Laboratory of Neuro Imaging Inspector, version 2.0

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I. Introduction to the Inspector

The LONI Inspector is an application for examining medical image files. Unlike most image viewers, the Inspector focuses on reading, displaying, searching, comparing, and exporting "metadata." The term "metadata" refers to data that describes the image data in a file. For example, metadata can be the patient name, the model of scanner on which the subject was scanned, the date on which the scan occurred, and the width and height of the image. Knowledge of metadata can be very important in understanding the imaging protocol and in protecting patient privacy since Federal regulation prohibits the exchange of image files that contain patient-identifying information.

There are many different types of medical image file formats, and the amount and type of information stored in these files varies depending upon the file format type and file creator. Unlike simpler file formats (GIF, JPEG), there is often a large amount of metadata (subject name, date of birth, scanner protocol) stored with the image data. The Inspector provides a single interface for viewing both metadata and image data in many common medical image file formats (AFNI, ANALYZE, DICOM, ECAT, GE, Interfile, MINC, NIFTI), searching files for keywords, comparing files for differences, and exporting metadata into XML and CSV files.

II. Starting the Inspector

A. Unzipping the downloaded file

From the LONI software download web site, you should be able to download the zip file:

inspector_2_0.zip

Unzip the file into its contents. This should create the following files:

File	Description
Inspector2_22Jun2007.jar	The main Inspector jar file
run.sh	Use to run the Inspector in Linux/OS X/Unix
run.bat	Double-click to run the Inspector in Windows

B. Starting the Inspector

In order to run the Inspector, you must have Java 1.5 or later installed on your machine. The Inspector has been tested on and successfully run on Windows, Linux, and OS X platforms. On Windows, double-click the run.bat file. On other platforms, open a command line shell and execute the run.sh script (It may be necessary to "chmod a+x run.sh" first if the file does not have executable permissions).

C. Selecting files as command line arguments

You can automatically load files into the Inspector by specifying them as command line arguments:

java -jar -Xmx1024m Inspector2_22Jun2007.jar <file1> <file2> <file3> ...

If no arguments are given, the Inspector will start as if you had executed the run.sh or run.bat file.

D. Supported File Formats

- AFNI
- ANALYZE 7.5
- DICOM
- ECAT 7
- GE 5.0
- Interfile (including HRRT Interfile)
- MINC
- NIFTI
- Variants of GIF, JPEG, and PNG

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III. Selecting files

In order to load files into the Inspector, they must first be selected in the selection dialog.

A. How to start the selection dialog

The Inspector file selection dialog is started using the menu option "File->Add/Remove Files." This will display a dialog similar to:
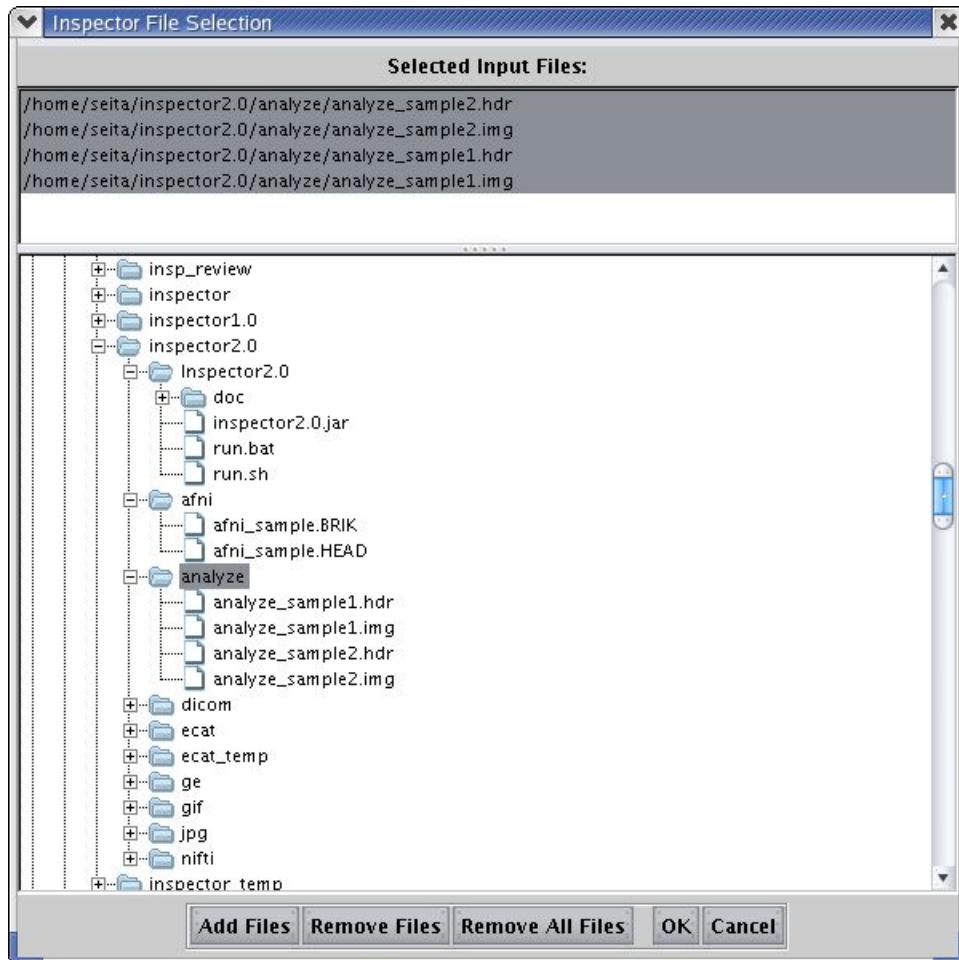
B. How to select a file

There are multiple ways to select files in the Inspector file selection dialog.

i. Double-click

If you double-click on a file in the lower tree-like display of your file system, the file (and those associated with it) will be selected and displayed in the upper part of the dialog.
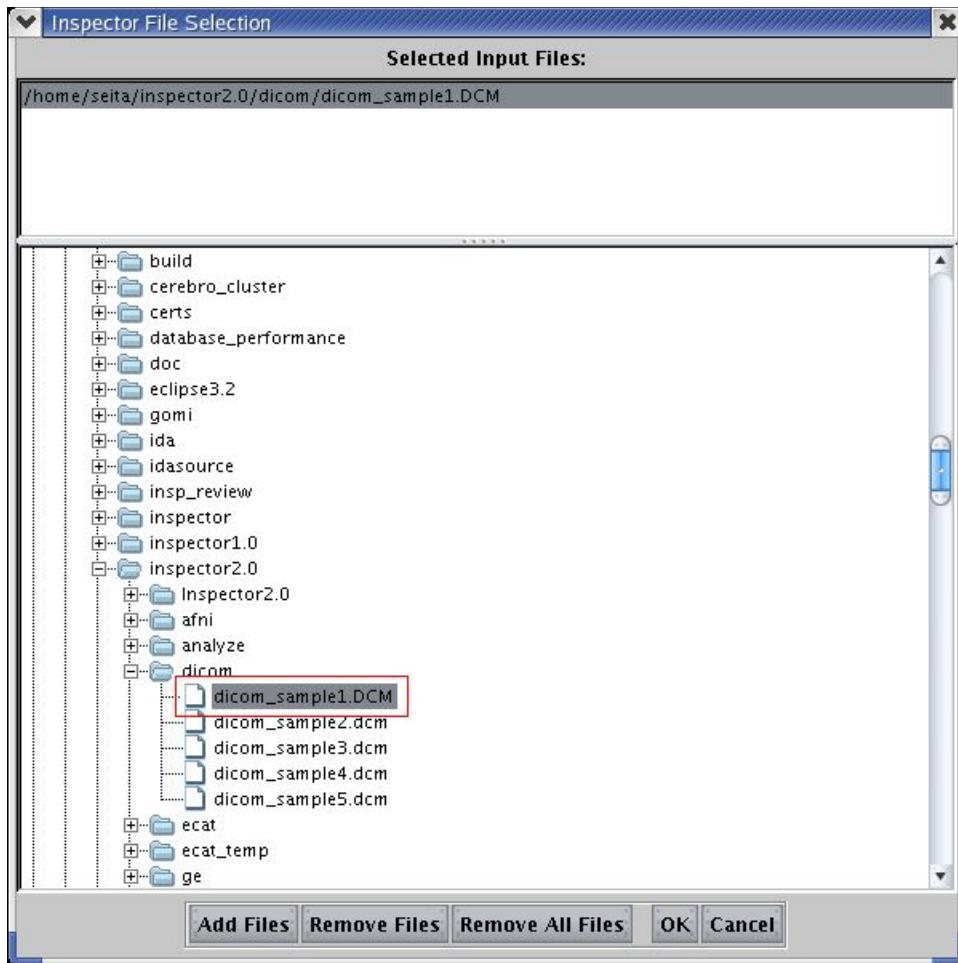
ii. Single click and "Add Files"

