RAAViewer

RAAViewer Manual (Macintosh)

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Introduction – Radiologic Anatomy Atlas (2023)

RAAViewer is currently maintained. I encourage people to send their comments and suggestions. If you find features of the program confusing, drop me a line. I may be able to help you and others by making the manual clearer.

There are, no doubt, errors in the atlas images themselves with structures incorrectly labeled or misspelled labels. There is considerable data included about the anatomic terms that accompanies the program. Much of that information may be outdated or wrong. Anatomy terminology is confusing and ambiguous in that many synonyms commonly exits for anatomic structures and various sources can refer to what are actually different structures with the same name. The normal variability of human anatomy from one individual to the next compounds the issue. Many of the sources for this program, while having the advantage of being in the public domain, are not up to date. Any help with these issues is appreciated.

The nature of **RAAViewer** is such that correcting such errors is easy, but I must know about them. Please drop me an email when you run across such things.

ANY such feedback is appreciated and will be acted upon.

I would like even more to have people send me high quality images or illustrations of some area of anatomic interest that they would like to include in **RAAViewer**. These pictures must be in the public domain or owned by the provider; I cannot use, without permission, material copied from journals or books that is protected by copyright.

If you send the pictures and indicate how they are labeled, then I can include them in the Atlas. Your contribution will be acknowledged.

In this program, the labels are not embedded in the picture. The labels are created in the program and applied to the image as a separate "layer". This allows modification in the future. If you submit pictures, it is best to send high quality images in a digital format that are not "pre-labeled". You can send a separate set of labeled images, however you wish, to inform me how the images *should* be labeled. I would do the final labeling in the program.

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Synopsis

The images in **RAAViewer** have dots on them. The user clicks on a dot and the anatomic term that corresponds with that dot is displayed. If there is additional information about the anatomic term, the term is displayed in blue letters. The term itself can then be clicked on and this additional information viewed. This is the heart of the program. It is not a complicated program to use and barely qualifies to have a manual at all.

Installation

There are three file/folders that are included with the Macintosh version of **RAAViewer**.

1. **RAAViewer** – the program itself

2. *RAAData.sqlite* – a file that contains the anatomic terms and data about them
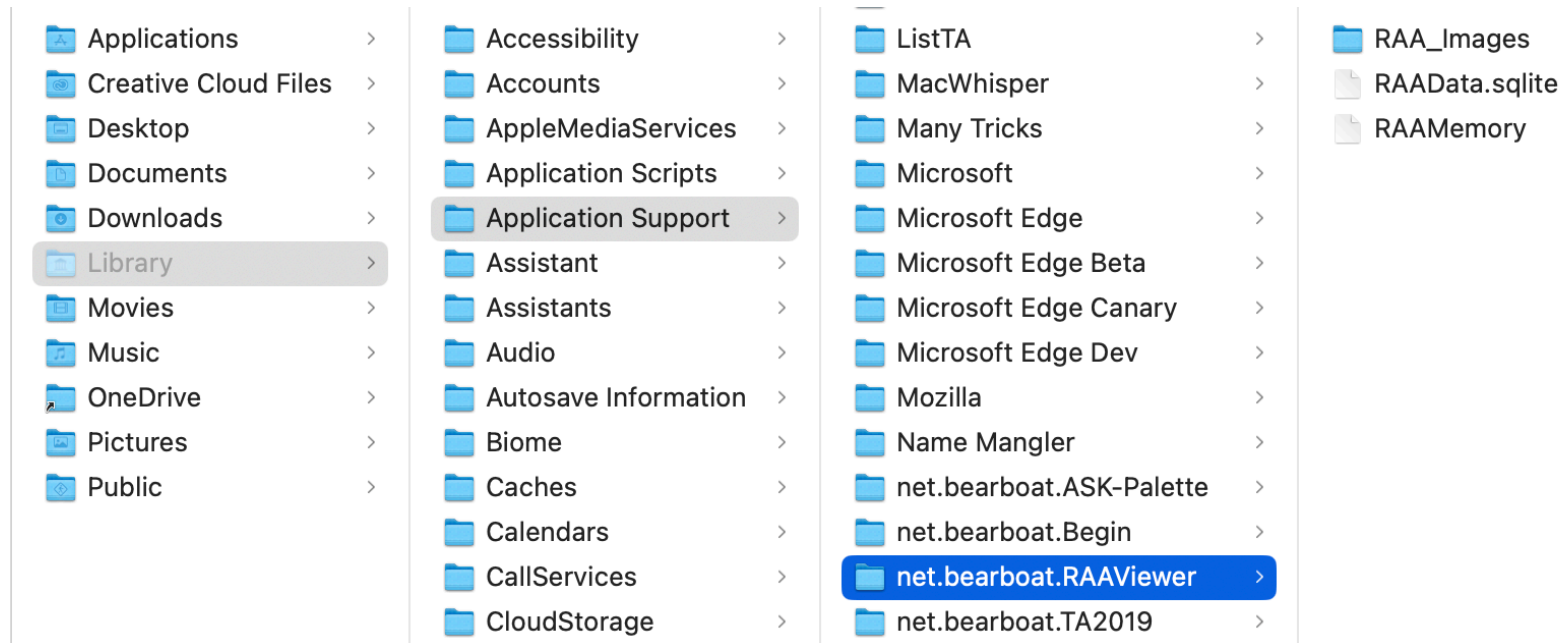
RAA_Images – a folder that contains any number of subfolders. These subfolders contain the images that are used in the program. Each subfolder contains a related set of images. When you use **RAAViewer**, you select one of these subfolders from within the program to allow you to see the images in that folder.

