Storing files

Temporary Network Storage (TNS) Service
https://uob.sharepoint.com/sites/itservices/SitePages/temporary-network-storage-service.aspx

For short to mid-term storage, IT Services provide the Temporary Network Storage (TNS) Service. With the TNS, University members can apply for 1 TB of free space. This performance-centric server is designed to allow files to be worked with directly (rather than needing to be transferred locally first). Capacity beyond the free 1 TB allocation is charged on a per-TB per-day basis. The TNS is not intended for long term storage and once files are no longer being actively used for a project, should be moved elsewhere (e.g. the RDSF).

Research Data Storage Facility (RDSF)
https://www.bristol.ac.uk/acrc/research-data-storage-facility/

For long term storage, the University's Research Data Storage Facility (RDSF) provides each research group with 5 TB of free networked space. Data is held on two separate servers and is also backed up periodically to tape for added protection. As this server is intended for long term storage, it's unsuitable for working directly to. That is, when processing images, the files should be moved to a local folder (or the TNS). Additional capacity can be purchased by contacting the RDSF team.

Reducing file sizes

Compressing files

For long term storage, files can be compressed to significantly reduce file sizes. For fluorescence images in particular, it's typically possible to reduce files to less than half their original size. The easiest way to compress files is via Windows file browser; files compressed in this way can be opened as usual, but occupy less space. This can be done using the following steps:
1. Right-click the folder or file to compress and select "Properties"
2. In the "General" tab, select "Advanced…"
3. Tick "Compress contents to save disk space"
4. Click "OK", then "Apply" in the "Properties" window

Cropping

One of the most effective ways to reduce file sizes is simply to remove areas that don't contain information of interest. To retain metadata within the file (e.g. microscope settings), cropping is often best done in the proprietary software for that image format. Most microscope manufacturers provide free software for basic editing that allows files to be saved in their original format. The following packages are available on Windows:

- *OlyVIA* for Olympus/Evident VSI files
  https://www.olympus-lifescience.com/en/downloads/detail-iframe/?0[downloads][id]=847254102

- *LAS X Office* for Leica LIF files
  https://www.leica-microsystems.com/products/microscope-software/p/leica-las-x-ls/

- *Zen Lite* for Zeiss CZI files
  https://www.zeiss.com/microscopy/en/products/software/zeiss-zen-lite.html

Viewing images

Virtual stacks in ImageJ/Fiji
https://fiji.sc

A quick and easy way to view files slice-by-slice is using "virtual stacks" in ImageJ/Fiji. Typically, ImageJ/Fiji will load images directly into the computer's memory (RAM) and for small files this works well as it allows very fast switching between channels, slices and timepoints; however, larger files may not fit in the available memory. To avoid this, images can be loaded in as "virtual stacks", whereby each 2D image is loaded directly from the file as it's required.

Virtual stacks allow ImageJ/Fiji to work with images of near-unlimited size, but switching between channels, slices and timepoints will be slower, especially for high resolution images. Also, this is only suitable for viewing, as applying most processing operations (e.g. filtering or thresholding) will result in the ImageJ/Fiji loading the full file into RAM as normal.

Files can be loaded as virtual stacks by ticking the "Use virtual stack" option in the "Bio-Formats Import Options" window that will open when loading most image formats. In cases where ImageJ/Fiji directly opens the image, the Bio-Formats importer can be run by going to *File > Import > Bio-Formats*.

BigDataViewer in ImageJ/Fiji
https://imagej.net/plugins/bdv/

For 3D visualisation, the BigDataViewer (BDV) ImageJ/Fiji plugin can be used. This requires that files are first converted to HDF5 format, which can be done in ImageJ/Fiji by first loading the file as a virtual stack (see above), then going to *Plugins > BigDataViewer > Export Current Image as XML/HDF5*. BigDataViewer is included as standard in Fiji and can be loaded by going to *Plugins > BigDataViewer > Open XML/HDF5*.

Proprietary free viewers

Most microscope manufacturers tend to provide free viewing software for their image formats. These may also offer some basic image processing and analysis functionality and are the best

way to view the full range of metadata associated with a file. Typically, these packages will only allow slice-by-slice viewing rather than full 3D rendering (often reserved for the paid-for versions). The following packages are available on Windows:

- *OlyVIA* for Olympus/Evident VSI files
  https://www.olympus-lifescience.com/en/downloads/detail-iframe/?0[downloads][id]=847254102

- *LAS X Office* for Leica LIF files
  https://www.leica-microsystems.com/products/microscope-software/p/leica-las-x-ls/

- *Zen Lite* for Zeiss CZI files
  https://www.zeiss.com/microscopy/en/products/software/zeiss-zen-lite.html