If you click on a file in the lower part of the file selection dialog and then click the "Add Files" button, the file (and those associated with it) will be selected and displayed in the upper part of the dialog.
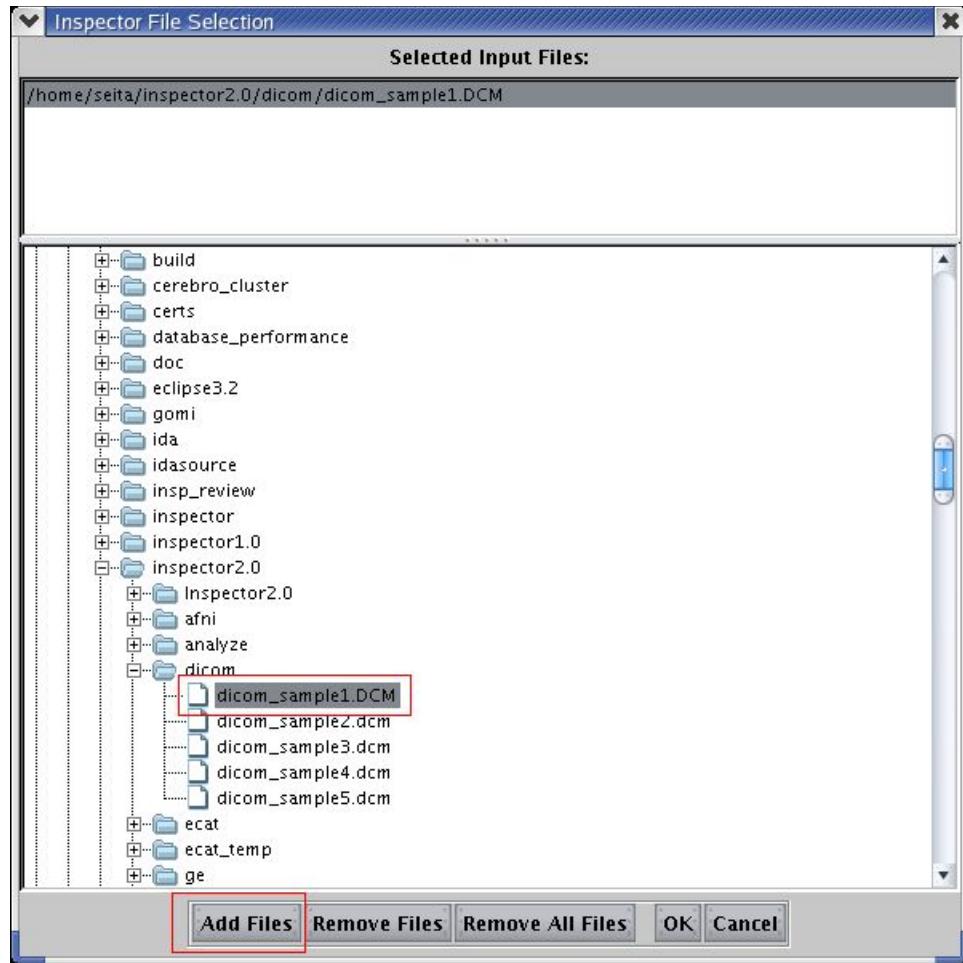
iii. Drag-and-drop

If you select a file with the mouse in the lower part of the file selection dialog and then drag the mouse (with the mouse button pressed) over the upper part of the dialog, the file (and those associated with it) will be selected and displayed in the upper part of the dialog when you release the mouse button.
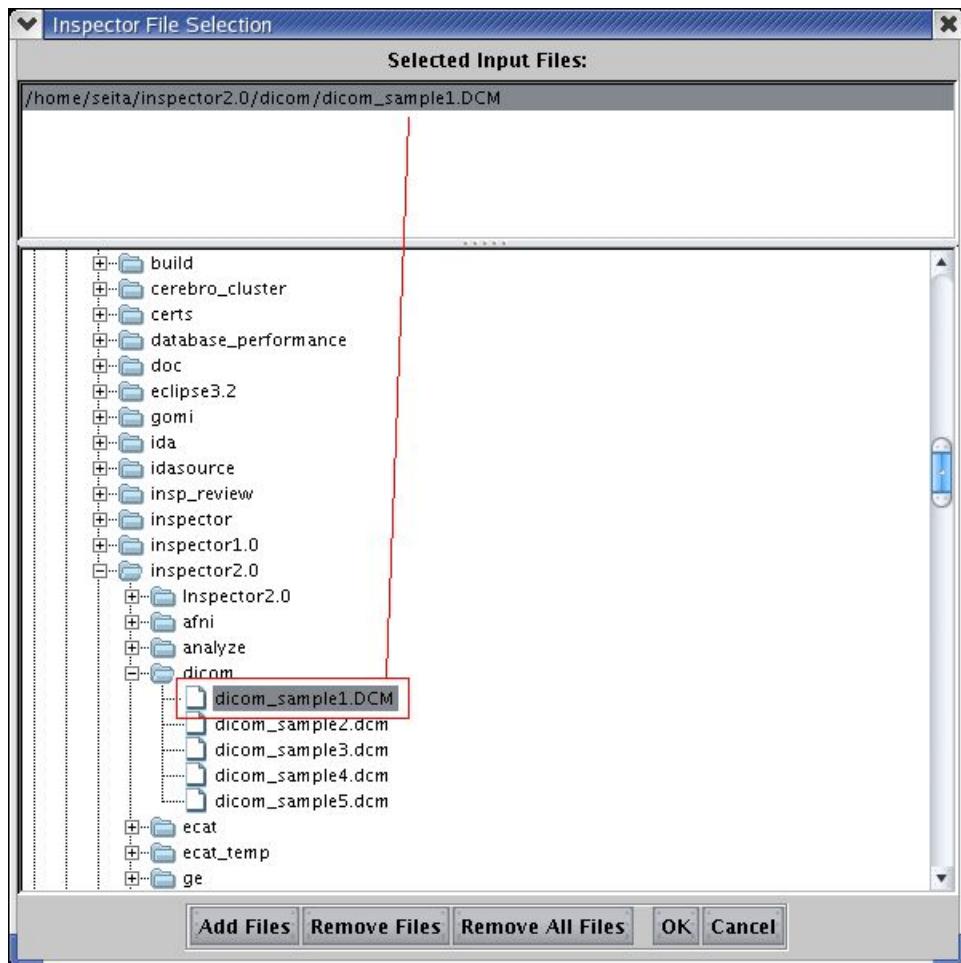
D. How to select a directory of files