Ultimately, these files should all end up in the correct locations for the program to run successfully. *RAAData.sqlite* and *RAA_Images* need to live in the Application Support folder for **RAAViewer** - *~Library/Application Support/net.bearboat.RAAViewer*

Ultimate Destination

1. *RAAData.sqlite*: *~Library/Application Support/net.bearboat.RAAViewer/RAAData.sqlite*

2. *RAA_Images*: *~Library/Application Support/net.bearboat.RAAViewer/RAA_Images*

📁 Applications >	📁 Accessibility >	📁 ListTA >	📁 RAA_Images
📁 Creative Cloud Files >	📁 Accounts >	📁 MacWhisper >	📄 RAAData.sqlite
📁 Desktop >	📁 AppleMediaServices >	📁 Many Tricks >	📄 RAAMemory
📁 Documents >	📁 Application Scripts >	📁 Microsoft >	
📁 Downloads >	📁 Application Support >	📁 Microsoft Edge >	
📁 Library >	📁 Assistant >	📁 Microsoft Edge Beta >	
📁 Movies >	📁 Assistants >	📁 Microsoft Edge Canary >	
📁 Music >	📁 Audio >	📁 Microsoft Edge Dev >	
📁 OneDrive >	📁 Autosave Information >	📁 Mozilla >	
📁 Pictures >	📁 Biome >	📁 Name Mangler >	
📁 Public >	📁 Caches >	📁 net.bearboat.ASK-Palette >	
	📁 Calendars >	📁 net.bearboat.Begin >	
	📁 CallServices >	📁 net.bearboat.RAAViewer >	
	📁 CloudStorage >	📁 net.bearboat.TA2019 >	

All these files *could* be placed manually in the correct locations. The *Library* folder is slightly inaccessible because Apple discourages users from wandering around in this part of the *Finder*. It is easy to damage the functioning of your applications by changing folder locations or names in this

area. To access the *Library* folder, you have to hold the Option Key down while clicking on the **Go** Menu. If you do this, the Library folder will appear in the list of menu items and can be selected.

To avoid forcing the user to place manually these files correctly, the application itself will help with the task when it is run for the first time. Initially, the application itself should be put into the *Applications* folder. Place the support files/folder, *RAAData.sqlite* and *RAA_Images*, in some location that you can access, perhaps a folder on the *Desktop*. When the application is run for the first time, the user is asked where these support files are. The application will move the files to the correct location.

The program is downloaded as a compressed file, a zip file for Macintosh. Uncompress this file and the program will be ready to run.

The program creates a small file that serves as its "memory". This is not a critical file and if it is lost or deleted, the program will just create another copy. That file remembers such things as recently selected files and the preferred language. That file is named *RAAMemory*. It is created in the folder *~Library/Application Support/net.bearboat.RAAViewer* to live with the other two entities here

(*RAAData.sqlite* and *RAA_Images*).
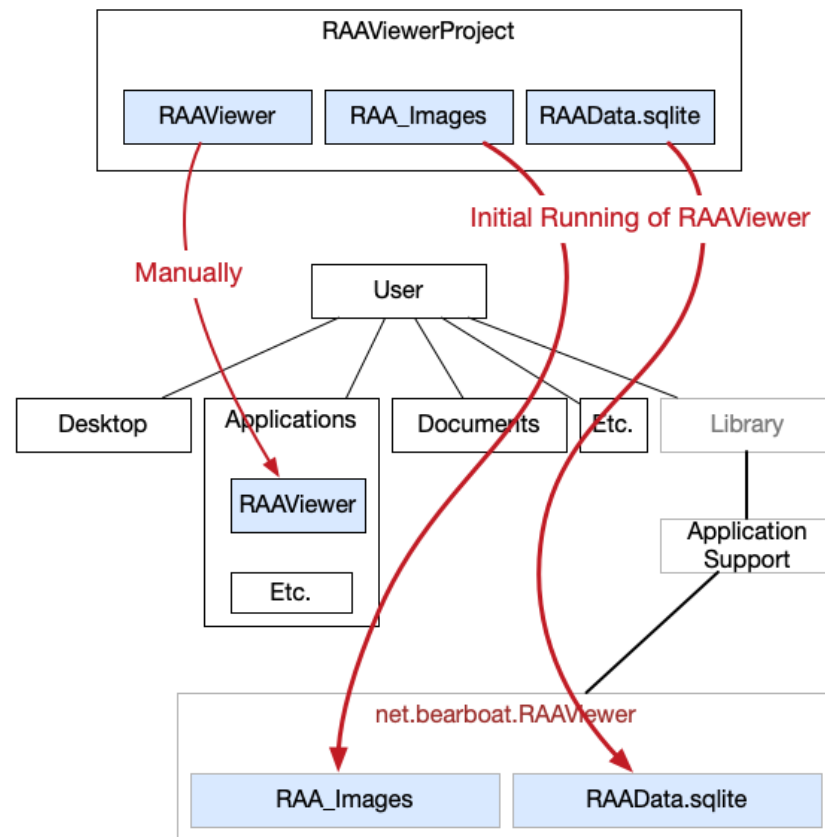
Bugs

Non-trivial programs generally have bugs. Therefore, I am sure that this one does. Additionally, I cannot guarantee the accuracy of the output of this program. Let the user beware. If you miss a question on your final exam in Anatomy because of **RAAViewer**, let it be a learning experience and tell me about it.

