

# HOW TO ACCESS IMAGES ON THE INTERNET

**I**MAGINE STUDYING A CARDIAC PET scan of single-vessel disease. With a click of your computer mouse, you uncover the "hidden" diagnosis. Another mouse click, and within seconds you're viewing a lymphoscintigram stored at a teaching hospital across the country.

Two years ago, administrators in radiology and nuclear medicine departments first recognized the fledgling World Wide Web as a solution to the rising space and cost constraints of maintaining collections of film-based teaching cases. They also saw an added advantage: They could share information and cases with other hospitals and universities. "Most servers with teaching files have a page for links to other teaching files, and our own server has 30 such links," said Gina Mammone, technical director of the Brigham and Women's Hospital Radiology Project ([gammone@dsg.harvard.edu](mailto:gammone@dsg.harvard.edu)).

Today, Web-based teaching files are mushrooming nationwide and overseas to create a global network of instantaneously updatable virtual textbooks, tutorials and patient databases. The best part is they are available for free, 24 hours a day, to anyone with an Internet connection and Web browser software—whether you are a computer wiz or a novice.

Now that the technology for storage, navigation and display of teaching files is in place, building up the files with new cases is the current scramble. As server administrators continue to add cases submitted by residents and staff and—hopefully—from outside institutions, teaching files may soon become complete enough to be integral to clinical work. "We're shooting for 'just-in-time knowledge' with teaching files," said David L. Rankin, MD, professor of diagnostic radiology and nuclear medicine at the University of Western Ontario in London. "Eventually, a clinician with a query about a patient will be able to connect to a teaching file, find the answer and then proceed with the diagnosis and treatment."

Teaching file coordinators also recognize the educational power of Web teaching files beyond resident training—as a fun and inexpensive way for radiologists and nuclear physicians to sharpen their diagnostic skills and stay informed. They are also anticipating that continuing medical education (CME) credit will be offered online within the coming year.

## Navigating Teaching Files

If you have a World Wide Web connection, you can navigate any teaching file server using the mouse to click your way through the options. (Most Web connections are equipped with a built-in browser software program, such as Mosaic or Netscape, that maintains the graphic interface at any site.) "Browsers make it possible to navigate extremely quickly through a very large dataset," said Keith Johnson, MD, manager of the Whole Brain Atlas at Harvard University ([keith@bwh.harvard.edu](mailto:keith@bwh.harvard.edu)). "A journal can publish only 4 to 5 images of each case, whereas a single brain tumor case on our server contains 1045 downloadable images in various modalities." Moreover, Web images need not be static. "Our multiple sclerosis case features a time-lapse movie that shows how the scans change with disease progression."

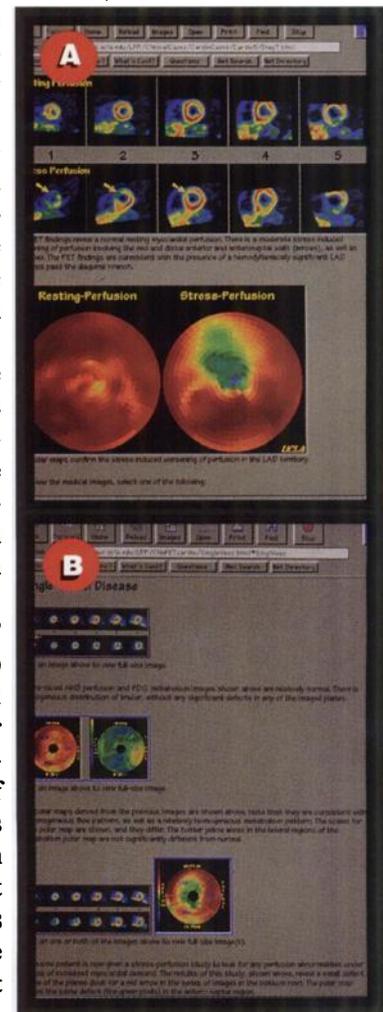
Where you once may have had to page through dozens of indexed teaching cases to find what you wanted, several teaching file sites now let you interact with the server to complete a search "form" containing set search criteria. Once your form is sent, the server responds by linking you to one of many possible Web pages.

What type of hardware do you need? "As a rule of thumb, most desktop machines that play games in color well are okay for downloading nuclear images," said Tom Lewellen, PhD, professor of radiology at the University of Washington Hospital in Seattle. This means you need a Macintosh or PC with at least a 14" 256-color screen (8-bit screen). Moreover, since teaching cases are small—the largest eat up just one megabyte of RAM—memory on most desktops should be sufficient.