To select all the files in a directory, single click on the directory and click the "Add Files" button. The contents of the directory will be selected and displayed in the upper part of the dialog.
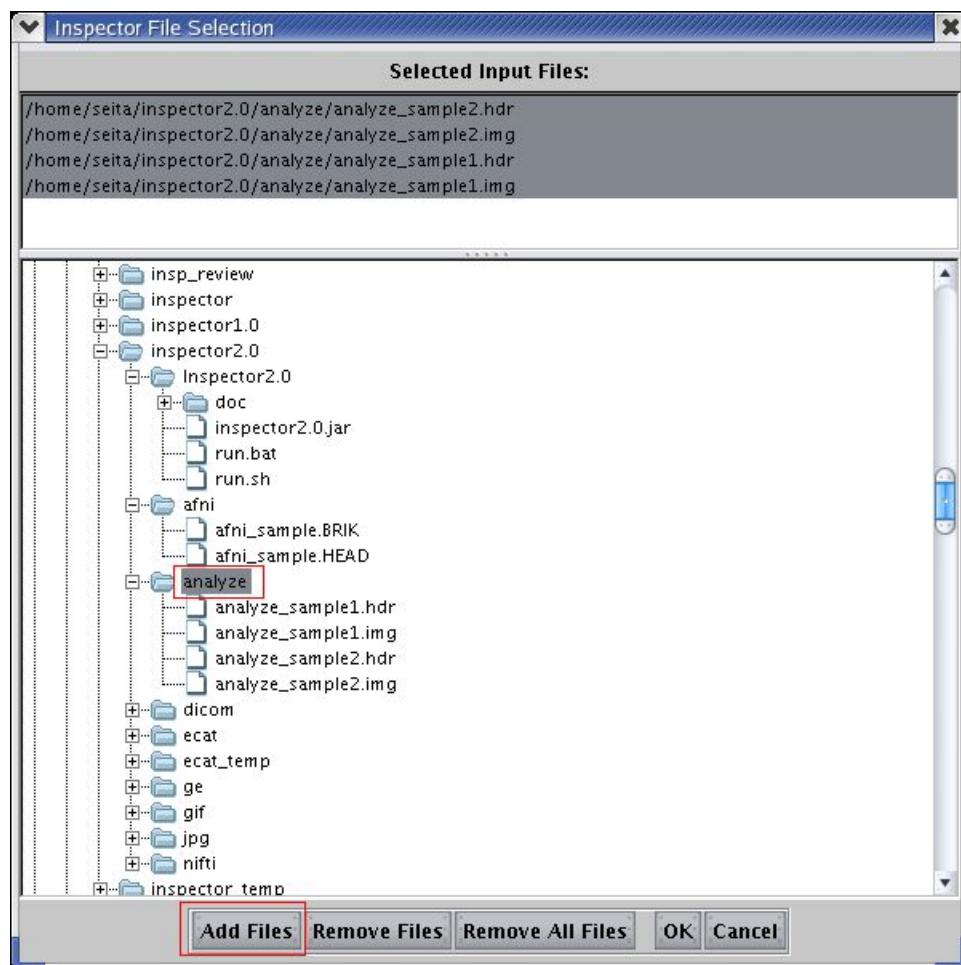
E. How to remove selected files

To remove a file from the Inspector, select the file in the upper part of the file selection dialog (hold down the CTRL key to make multiple selections, or hold down the SHIFT key to select multiple files at once). Click the "Remove Files" button to remove the selected files.
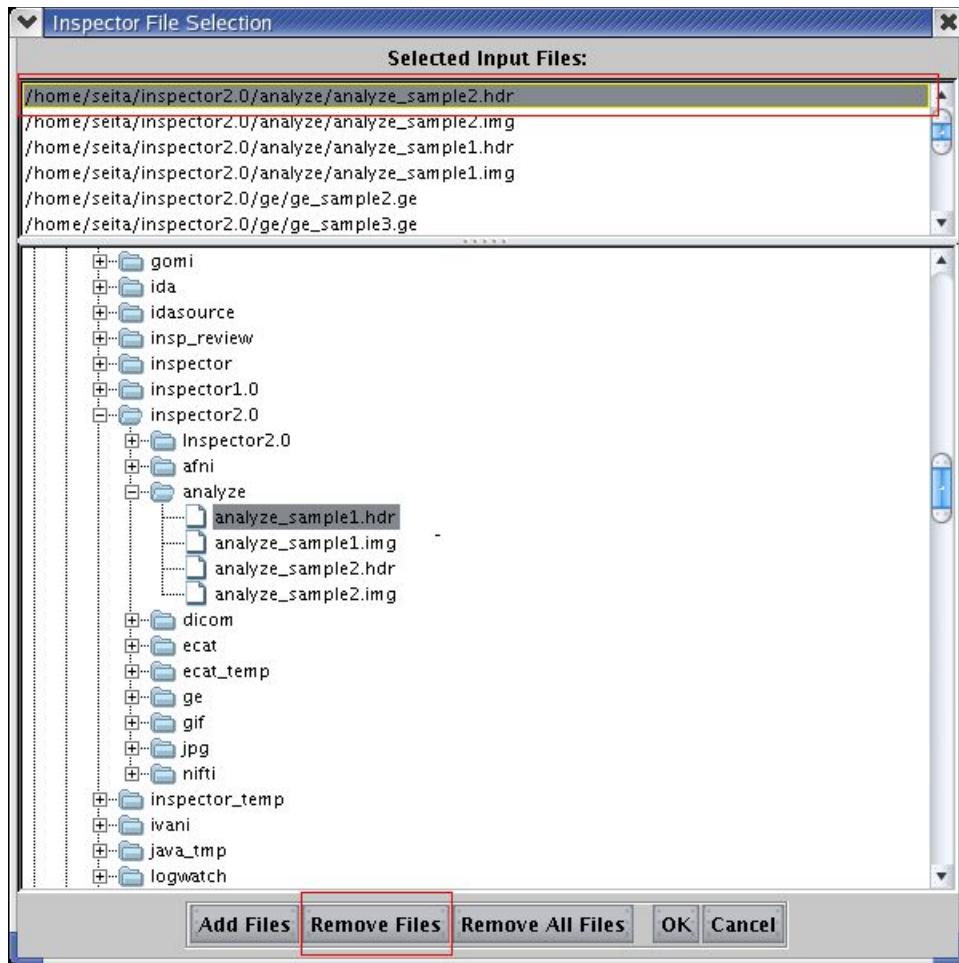
F. How to remove all the selected files

To remove all selected files from the Inspector, click the "Remove All Files" button.
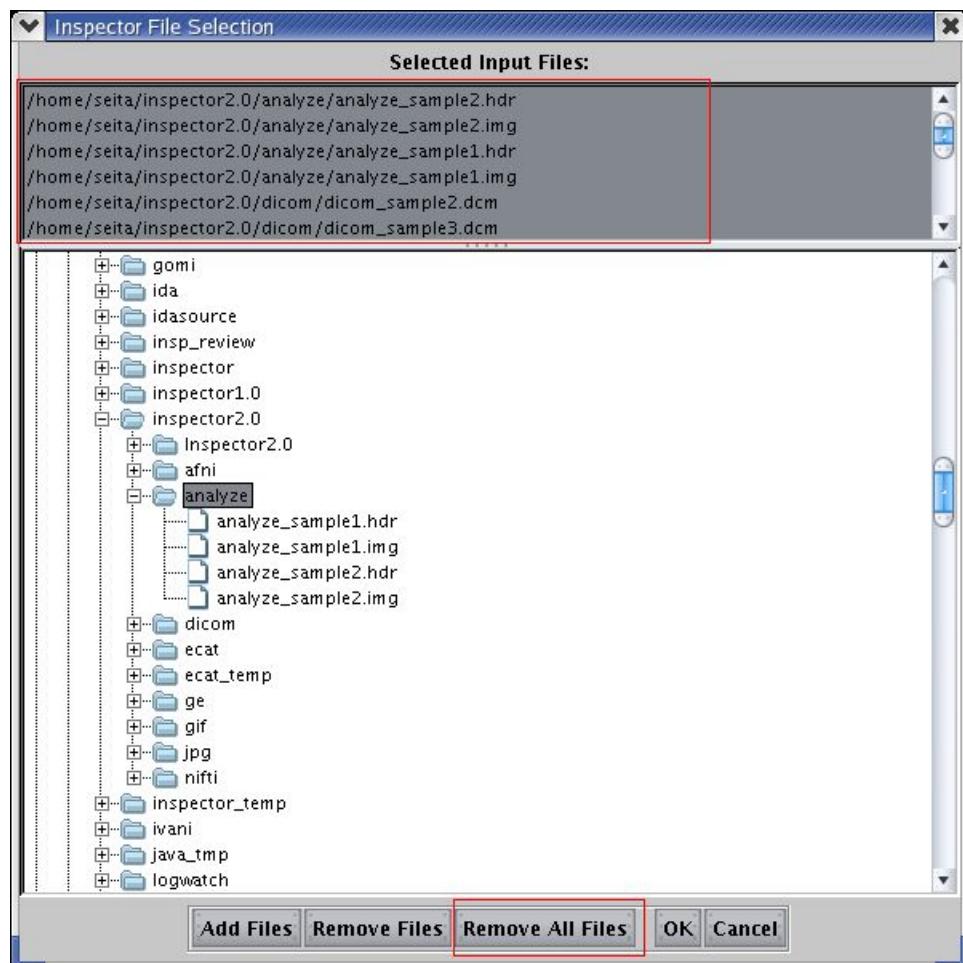
G. File loading progress