Having said this, I am interested in squashing any bugs and content errors. If you see any anomalous (incorrect) results or strange behaviors when you are doing things that seem rational, please notify me so I can correct or clarify the situation.

Computer Interface Terminology

This manual strives to be consistent in how it refers to the various widgets that are used to specify the user's intents.

DOT

Most of the images in the program have dots on them. You click on the dot to reveal the anatomic information contained in the dot.

DOT OPACITY SLIDER

The dots can be made more or less conspicuous by use of this dot opacity slider. There is potential for a dot to obscure the anatomy over which it lies. This slider addresses that problem.

ORIENTATION BUTTONS

There are four buttons that allow the user to orient the image in various ways.

1. Flip the image around a horizontal axis (turn a right leg image into a left leg image)

2. Flip the image around a vertical axis (supine to prone)

3. Rotate the image 90 degrees clockwise

4. Rotate the image 90 degrees counterclockwise

Clicking on any of these buttons with the Shift key held down will return the picture to its original orientation.

IMAGE SELECTION CONTROL

There may be many images in the image subfolder currently being viewed. This control can be used to quickly move to other images in the subfolder. Click anywhere in the cells in the middle to select a particular image in the sequence. Click on the arrows at the end to advance one image in that direction. Drag the highlighted blue cell to other locations to see thumbnails of the intervening images in the subfolder.

Alternatively, the scroll wheel on your mouse will also allow you to move from one image to the next. The right and left arrow keys also will accomplish this.

MAIN IMAGE FOLDER

This folder should be called *RAA_Images*. Changing the name of this folder will interfere with the proper functioning of the program. This folder should contain only the image subfolders.

IMAGE SUBFOLDER

The pictures used in the program are placed in subfolders within the *main image folder*. An individual subfolder is selected, when using the program, to show all the related images in that folder. A subfolder, for example, might contain a series of T1 weighted coronal images of the knee.

There is a set of standard subfolders that are downloaded with the application itself.

DOT DATA FILE

Within each image subfolder there will probably be a file called dd_[name of the subfolder]. The file contains the information about the dots that lie on the images in that folder. Removing or changing this file will interfere with the proper functioning of the program. This file knows the name of every image in the subfolder and knows how many of such images are present. If the user removes some images or adds some images, this file will be aware that something has changed and will be unable to perform properly.

LABEL CHECKBOX

A checkbox allows the user to request that all the dots on the image be attached to text labels at the side of the picture. If there are many dots, this can result in a crowded set of labels. If there are lots and lots of dots, some will not create an attached label. Use at your discretion.

LABEL COLOR SQUARES

If the label checkbox is checked, lines are created connecting the dots to the text labels at the sides of the image. Near the label checkbox are two colored squares that allow you to specify line colors. Depending on the colors contained in the image itself, various line colors can be more or less conspicuous. Simply clicking on these squares, toggles through a default set of colors. You may move backwards through the defaults by Option-clicking. You may select your own custom color by Shift-clicking on the label color square.

There are two squares because colors are used alternately when drawing the label lines. This makes the lines easier to follow from the label to the dot when the lines get crowded together. If you want all the lines to be the same color, Shift-Option click on the color that you want.

IMAGE FOLDER SELECTION BUTTON

A button in the right lower corner of the main window brings up the image folder selection window, which allows the user to select which image subfolder to view.

MAIN WINDOW

The program starts up with this window displayed. Here will be displayed the individual anatomic images that the user is reviewing.

IMAGE FOLDER SELECTION WINDOW

Here are listed all the image subfolders. The user highlights an entry on this list and then clicks on the **View** button to bring the images in that subfolder into view

ANATOMIC INFORMATION WINDOW

Clicking on the text of the highlighted dot will bring up this window, which contains information about the anatomic entity.

PURPOSE

Paper anatomy textbooks have some advantages. The best of them have employed skilled medical illustrators to show anatomy in a way that MR or CT cannot, creating images that show relationships between anatomic structures in an abstract and, hopefully, informative way. The text further describes the information.

The problem with these textbooks in the hectic world of the radiologist is that they never seem to be available at the time that you need them. You cannot lug a cartload of these things wherever you go. Each textbook has a different layout that complicates quickly looking up a topic. There are practical limitations on how many pictures they can show. So often, they do not have a picture that really corresponds to the radiographic image that you are looking at. On the other hand, **RAAViewer** can contain a huge selection of images and finding a particular image is easy. Essentially you are scrolling though anatomic images in the same fashion that we scroll through clinical images all day long.

RAAViewer has become possible because of the speed with which most people are now able to access the Internet to download pictures. MR and CT digital images from a radiology practice and public domain images on the Internet are resources that allow accumulations of useful images and information that can be bundled into a program of this nature and offered gratis to the interested.

TERMINOLOGIA ANATOMICA

International Anatomical Terminology

Frequently, there are many names for the same anatomy. I have made my own choices, sometimes arbitrarily. I have also attempted to provide, in many cases, an "official" name from *Terminologia Anatomica*. When **RAAViewer** was written, *Terminologia Anatomica* had recently been published (1998). The names in the application come from that edition. More recently a second edition of *Terminologia Anatomica* (2019) was prepared. As of 2023 the terms in **RAAViewer** have not been updated.

https://www.bearboat.net/TerminologiaAnatomica/TerminologiaAnatomica.html

Ideally, there would be no ambiguity in the naming of anatomic structures. This is an elusive goal for several reasons. A major one is the Tower of Babel problem: different nationalities develop their own vocabularies, and there is commonly no simple one-to-one correspondence between terms used by different languages. Also, within a given language, there may be a plethora of synonyms for the same structure. Sometimes different structures are referred to by identical terms due to the confusions and ambiguity inherent in a natural language.