## Contributing Cases

To supplement their teaching files, server administrators are seeking new nuclear medicine cases from institutions worldwide. Fortunately, you do not need to be computer savvy to contribute cases: All that is required is collecting film and writing up the case information. The server administrator will scan and digitize your word-processed text and

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The two figures (above) are examples of pages from Let's Play PET (<http://www.nuc.ucla.edu>), a Web teaching file created through the UCLA School of Medicine. Figure A shows a cardiology clinical case presentation. Figure B shows a tutorial on single-vessel disease.

## Images on the Internet

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film and then integrate your case with the rest of the teaching file. "Contributing cases is especially convenient if you can get raw digital data through your MR or CT lab," said J. Keith Smith, MD, PhD, a clinical instructor in the department of radiology at the University of North Carolina.

One current problem with teaching files: They have no firmly established system of peer review. Unlike a written medical journal article which undergoes review by an independent group of experts in a particular field, teaching files are not formally reviewed. Quality control for teaching files has generally meant physician staff members verifying resident cases and checking their own work as well as relying on e-mail comments from users. Many teaching file servers, however, are working to remedy this. "We are working to implement a high quality standard for the Whole Brain Atlas, in which neuroimaging experts will be peer reviewers," said Johnson.

### Sharing Images with Colleagues

Let's say you want to get a gallium scan on a colleague's imaging machine 1000 miles away. The Internet offers two basic options for transferring diagnostic images, explains Trevor D. Craddock, PhD, at Victoria Hospital in Ontario. You can either send images over file-transfer protocol (ftp) or attach them to e-mail.

If you have access to ftp through your Internet connection, you can send or receive images from another ftp-connected colleague by establishing a shared "read-write" access Internet account and password, which your institution or Internet provider can arrange. This account allows you and your colleague to exchange patient images privately and preserves patient confidentiality.

Sending images over e-mail may be your only option if either you or your colleague does not have a full-fledged Internet account. One disadvantage to this method is that you need to convert image files from binary format into ASCII (a text format which e-mail can send) and then back into binary. This means both sender and receiver need an e-mail file-conversion program such as uencode/udecode. Another problem with e-mail transfer is that image files may be too large for commercial online service e-mail systems, although some systems allow you to get around the problem by sending large files in chunks as multiple messages.

Diagnostic images sent over e-mail need to be saved with a .gif, .jpeg or other image-file format extension so that the receiver can open and view them as image files. To do this, the sender first needs

to do a "screen grab" of the image from the imaging machine—similar to printing from the screen—to capture the screen into an image-file format. For example, to send a gallium image by e-mail, your colleague would screen-grab the file as gallium.gif or whichever image-file extension the imaging program indicates. Then, he would go into uencode/udecode and tell it to encode gallium.gif; the encoded file, gallium.uue, would then be attached to the e-mail message.

Once you receive the image, the message would appear as gallium.uue. You would then have to enter uencode/udecode to decode the file back to gallium.gif. Since you cannot view an image in a word processing program, you would then need to open the image file in a software viewer program. You could also use the browser program that you use with the Web. Enter the directory in which the file is stored and the filename, for example, C://public/email/gallium.gif.

One final word: If you and your colleague are not transferring images from nuclear scanners made by the same company, you will need to do a conversion through Interfile, a common file format which accommodates nuclear images as counts rather than pixels. For more information on Interfile, contact the University of Western Ontario home page (<http://www.largnet.uwo.ca>).

Jill Steuer

### Erratum

In our April Newsline article "Navigating the Internet," we regret that some e-mail and Internet addresses had slight misprints or have since been updated. A number of astute readers brought the correct addresses to our attention. Here is a revised list:

1. Let's Play Pet:  
<http://www.nuc.ucla.edu>
2. Radiation Biology:  
<http://www.science.ubc.ca/departments/physics/radbio/HomePage.html>
3. Medical Matrix URL:  
<http://kuhttp.cc.ukans.edu/cwis/units/medcntr/Lee/HOMEPAGE.HTML>
4. Big Dummy's Guide to the Internet:  
[ftp.pub/Net\\_info/EFF\\_Net\\_Guide/netguide.eff](ftp.pub/Net_info/EFF_Net_Guide/netguide.eff)
5. Loyola University Nuclear Information Service:  
<http://www.lunis.luc.edu>
6. Nucmed e-mail list: [nucmed@largnet.uwo.ca](mailto:nucmed@largnet.uwo.ca)  
To subscribe to nucmed, send an e-mail message to:  
[listserv@largnet.uwo.ca](mailto:listserv@largnet.uwo.ca)
7. The Institute for Clinical PET can also be reached through the Internet.  
Their e-mail address is:  
[PETicp@aol.com](mailto:PETicp@aol.com)