A progress dialog will appear while the Inspector loads files in the event that a large number of files are selected.
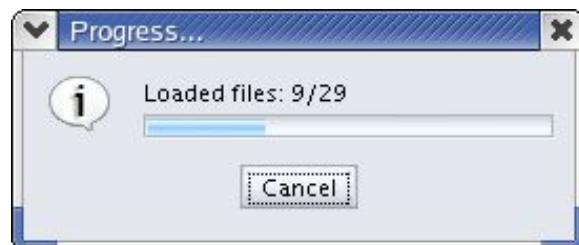
H. Unsupported file formats

Files that cannot be recognized by the Inspector are reported in a dialog after the loading process finishes:
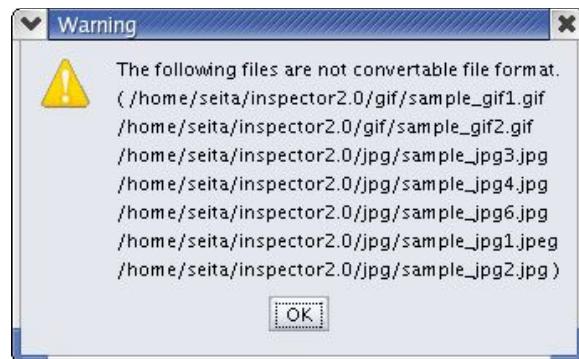
IV. Inspecting metadata

The term "metadata" refers to data that describes the image data in a file. For example, metadata can be the name of the subject that was scanned, the date on which the scan occurred, and the width and height of the image. Each "file format" (e.g., DICOM, ANALYZE, or JPEG) contains different sets of metadata elements.

A. Name and description columns

The "name" column of the Inspector lists the names of the metadata elements that are present in the chosen file(s). The "description" column gives a brief description of each metadata element. If there isn't information about a metadata element (e.g., a privately-defined element), then the description for the metadata element will be blank.
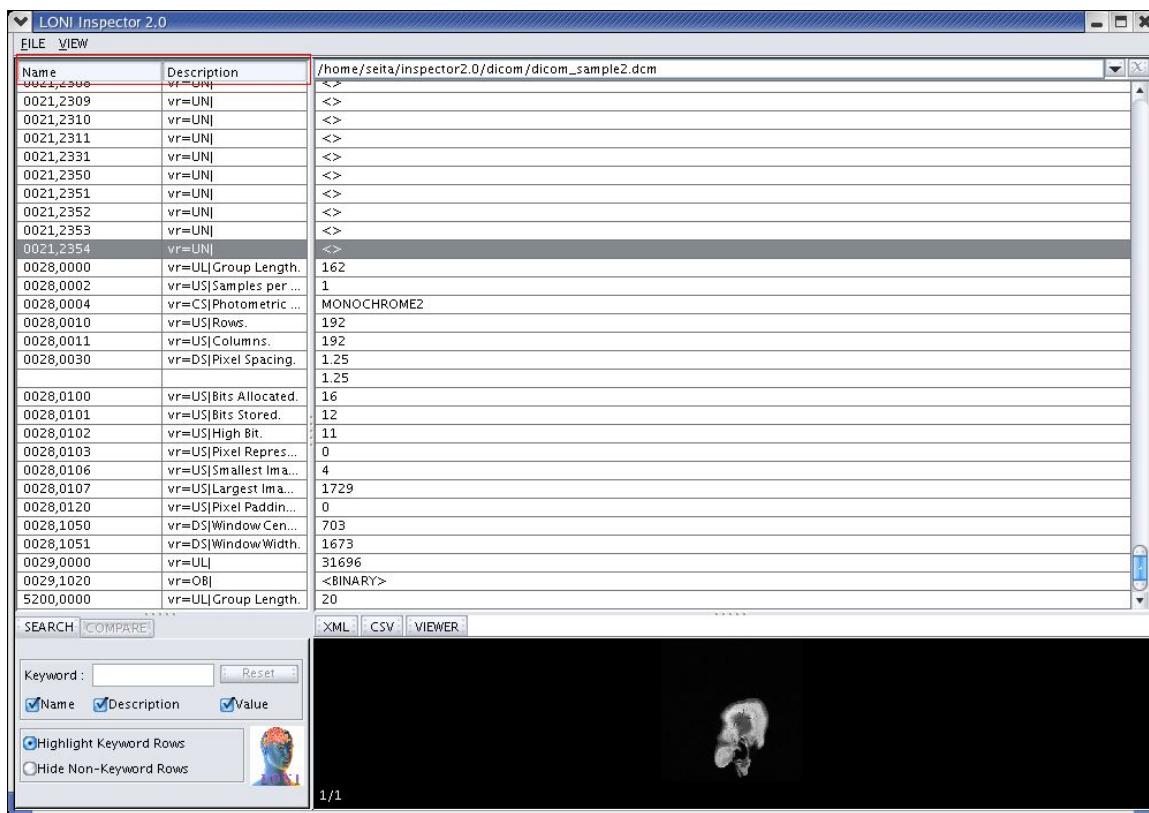
B. How to identify the file format

The first row of metadata displayed in the Inspector gives the file format.

C. How to add or remove a column

Two or more files can be compared side-by-side by "adding a new column." A new column is added using the menu option "View -> Add column." This menu option will not be active if there are no more files to compare. A column is removed by clicking the "X" button located at the top-right corner of the column.

D. Opening a new window

Use the menu option "View -> New window" to open a new Inspector window. All files currently loaded into the Inspector will be accessible in the new window.
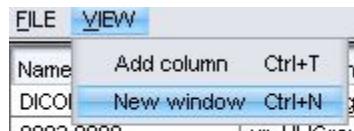
E. Resizing the columns

The width of each table column can be changed. Move the mouse cursor over a column divider and, while holding the mouse button down, drag the divider left or right to change the column widths.

F. How to change the displayed files

At any given time, the Inspector will display metadata from only <u>one</u> file format.

i. Leftmost file column chooses the file format

The file format of the file chosen in the leftmost file column determines what metadata elements are displayed in the name and description columns.
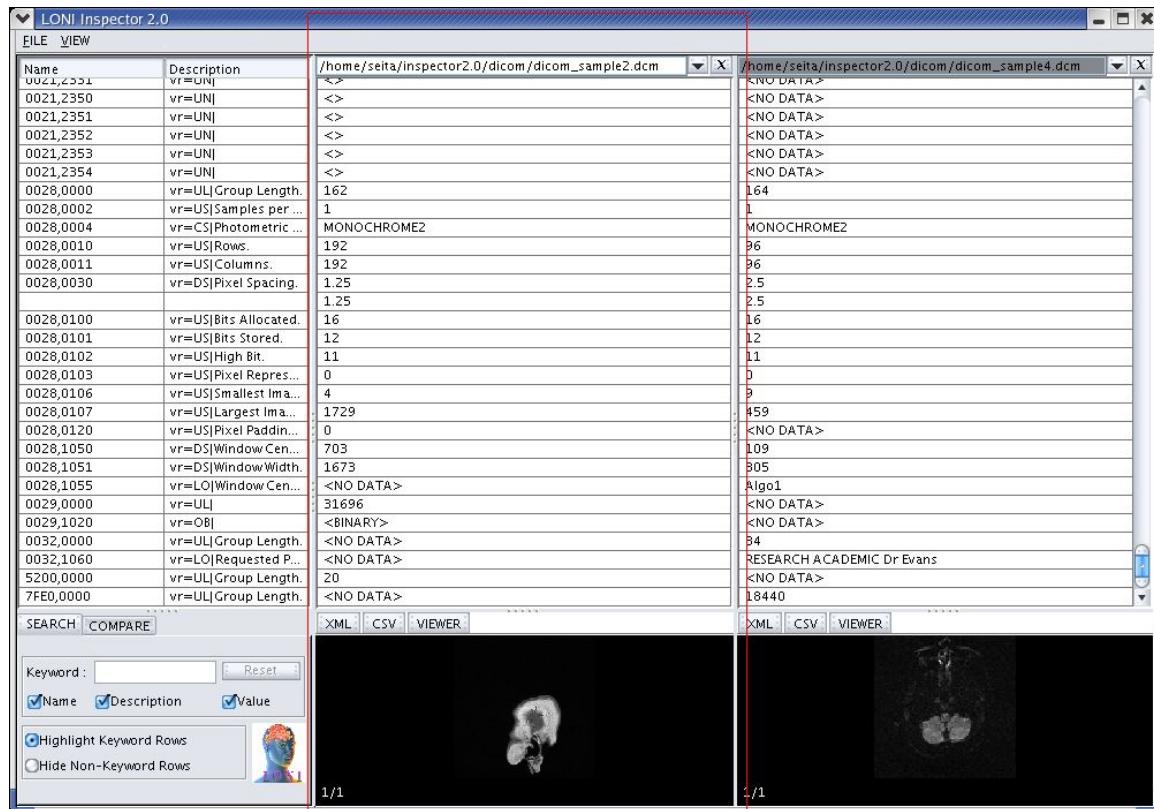
ii. Other file columns list only files of this file format

When there is more than one file column displayed in the Inspector, all other file columns (other than the leftmost file column) contain files of the same file format.   For example, if a DICOM file is chosen in the leftmost file column, only DICOM files will be listed in the other file columns.

iii. Changing the file format in the leftmost file column

If you select a file in the leftmost file column that has a different file format than the file currently selected in the column (e. g., change the selection from a DICOM file to an ANALYZE file), the content of the name and description columns will change to match the new file format and the other file columns will switch to files of the new file format.