Compounding the situation, human anatomy is itself variable from one individual to the next. A structure may exist in one person that does not exist in the next. Other structures may be combined in different patterns from person to person.

The anatomy of the brain, in particular, is complicated because morphology and function provide two alternative ways of describing and lumping structures. On-going brain research makes knowledge of the anatomy here more fluid than is true for the rest of the body.

To try attack part of this problem, the Federative Committee on Anatomical Terminology was formed by the International Federation of Associations of Anatomists and charged with coming up

with a list of anatomic terms that would be generally agreed upon by the member associations. Their work built upon previous "official" nomenclatures that date back to the Basle Nomina Anatomica (BNA) published in 1895. For historical and political reasons, Latin was chosen as the language in which to create the "official" terms. The hope was that the individual associations would be able to create their own language equivalents that would map one-to-one with the agreed upon Latin terms. The Committee published the English equivalent terms. Every term in the *Terminologia Anatomica* has its own unique code number.

It is an enormous achievement, not the least of which is related to the fact that it is difficult to coordinate people of different countries and cultures to complete a cooperative endeavor of this type. *Terminologia Anatomica* was published in 1998 as a book with a list of the code numbers, Latin name and English equivalent. An accompanying CD contains a primitive program to access the various terms.

It is not perfect for the purposes of the **RAAViewer**, but I have tried to incorporate it nonetheless. Some of the chosen terms are not the terms generally used in clinical medicine. The list strictly avoids eponyms so a term such as "fallopian tube" is rejected despite the depth with which it is

embedded in the medical vocabulary. There are anatomic structures, important in radiology, which do not rate a separate entry in the book.

One annoyance is that many individual terms do not stand on their own. They are presented in the book as a hierarchy of terms. The place in the hierarchy is sometimes required to make sense of the term. An example given in the preface is

A13.3.05.001 Lymph nodes of lower limb

A13.3.05.011   Popliteal nodes

A13.3.05.013   Deep nodes

A13.3.05.013 refers to *Deep popliteal lymph nodes* which you can only know by seeing this particular list entry in context. I would have preferred the entry itself be *Deep popliteal lymph nodes* rather than simply *Deep nodes*.

Synonyms for the selected Latin and English terms are sometimes provided, seemingly most often for the purpose of deprecating the alternative terminology. Sadly, there has not been an attempt to

provide any sort of complete list so it is not really a resource to look up the "correct" name for an entity that you might know by another name.

The *Terminologia Anatomica* has other weaknesses. There might be two separate entries for the same entity. This is generally because there are two places in the hierarchy where it seems appropriate to place this entity. For example, a vein that drains into a different larger vein in different individuals due to anatomic variability might end up having two entries. I doubt that this choice would have been made in a world where computerized databases have become so ubiquitous and triumphant over text in for this purpose. Computers provide alternative ways of dealing with this issue. The 1998 edition of the *Terminologia Anatomica*, however, was created at the time this transition was just starting.

If this work had been done a few years later, the basic *Terminologia Anatomica* list might have been made more computer-friendly and available on the Web. [The second edition of 2019 ***does*** have a web version. This edition is more computer friendly. https://ta2viewer.openanatomy.org/] As it is, extracting the terms to use in **RAAViewer** has been a tedious and wearying process. The program provided on the CD is of very limited help.

The following abbreviations are used:

