subset of computers on the Internet. It enables users to jump from one database to another at the click of a mouse through computer technology known as hypertext.

Touring the Web requires browsing software, such as Mosaic or Cello. Mosaic was developed by programmers at the National Center for Supercomputing Applications at the University of Illinois, Urbana-Champaign. It is available free on the Internet to non-commercial users (use FTP to ftp.ncsa.edu to transfer the file) or through Spyglass, Inc., of Savoy, Ill., to commercial users. Mosaic is a menu-driven interface that reads documents written in hypertext markup language (HTML)—ASCII text embedded with characters that link the text to other files and documents. It allows users to retrieve linked graphics, sound and video clips, and even real-time TV broadcasts.

RSNA Home Page "Other Internet Resources": On-line Sources of Information

RADIOLOGY RESOURCES

Advanced Imaging Research Group, London, Ontario, Canada
Biomedical Imaging Conferences
Brigham & Women's Hospital, Department of Radiology
Center for Biomedical Imaging Technology, University of Connecticut Health Center
Centre of Medical Imaging Research, University of Leeds, England
Cornell Medical College
Database of Funding Sources in Radiology
Dalhousie University Division of Oral and Maxillofacial Radiology
Digital Imaging and Communications in Medicine (DICOM) Standard
DICOM 3.0: The ACR-NEMA Standard for Medical Information Communication, Penn State University
Electronic/Nuclear Paramagnetic Resonance Gopher, University of Saskatchewan, Canada
Focal Spot, Mallinckrodt Institute of Radiology
Functional MRI
Georgia Tech: Medical Informatics Research Group (Graphics Visualization and Usability Center)
Harvard University Joint Program in Nuclear Medicine Teaching File
Health and Medicine
History of Radiology, University of Würzburg (German and English versions)
Human Radiation Experimentation Database
IMPHONE, a system for communication of patients' images and data, Department of Radiology, University of Pisa

Image Processing Laboratory, Korea University
 Indiana University, Radiology Department
 International Society for Optical Engineering (SPIE)
 Journal of Digital Imaging
 Laurie Imaging Center of Central New Jersey
 Loyola University of Chicago Nuclear Information System (LUNIS)
 Magnetic Resonance Home Page
 Mallinckrodt Institute of Radiology
 Medical College of Ohio, Image Analysis Research Center
 Medical College of Wisconsin's Collaborative Hypertext of Radiology and Ultrasonography (CHORUS)
 Medical Image Processing Group
 Medical Image Volume Visualization Software FAQ
 Medical Imaging Lab, Johns Hopkins University School of Medicine
 Neurosciences Internet Resource Guide, University of Michigan
 Penn State Department of Radiology
 Rush-Presbyterian-St. Luke's Medical Center, Department of Radiology
 Society for Computer Applications in Radiology (SCAR)
 Society for Neuroscience
 Society of Nuclear Medicine: Computer and Instrumentation Council
 South Bank University, London, England, Division of Imaging and Radiotherapy
 Telemed, National Jewish Center for Immunology and Respiratory Medicine and Los Alamos National Laboratory
 Three-Dimensional Medical Reconstruction
 United Medical and Dental Schools of Guy's and St. Thomas' Hospitals
 University of California, Davis, Department of Radiology
 University of Florida, Radiologic Anatomy Project
 University of Iowa, Virtual Hospital
 University of Miami, Center for Medical Imaging and Medical Informatics
 University of Pennsylvania, Department of Radiology
 University of Pisa, Institute of Radiology
 University of Texas at Arlington, Magnetic Resonance Imaging Group
 University of Texas Southwestern Medical Center at Dallas, Department of Radiology
 University of Washington, Department of Radiology
 University of Washington Children's Hospital, Department of Radiology
 University of Western Ontario, LARG*net Medical Resources
 Visible Embryo Project, University of California, San Francisco
 Washington University, St. Louis, Mallinckrodt Institute of Radiology
 Yale School of Medicine, Image Processing and Analysis Group

MEDICAL IMAGE DATABASES

Mallinckrodt Institute of Radiology Sample DICOM Images
 Medical Image Store, Laboratory for Advanced Computing Biomedical Visualization Laboratory, University of Illinois at Chicago
 Slice of Life, University of Utah
 Société Française de Radiologie et Conseil des Enseignants en Radiologie de France University of Rennes (image database and multimedia syllabi in French)
 Ten Digitized Normal Mammograms, Medical Image Measurements Laboratory, University of Pennsylvania
 UMDS Image Processing Group Medical Image Archive
 Visible Human Project, National Library of Medicine
 Whole Brain Atlas, CNS Images and Text