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G. What does <NO DATA> mean?

When two or more files are compared side-by-side, it is possible that one file will contain metadata elements that are not present in the other files. If this occurs, the label "<NO DATA>" is displayed where the metadata is missing. This makes it possible to distinguish the case where a value is missing (<NO DATA>) from the case where the value is empty ("").

ma...	<NO DATA>	4		6
na...	<NO DATA>	97		91
lin...	<NO DATA>	0		0
en...	<NO DATA>	68		68
idth.	<NO DATA>	168		167
	<NO DATA>	31696		31696
	<NO DATA>	<BINARY>		<BINARY>

H. Viewing long metadata strings with tool tips

If a table cell is not wide enough, the cell value will be truncated and dots (...) will appear at its end. The full string can be displayed by moving the mouse cursor over the table cell. After about two seconds, a tool tip will appear showing the full value.

DICOM	Digital Imaging and ...	
0002,0000	vr=UL|Group Length	<NO DATA>
0002,0001	vr=OB|File Meta In...	<NO DATA>
0002,0002	vr=UI|Media Storag...	<NO DATA>
0002,0003	vr=UI|Media Storag...	<NO DATA>
0002,0010	vr=UI|Transfer Syn...	<NO DATA>
0002,0012	vr=UI|Implementati...	<NO DATA>

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I. Differences in row color and >'s

Some metadata elements are contained inside other metadata elements. The ">" symbol appears in front of metadata elements that are contained in other metadata elements. Many ">"'s indicate many levels of containment. The background color get darker with the number of ">"'s.

JPEG	Joint Photographic Experts Group	
>JPEGvariety	A node grouping all marker segm...	
>>app0JFIF		
>>>Xdens...	The horizontal density or aspect r...	100
>>>Ydens...	The vertical density or aspect rati...	100
>>>major...	The major JFIF version number	1
>>>minor...	The minor JFIF version number	2
>>>resUni...	The resolution units for Xdensity	0
>>>thumb...	The height of the thumbnail, o...	0
>>>thumb...	The width of the thumbnail, or 0 if...	0
>markerSe...	A node grouping all non-jfif mark...	
>>app14A...	An Adobe APP14 marker segment	
>>>flags0	The flags0 variable of an APP14 m...	49152
>>>flags1	The flags1 variable of an APP14 m...	0
>>>transf...	The color transform applied to th...	1
>>>version	The version of Adobe APP14 mark...	100
>>dht	A Define Huffman Table(s) marker...	
>>>dhtable	A single Huffman table	

The minor JFIF version number

V. Searching for metadata

A. Keyword search

Click on the "Search" tab in the lower left corner of the Inspector to activate the search function.
Type text in the "keyword" field to search for all occurrences of the text.
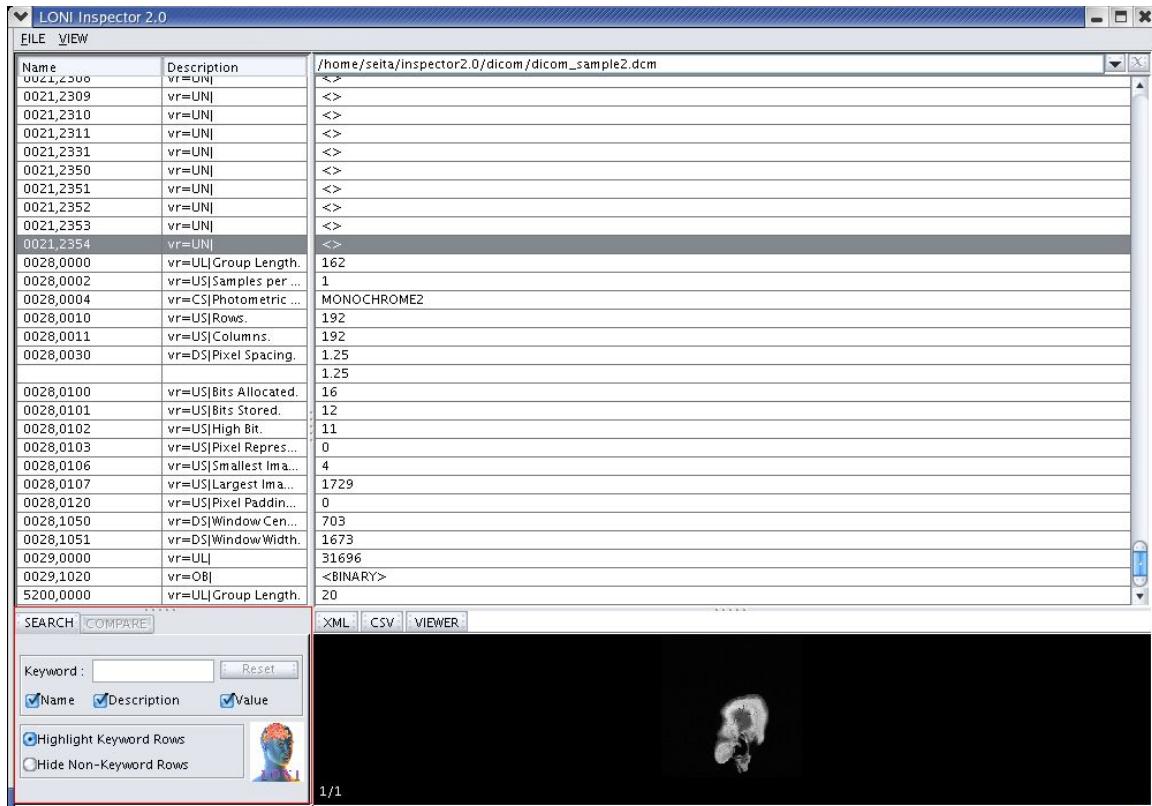

i. Searching for name, description, and value

Name	Search the name column (names of the metadata elements).
Description	Search the description column (descriptions of the metadata elements).
Value	Search all the columns excluding the name and description columns (metadata from the files).
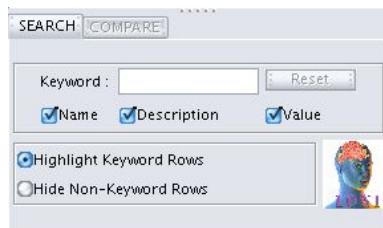
ii. Case insensitive search

All keyword searches are case insensitive. For example, searching for "LONI" is equivalent to searching for "loni" and "LoNi". The results of keyword searches return all occurrences of the keyword. For example, searching for "loni" would yield results such as "LONI", "loni.ucla.edu", and "cloning." All table cells that contain a keyword match are colored blue:

iii. Reset button

To clear the results of a search, click the "Reset" button.
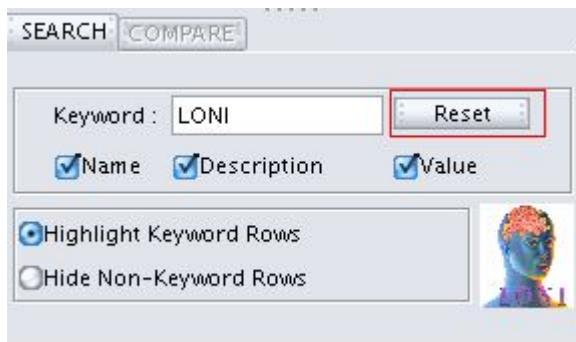
B. Highlight Keyword Rows

Choose the "Highlight Keyword Rows" option to color all table cells with keyword matches.