A. = Artery

Aa. = Arteries

Lig. = Ligament

Ligg. = Ligaments

M. = Muscle

Mm. = Muscles

N. = Nerve

Nn. = Nerves

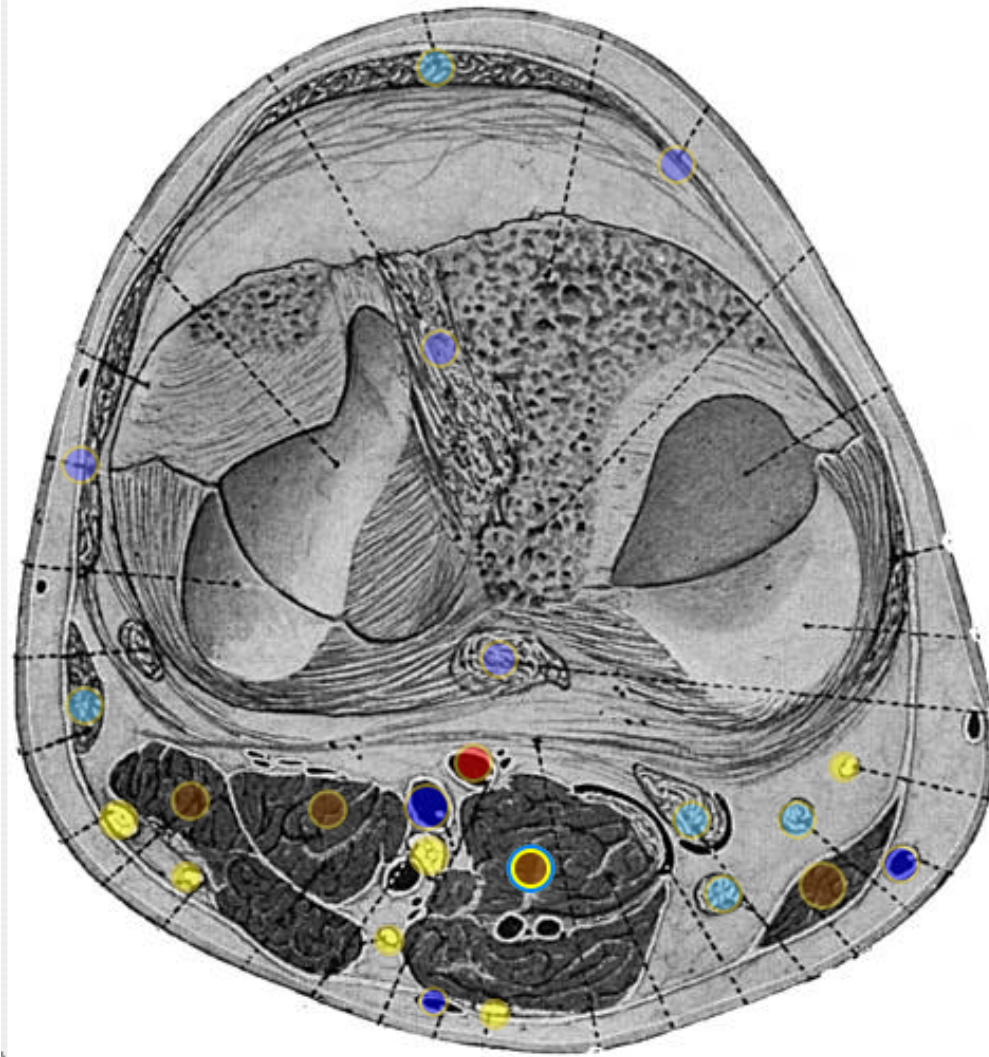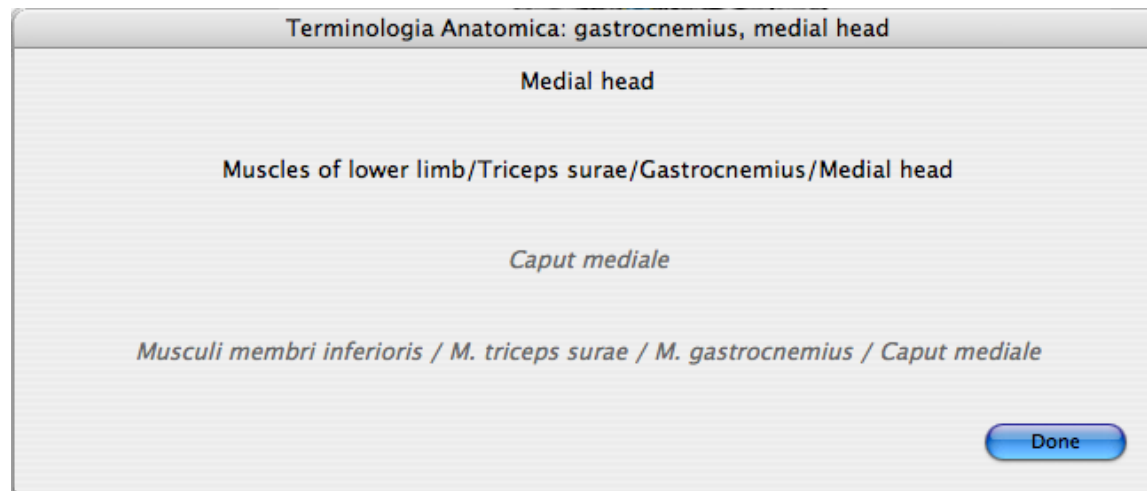R. = Branch (Ramus)

Rr. = Branches

V. = Vein

Vv. = Veins

In **RAAViewer**, when available, the *Terminologia Anatomica* Latin term is presented in gray text underneath the English term that I have chosen for the anatomic entity.

gastrocnemius, medial head
Caput mediale

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If you click on that gray text, a window will pop up that will show the approved *Terminologia Anatomica* English terms, the synonyms and the terms in hierarchical context.

Terminologia Anatomica: gastrocnemius, medial head

Medial head

Muscles of lower limb/Triceps surae/Gastrocnemius/Medial head

Caput mediale

Musculi membri inferioris / M. triceps surae / M. gastrocnemius / Caput mediale

Done

ALTERNATE LANGUAGES

The program is written in English. I have little facility with any other languages. In Nov 2009, an option was added to allow the user to specify Japanese or Spanish as the language for the anatomic terms. I know no Spanish and less Japanese, but there are sites on the Internet that provide translations of the *Terminologia Anatomica* terms into those languages.

Japanese: Kazuya Funato Department of Anatomy, Keio University School of Medicine, Japan

I no longer can find this resource (04/18/23).

Spanish: Apuntes de Anatomia

http://www.iqb.es/cbasicas/anatomia/clasificacion/indice.htm

There are a large number of typographical errors in the Spanish listing. Many of these I was able to find and correct because Spanish is close enough to Latin that many terms are recognizable to an English speaker. I have no way of knowing whether there are errors in the Japanese listing.

Using those sources as a starting point, I have incorporated Spanish and Japanese translations for a large subset of the anatomic terms used in this program.

In January 2010, French was added to the supported languages. This was possible due to the assistance of Paul Fabry at the Université de Sherbrooke who has taken an interest in multilingual versions of *Terminologia Anatomica*.