OTHER DATABASES

ACR Index for Radiological Diagnoses (4th edition)

MEDICAL RESOURCES

Atlanta Reproductive Health Center
 Biomedical Internet Resources, Emory University
 Biomedical Magnetic Resonance Laboratory, University of Illinois at Urbana-Champaign
 Biomedical Visualization Laboratory, University of Illinois at Chicago
 Biosciences—Medical Page, WWW Virtual Library, Harvard University
 CancerNet Gophers, National Institutes of Health
 Case Western Reserve University School of Medicine
 Clinical Alerts
 Clinical Practice Guidelines, Agency for Health Policy and Research
 CPMCnet: Columbia-Presbyterian Medical Center, New York
 Dartmouth-Hitchcock Medical Center
 Diabetes Knowledgebase
 Diagnostic Test Information Server and Primary Care Teaching Modules, University of California, San Francisco
 Directory of Digestive Diseases Organizations for Professionals
 Harvard University Medical Gopher
 InfoLink, University of Wisconsin-Madison Medical School
 Information Technology Directory, Penn State Medical Center
 International Society of Nephrology Commission on Acute Renal Failure
 Internet Health Science Resources
 Louisiana State University Medical Center
 MacLean Center for Clinical Medical Ethics at the University of Chicago
 Medical College of Georgia
 Medical Computer Laboratory, Göteborg University, Sweden

Medical Education Page
 Medical Matrix: Guide to Internet Medical Resources,
 University of Kansas Medical Center
 Medical Photography Forum
 Medical Research Council of Canada
 Medical Resources on the Internet, University of Ten-
 nessee, Memphis
 Medical Standards Documents at Duke University
 Medical Center
 Miyazaki Medical College
 Morbidity and Mortality Weekly Report
 Nagoya University School of Medicine
 National Cancer Center of Japan
 National Heart, Lung, and Blood Institute
 National Institute of Diabetes and Digestive and Kid-
 ney Disease
 National Institutes of Health
 National Library of Medicine
 Neurosurgical Internet Resource, University of North
 Carolina
 New York University Medical Center
 OncoLink, University of Pennsylvania Medical School,
 Philadelphia
 On-Line Images from the History of Medicine
 Osaka Medical College Medical Computation Center
 Pathology Images, Cornell University Medical College
 PATHY—textbook of leukemia, chemotherapy data-
 base, on-line case reports (in Japanese)
 Shiga University of Medical Science
 Southern Illinois University School of Medicine
 Special Internet Connections: Yanoff List
 Stanford Center for Tuberculosis Research
 Stanford Medical School
 St. Joseph's Health Centre, London, Ontario, Canada
 Tulane Medical Center
 Uniformed Services University of the Health Sciences
 University of Adelaide Faculty of Medicine, Australia
 University of Bonn Medical Center (in German and
 English)
 University of Michigan Medical Center
 University of North Dakota School of Medicine
 University of Tromsø School of Medicine (in English
 and Norwegian)

University of Vermont College of Medicine
 Urbana Atlas of Pathology, University of Illinois Medi-
 cal School
 U.S. Army List of Medical WWW Servers
 Walter and Eliza Hall Institute of Medical Research,
 Melbourne, Australia
 WebPath: The Internet Pathology Laboratory for
 Medical Education, University of Utah
 World Health Organization (WHO) Gopher Server

MEDICAL INFORMATICS

Columbia University, Department of Medical
 Informatics
 Department of Medical Informatics, University of
 Limburg, Maastricht, The Netherlands
 Duke University Medical Informatics
 Georgia Institute of Technology Medical Informatics
 InfoNet, Johns Hopkins Medical Institutions
 Institute for Health Informatics, Aberystwyth, Wales
 Medical Informatics Conference Database (Gopher)
 Medical Informatics Laboratory, University of Pavia
 Monash University Medical Informatics
 Multimedia Health and Medical Informatics Databases
 (eg, Global PACS Project and Digital Video in
 Medicine), University of Arizona College of Medi-
 cine
 Stanford University Medical Media and Information
 Technologies
 Thomas Jefferson University
 University of Florida Medical Informatics
 University of Miami Medical Informatics
 University of Pittsburgh Section of Medical Infor-
 matics
 University of Rochester Division of Medical Infor-
 matics
 Yale Center for Medical Informatics

NUCLEAR MEDICINE

Association of Managers of Magnetic Resonance Labs
 Archives (Gopher)
 List of PET Centers
 Society of Nuclear Medicine (General Information)
 Society of Nuclear Medicine Computer and Instru-
 mentation Council