C. Hide Non-Keyword Rows

Choose the "Hide Non-Keyword Rows" option to hide all rows without keyword matches. To show all the rows again, click the "Reset" button.
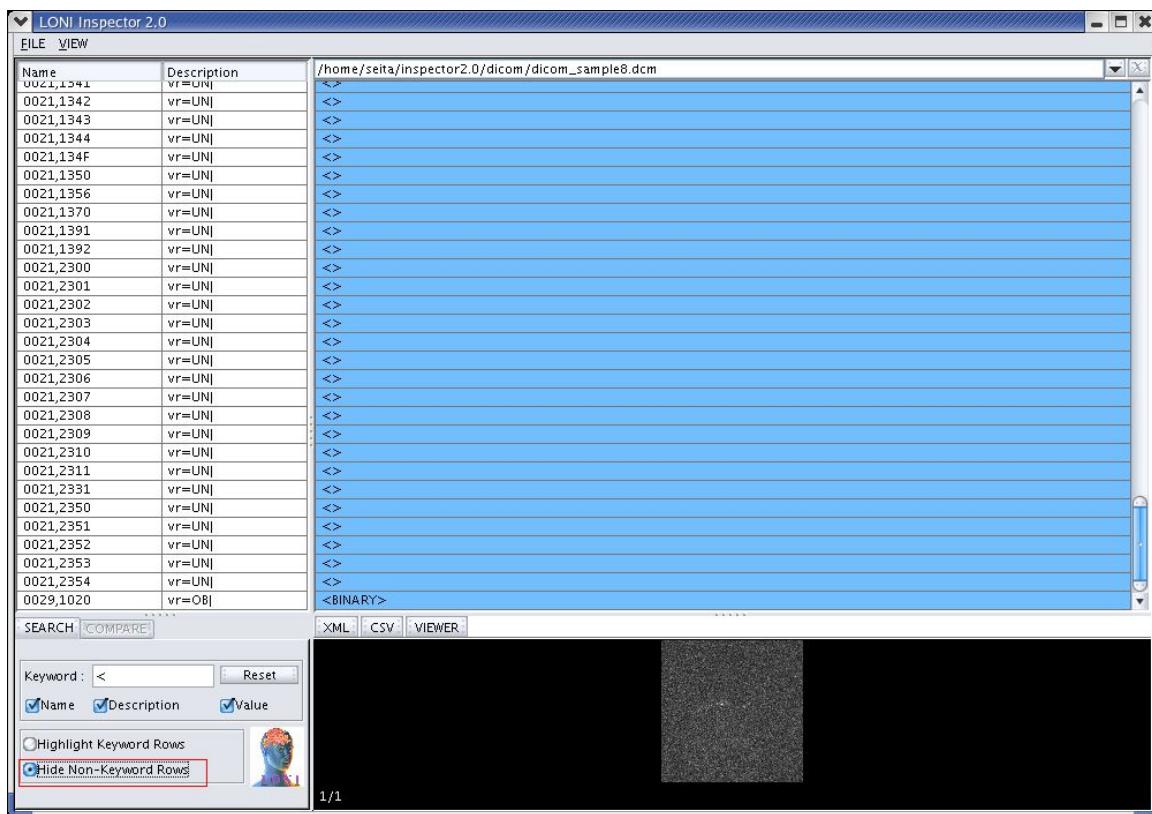
VI. Comparing metadata

A. Compare tab is active when two files can be compared

Click on the "Compare" tab in the lower left corner of the Inspector to activate the compare function. This function is only available when there are two or more columns visible in the Inspector.
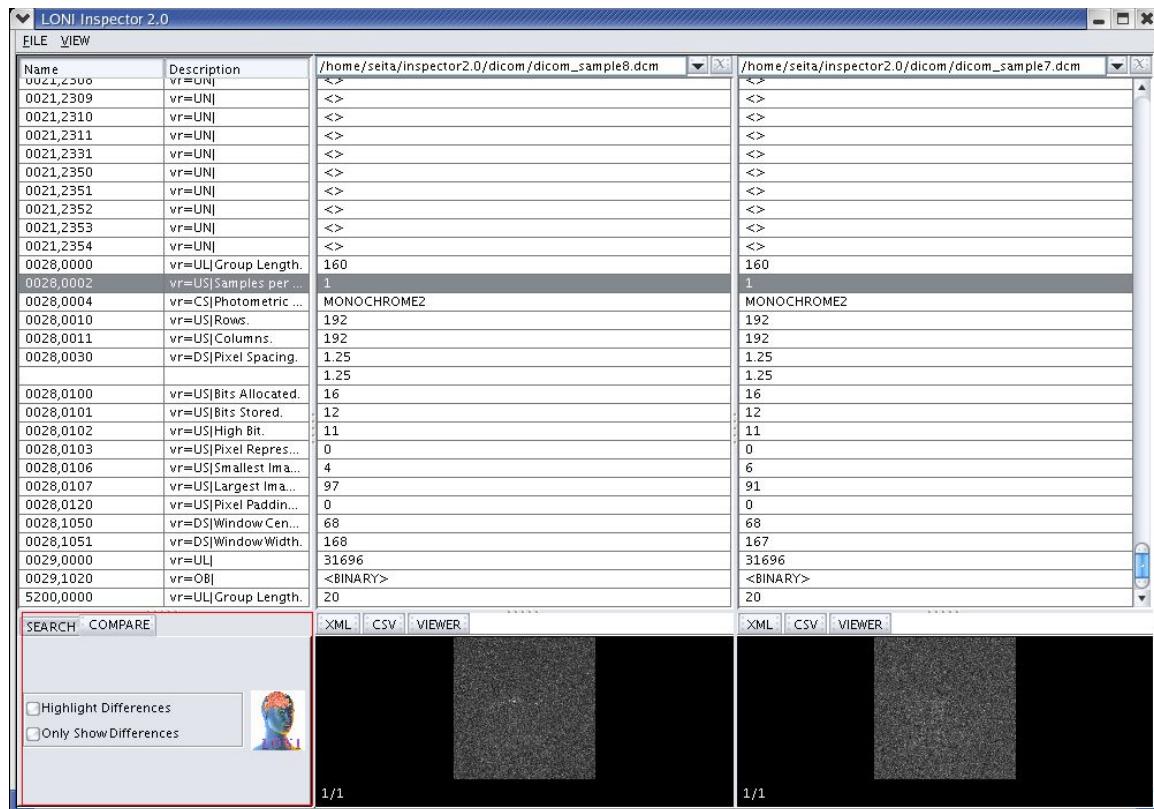
B. Highlight Differences

Choose the "Highlight Differences" option to highlight the differences between files. Each row that contains differences is colored blue. If there are many values for a metadata element and at least one value differs between two files, then all rows containing the values are colored blue.

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C. Only Show Differences

Choose the "Only Show Differences" option to show the differences between files (while hiding the similarities). This option is useful when there are only a few differences between files.
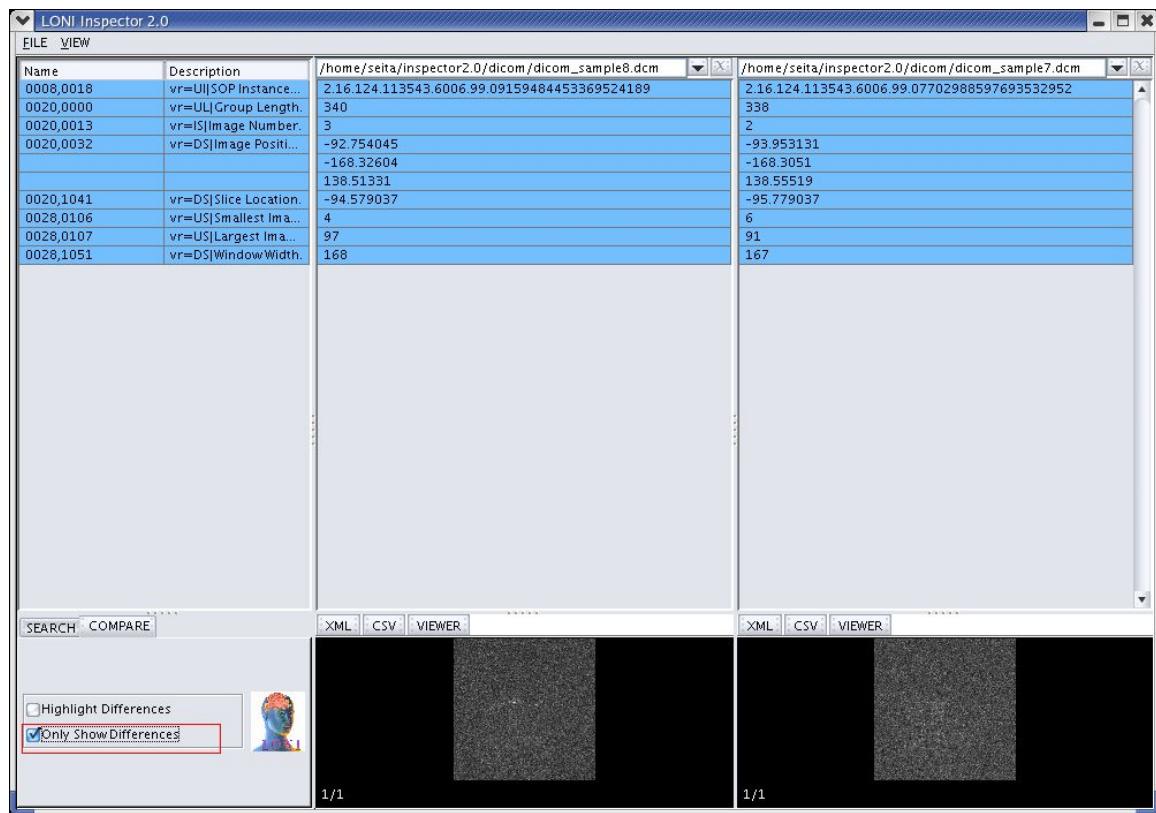
VII. Exporting and copying metadata