The detailed descriptions and other text remain in English, but if the user selects one of these alternate languages, many of the actual terms will be displayed in those languages. When the program is launched for the first time, there is a menu that by default will display **English**. That menu can be used to specify one of the other languages.
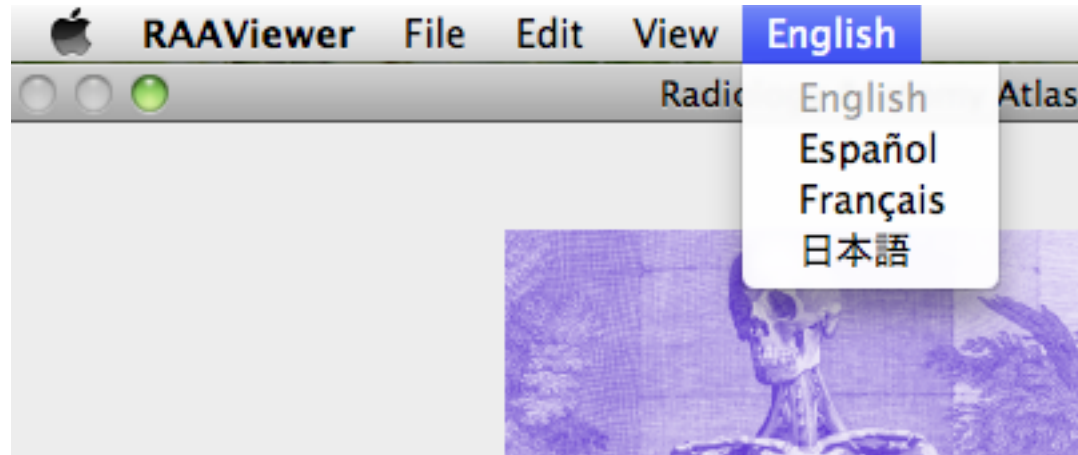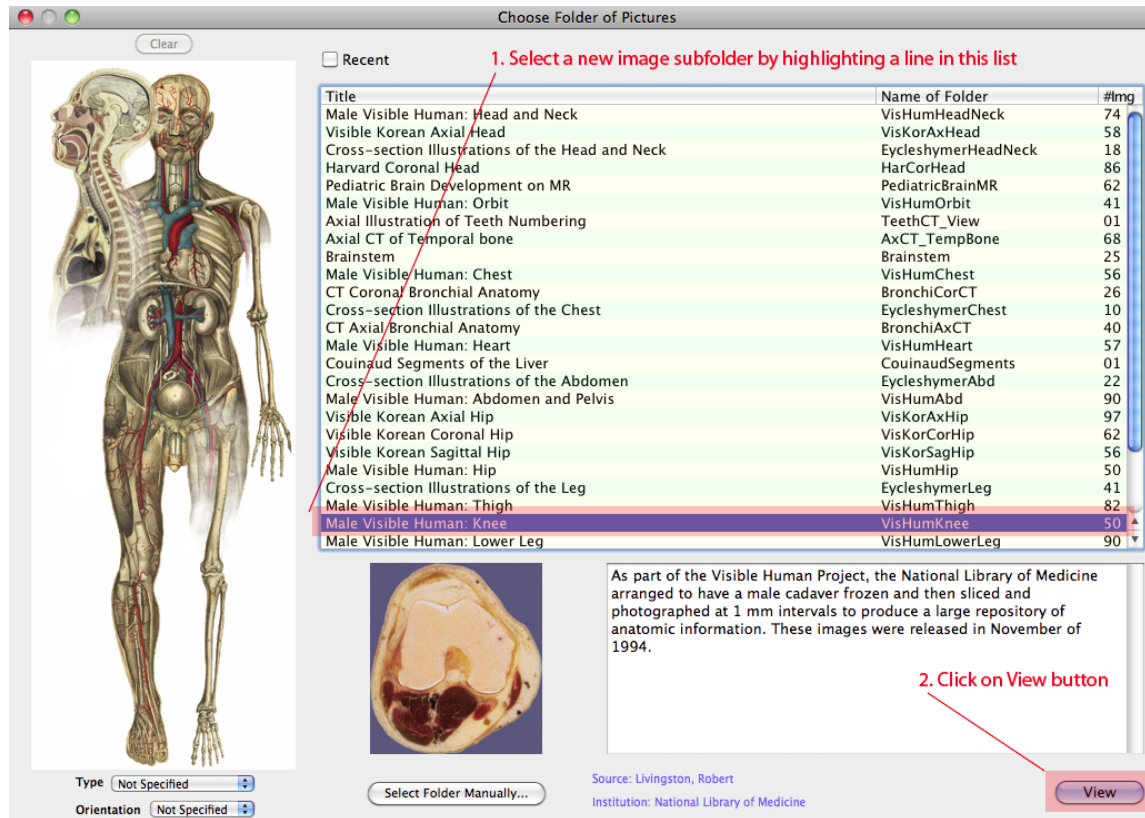
INSTRUCTIONS