There are two ways to export metadata from the Inspector, and one way to copy metadata.

A. Export as XML

Click the XML button (located near the upper-left of an image) to write the metadata as an XML file. You must supply the name of the XML file in the dialog that pops up.
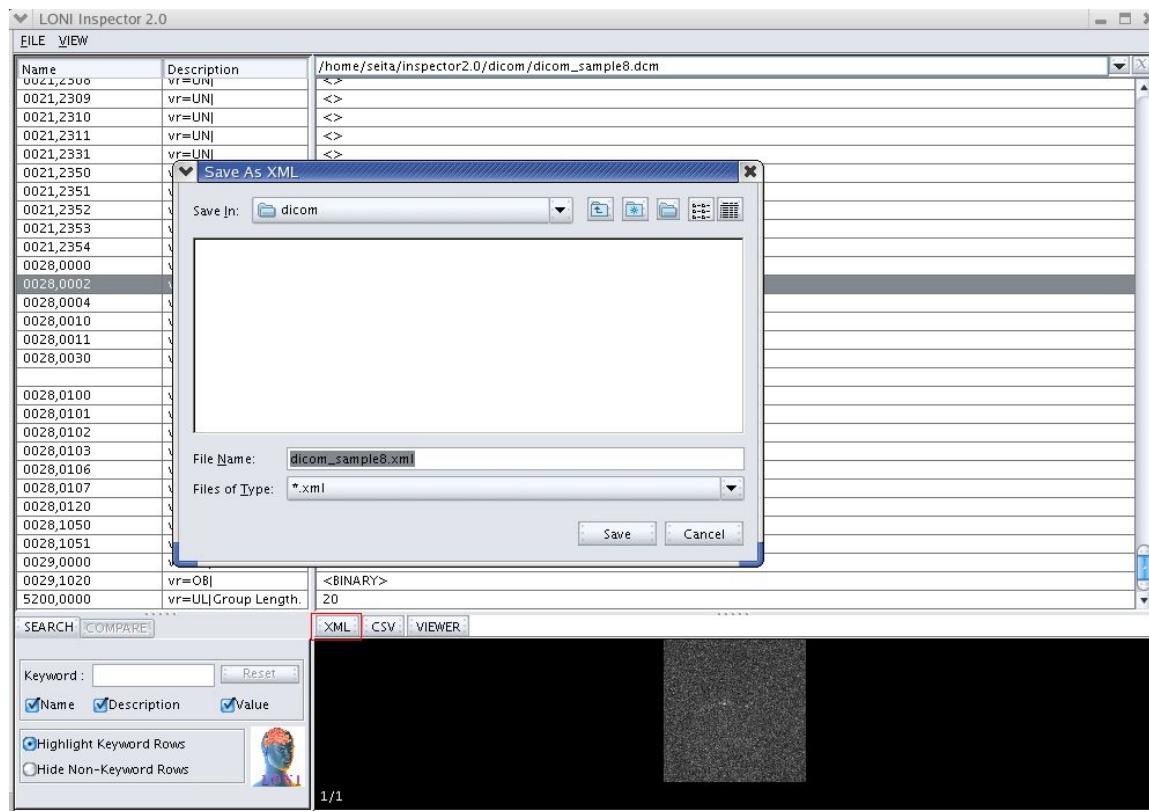
B. Export as CSV

Click the CSV button (located to the right of the XML button) to write the metadata as a CSV file. A CSV file contains a comma-delimited version of the metadata. You must supply the name of the CSV file in the dialog that pops up.
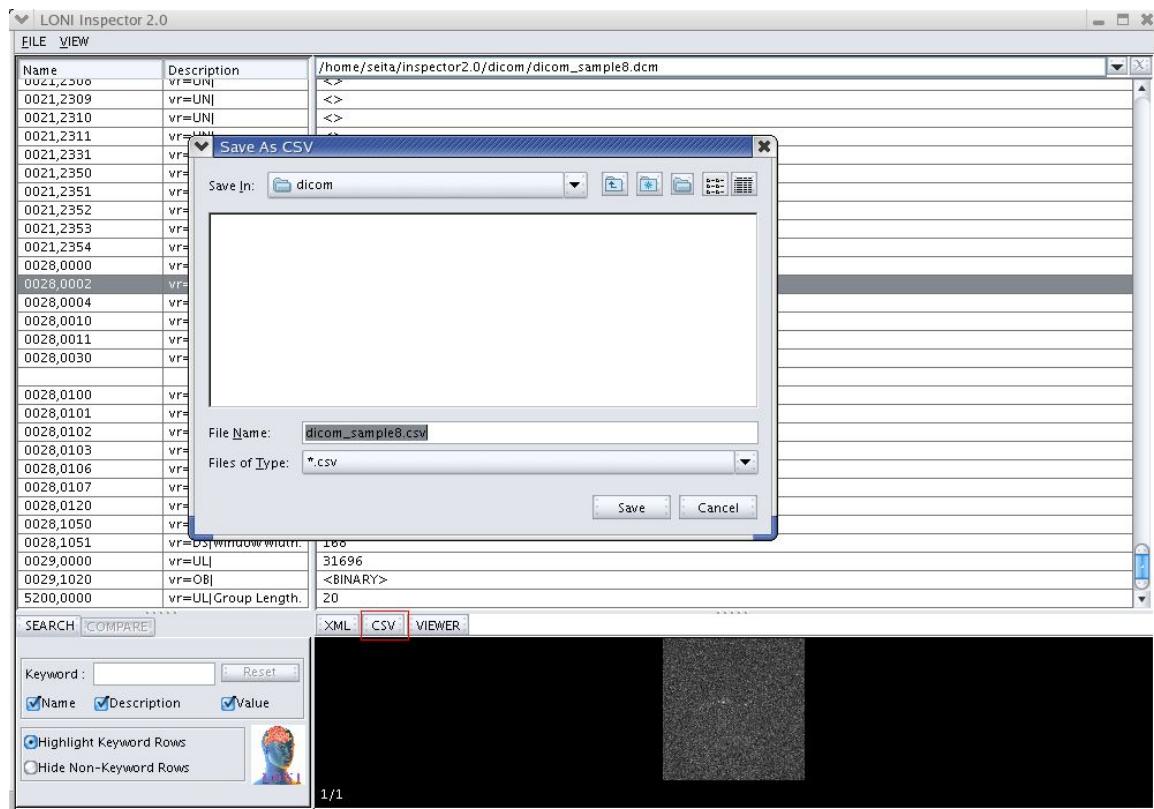
C. Copy a cell value

The value shown in a table cell can be copied to the system clipboard and then copied to other applications. Move the mouse cursor over the cell and right-click the mouse (hold down the command key as well in OS X) to bring up the copy menu. Click on the copy menu item to copy the cell value. The keyboard shortcut (e. g., CTRL-C) for your operating system can also be used.

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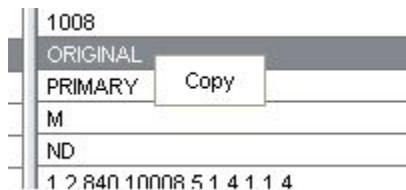
VIII. Viewing images

A. A few images are automatically shown

For each file selected in a file column there will be one or more images displayed at the bottom of the Inspector (depending upon how many images are stored in the file).

B. Image number and total number of images

Two numbers are displayed in the bottom left hand corner of each image. The first number is the number of the displayed image and the second number is the total number of images in the file. For example, "1/3" means that image #1 is displayed and there are 3 images in the file.

C. Viewer button launches a pop-up viewer

Click the VIEWER button (above each image) to start the image viewer. The image viewer displays all the images in the file.
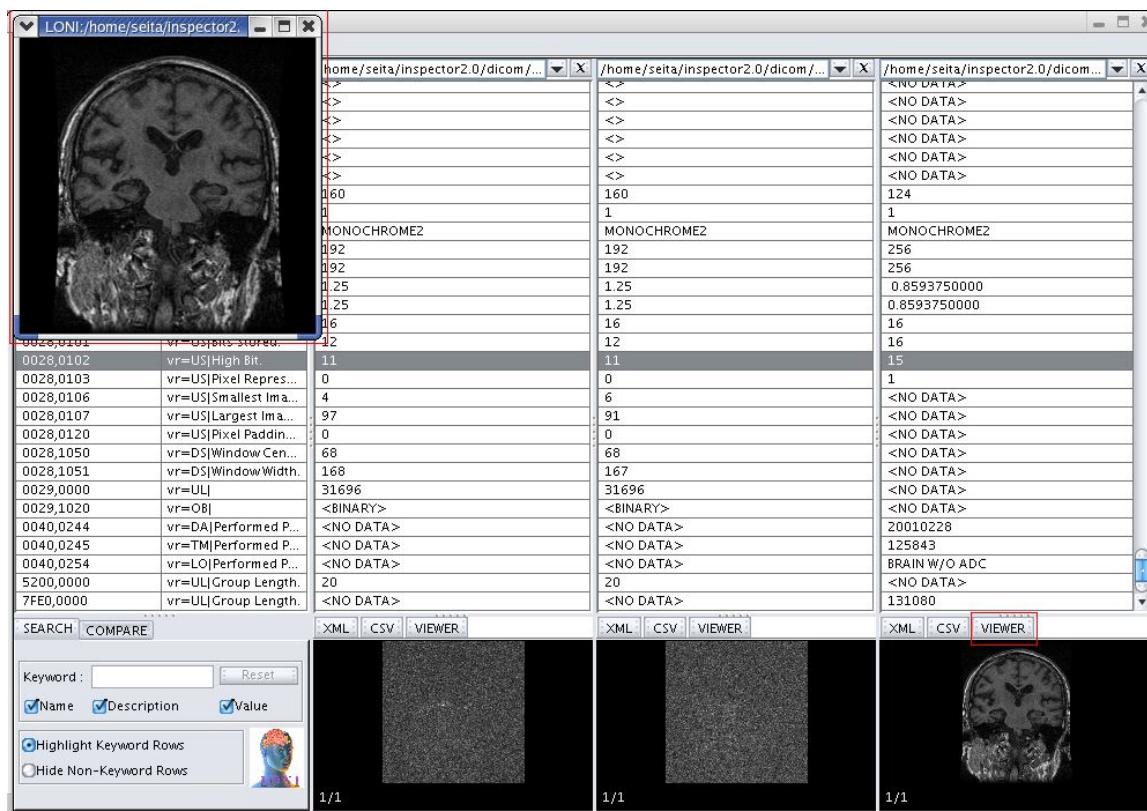
i. Progress bar shows loading progress

If there are many images in the file, it can take a few seconds to read them all into the image viewer. A progress window will appear to report on the loading progress. When the progress reaches 100%, the progress window disappears and the image viewer is shown.
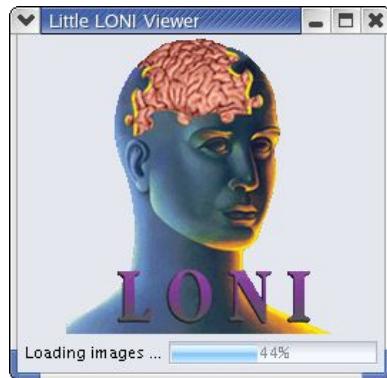
ii. Resizing the window changes the image size

When the image viewer window is changed, the image displayed inside of it is rescaled accordingly. On most operating systems, the window can be resized by selecting the bottom-right corner of the window with the mouse and dragging it to the desired size.

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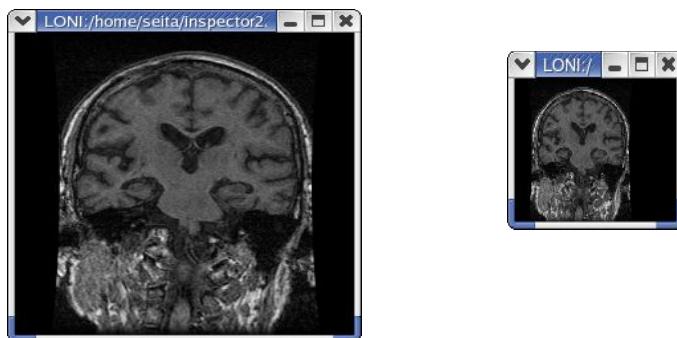
iii. Scrolling the mouse on the image changes the image in view

The image viewer will only display one image at a time, even if there are many images in the file. The displayed image can be changed by moving the mouse cursor onto the image, holding down the leftmost mouse button, and dragging the mouse cursor up/down. If there is only one image, no change will occur.
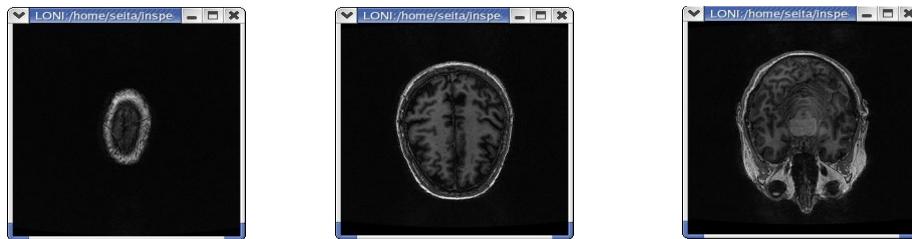
v. Clicking the top/bottom of the image changes the image in view

The displayed image can also be changed by moving the mouse cursor to the top (or the bottom) of the image and clicking the leftmost mouse button. The next image displayed will be the previous (or next) image in the image sequence. If there is only one image, no change will occur.
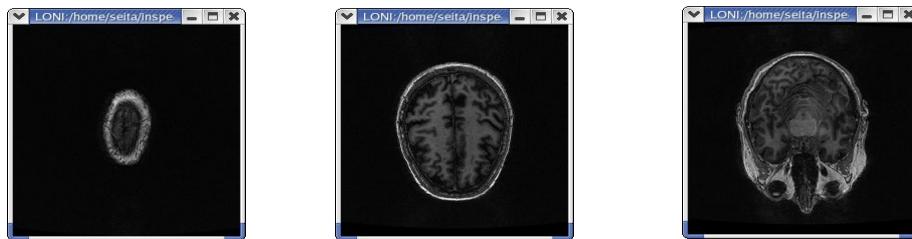
vi. Rotating and flipping the image

The orientation (rotation and flip) of the displayed image can be changed by moving the mouse cursor onto the image and clicking the middle mouse button (hold down the option key in OS X).

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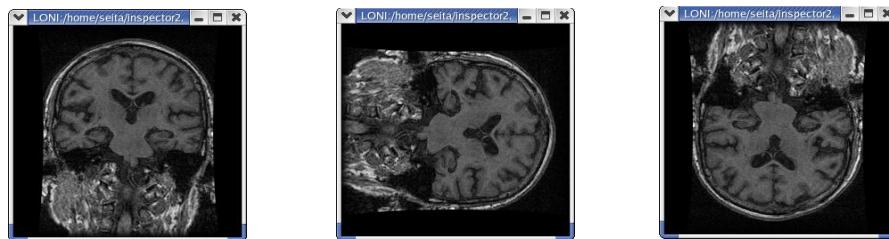
IX. Quitting the Inspector

To quit the Inspector application, select the "File -> Exit" menu option, hold down the CRTL and "E" keys, or just close all the Inspector windows.