Main window (Initial Appearance)
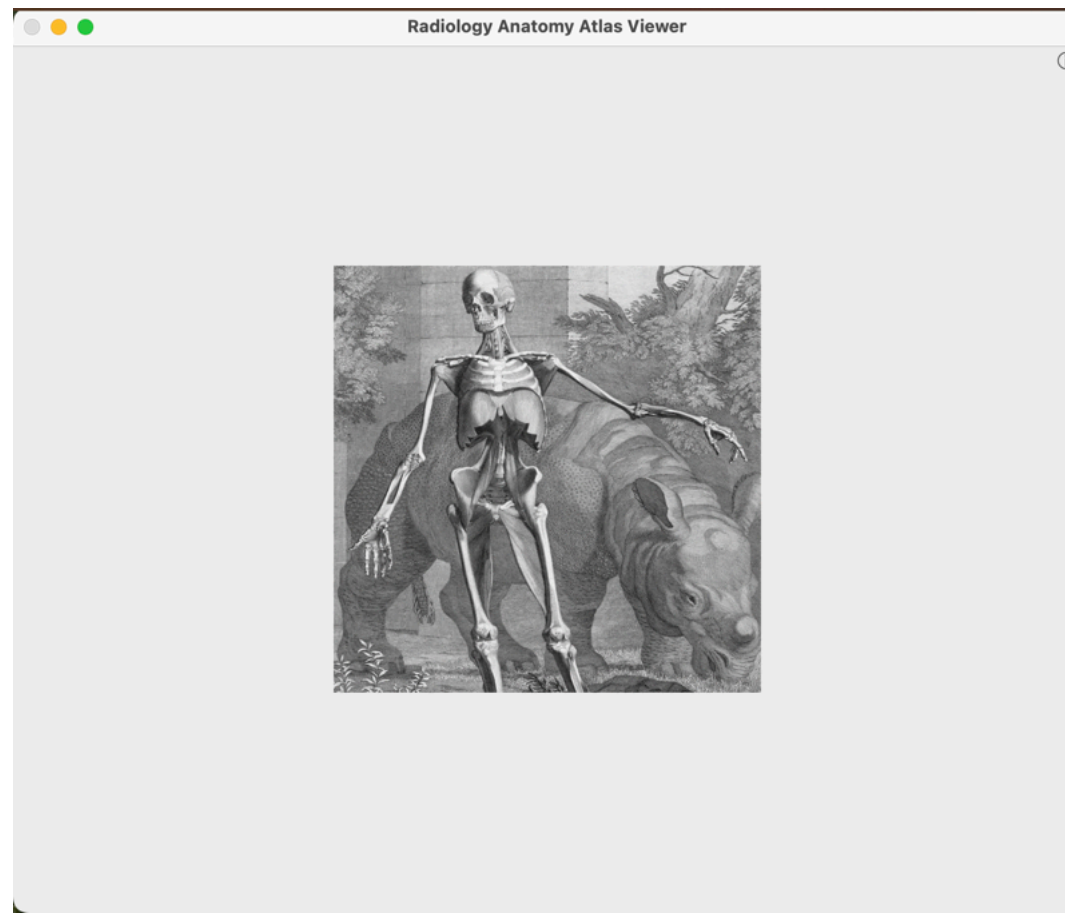
On initially opening the program, the window above briefly appears. Shortly a second window, appears, the image folder selection window.

In the image folder selection window, a list of the image subfolders will appear. A specific folder of images is selected by clicking on it. Then click on the **View** button to see the images that you have selected. The list contains all the possible folders that are known to **RAAViewer**. If a particular folder is not in the *RAA_Images* folder, it will be grayed out and not selectable.

On the left side of the window, there are tools to *prioritize* the image subfolders. These do not filter out folders; rather they sort the listing so that those best meeting the criteria appear toward the top of the list. The picture of the standing human on the left can serve to sort the folders of interest by anatomic region. Click on the part of the body that you are interested in (for example the knee) and the list will re-sort itself such that the image subfolders that relate to the knee will float to the top. A red line will appear on the diagram to indicate where it was clicked. It is also possible to click and drag to indicate a region of interest on the human diagram. In this situation, two red lines will appear indicating the boundary of the selected region. There is a **Clear** button at the top of the picture to clear away the red lines.

Underneath the picture are two pop-ups that can also be used to prioritize the list, for example to look for coronal scans. Again, the list will re-sort itself to place the requested type of images at the top.

On the top of the window, there are checkboxes that *filter* the list. The Recent checkbox will restrict the list to image folders that have been examined recently.

Main window (Showing Specific Picture)
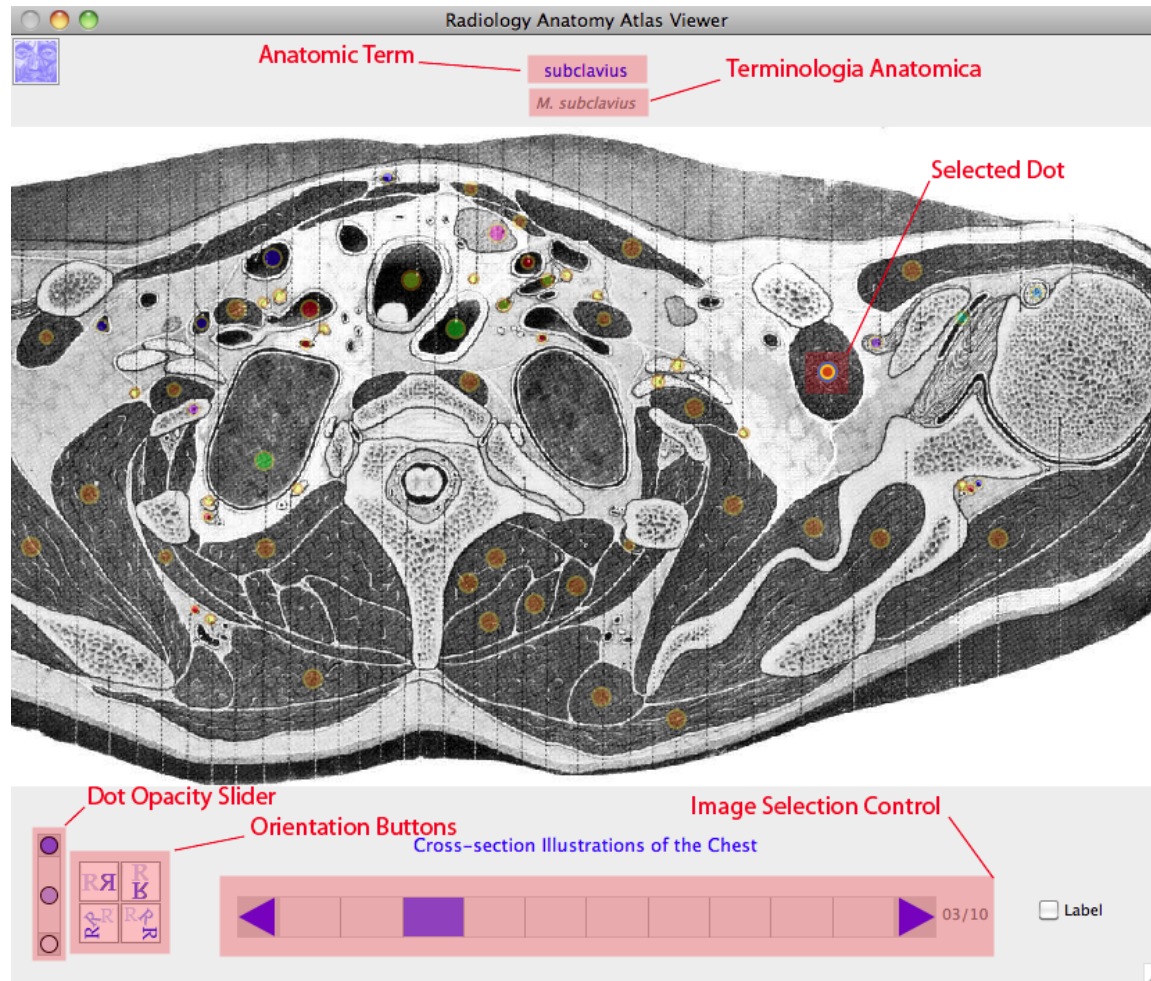
The various controls for this window are labeled in the above picture. Use the image selection control to navigate from one picture to the next in the selected image subfolder. The orientation

buttons will flip the image around which can be useful to match the atlas image with the radiographic image that you are interested in. For example, an image of the right arm can be converted into an image of the left.

Clicking on a dot will select it. The corresponding anatomic term (in the example above – subclavius) will appear above the picture. The selected dot is highlighted as can be seen in the illustration above in the right upper corner. When the word is written in blue, as it here, then clicking on that word will bring up the anatomic information window that be seen below.

subclavius

ORIGIN: first rib about the junction of bone and cartilage
INSERTION: lower surface of clavicle
NERVE: nerve to the subclavius, C5,6
BLOOD: clavicular branch of thoracoacromial artery
ACTION: assists in stabilizing the clavicle

The subclavius is a small triangular muscle, placed between the clavicle and the first rib. It arises by a short, thick tendon from the first rib and its cartilage at their junction, in front of the costoclavicular ligament; the fleshy fibers proceed obliquely upward and lateralward, to be inserted into the groove on the under surface of the clavicle between the costoclavicular and conoid ligaments

Language	Word	English
Latin	clavis	key

clavicle diminutive of clavis: So named for its resemblance in shape.

The anatomic information window contains data about the anatomic entity that has been selected. In some cases, as seen here, there is additional information lower down in the window about the etymologic derivation of the word. When those lines are highlighted in yellow (as the first one can be seen in the example above) then it is possible to click on the line in question to see yet more information about that line. When applicable, lists of individuals connected historically with the entity, will appear.

When done with looking at the anatomic information window, click on the close button at the top of the window to make it disappear.

Click on the **New Series** button (or go to the **File** menu and choose Open Image Series…) to return to image folder selection window.

These instructions should be enough to get you started with using this program, which is simple in design.

DATA SOURCES

I am not an anatomist and have done no original research in this field. The information in the anatomic information window comes from secondary sources. The most heavily used sources are:

1. *Gray's Anatomy* (1918) This anatomy textbook is outdated but has the advantage of being out of copyright.

http://www.bartleby.com/107/

2. *Wikipedia*. This web site is an information resource created by the public. Most of the anatomic information in this encyclopedia is derived from the Gray's Anatomy source mentioned above, but it can still be very useful.

http://en.wikipedia.org/wiki/Main_Page

3. *Who named it* – is a delightful website that has posted small biographies of many of the men (and the very rare women) whose names are remembered in eponyms. The whole topic of eponyms

is a contentious one, but the biographies of those so honored are interesting even if the selection of such individuals is capricious.

http://www.whonamedit.com/

5. BrainInfo (NeuroNames) Unfortunately, I became aware of this resource relatively late in the project. The project is an effort to come up with a rational, consistent, and hierarchical lexicon for neuroanatomic terms. This was developed in the modern computer era and escapes some of the problems embedded in *Terminologia Anatomica*. The problems of redundancy and ambiguity and overlap are severest in brain anatomy, and this resource presents one approach to the problem.

http://braininfo.rprc.washington.edu

Final Comments

This manual covers the highlights, but to learn the program you must use it. It is not very difficult.

For updates of the program, go to

https://www.bearboat.net/RAAViewer/RAAViewer.html

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