Software Installation Instructions for Mac OS X

The workshop will provide hands-on instruction for image processing and analysis. To gain the most benefit from the workshop, several open-source applications should be installed on your laptop before arriving at NIST. The software packages are

- **ImageJ**: A general-purpose application for editing and manipulating digital images or image stacks; used for image filtering, thresholding, and noise removal.

- **MultiSpec**: An application for multispectral analysis of images developed at Purdue University; used for image analysis and phase segmentation.

- **Profex**: Application and graphical user interface for Rietveld refinement of powder X-ray diffraction data using the program BGMN.

- **MicroChar**: A NIST-developed application for structure and phase analysis of segmented digital images of cement microstructures.

These instructions assume that all software is being installed in the Applications folder. Users should feel free to install the software elsewhere on the computer, especially if the user does not have permission to modify the Applications folder.

ImageJ

1. Download the application.

    (a) Open a web browser and go to `https://imagej.nih.gov/ij/`.

    (b) Click on the Download link

    (c) Scroll to the section "Mac OS X" and download the package for Java 8, "bundled with Java 1.8.0_101". Note, some Mac OS X computers may still have Java 6 running, in which case you should download the "imageJ" link under the same section.

    (d) In your Downloads folder, single click on the downloaded file (it should be named `ij150-osx-java8.zip`) to unzip the package in place.

2. Add the Thresholded Blur plugin

    (a) Direct a web browser to `http://imagejdocu.tudor.lu`

    (b) On the navigation sidebar at the left of the page, click on Plugins

    (c) Scroll down to the "Filters" section of the loaded web page and click on the link for Thresholded Blur

    (d) Scroll down to the "Usage:" section of the page.

    (e) Find the link in the *first* bullet item, called `Thresholded_Blur.java`

(f) Right-click on this link and choose `Save Link File As . . .`

(g) Call the downloaded file `Thresholded_Blur.java` (uppercase and lower-case is important), and save it in `Downloads/ImageJ/plugins/Filters`.

3. Add the Color Segmentation plugin

(a) Direct a web browser to `http://bigwww.epfl.ch/sage/soft/colorsegmentation/`

(b) Just above the section for "Conditions of Use", click on the link `ColorSeg-mentation_.jar`

(c) Save the download as `ColorSegmentation_.jar` (uppercase/lowercase matters) in the folder `Downloads/ImageJ/plugins/Filters`.

4. Move the ImageJ folder to the Applications folder

5. Open ImageJ

(a) Navigate a Finder window to `Applications/ImageJ`, and double-click on `ImageJ.app`

(b) Versions of Mac OS X 10.7 and higher have various problems opening ImageJ the first time. These problems can be solved by consulting the `Installation Notes.html` file in the `Applications/ImageJ` folder.

6. Compile the plugin

(a) There should be an ImageJ application window open on your Desktop

(b) Click on the that window once with the mouse to bring it into focus

(c) In the ImageJ menu bar at the top of the screen, choose `Plugins/Compile and Run`.

(d) A file chooser dialog will open. Navigate to the `Filters` folder and choose `Thresholded_Blur.java`.

(e) Click the Open button.

(f) You may receive a warning that there are no images to process. Close this warning window.

(g) Open a Finder window and navigate to `/Applications/ImageJ/plugins/Filters` and verify that the `Thresholded_Blur.class` java class has been created in that folder.

7. Close the ImageJ application.

MultiSpec

1. Open a web browser and go to `https://engineering.purdue.edu/~biehl/MultiSpec/`

2. Click on the "Download" pull-down menu and select "Macintosh"

3. Scroll about halfway down the page and click on the link in the *first* bullet item, `Intel version`.

4. The download will automatically be saved in your Downloads folder as a zipped folder named `MultiSpec_2018.07.30f.zip`.

5. Double-click on the zipped folder to uncompress it.

6. Drag the newly formed `MultiSpec_2018.07.30f` folder from Downloads to the Applications folder.

7. Verify that you can open the application by navigating the Finder window to `/Applications/MultiSpec_2018.07.3f` and double-clicking on the `Multi-Spec.app` item.

8. This might produce an error that says ' "MultiSpec.app" cannot be opened because it is from an unidentified developer.' If this happens

    (a) Close the error dialog.

    (b) Right-click on the `MultiSpec.app` icon, and select Open from the popup menu.

    (c) A warning might appear; go ahead and choose Open.

    (d) In the future, you should be able to simply double-click on the `Multi-Spec.app` icon to open it without errors or warnings.

9. When MultiSpec opens successfully, it should show a simple terminal window with the title "MultiSpec Text Output".

10. Close the MultiSpec application from the upper menu bar by choosing `Multi-Spec/Quit MultiSpec`.

Profex

1. Download the application

    (a) Open a web browser and go to `http://profex.doebelin.org/`

    (b) Click on the Download pull-down menu and select "OS X"

    (c) Download the first zip file in that section, `Profex-BGMN-Bundle-3.13.0.dmg.zip`

2. Install Profex

    (a) Double-click on the `Profex-BGMN-Bundle-3.13.0.dmg.zip` file in the Downloads folder. This will unzip the disk image file to create a file called `Profex-BGMN-Bundle.dmg`

    (b) Double-click on the `Profex-BGMN-Bundle.dmg` file.

(c) This will create a disk icon called `Profex-BGMN` on your Desktop.

(d) Double-click on the `Profex-BGMN` disk icon. This will open a window with a single folder called `Profex-BGMN`.

(e) Drag this folder to your Applications folder.

(f) When the move is complete, close the disk window and drage the `Profex-BGMN` disk icon to the Trash.

3. Install the structure and device files

   (a) Open a web browser and go to the workshop web page where you downloaded these instructions.

   (b) Scroll down to the section entitled **Hardware and Software Requirements**

   (c) Click on the `Workshop-2018-XRD.zip` link to download the data.

   (d) If the `Workshop-2018-XRD.zip` file did not automatically uncompress during the download, double-click on the zip file to uncompress it.

   (e) Open a second Finder window and navigate it to `Applications/Profex-BGMN/BGMN-Templates`

   (f) The Workshop-2018-XRD folder has the following folders:

   - PROFEX
     - CementPhases
     - Devices
     - FlyAsh
     - InternalStandards
   - Reference
   - XRD_Data
     - 177
     - 178
     - ID Exercises
     - Quartz
     - SRM2686a
     - SRM2688

   (g) Open a second Finder window and navigate it to Applications/Profex-BGMN/BGMN-Templates

   (h) In that window, rename the `Devices` folder to `Old-Devices`

(i) Drag all the folders in the PROFEX folder (listed above) to the BGMN-Templates subfolder in the second Finder window.

4. Launch the Profex app

   (a) Navigate the Finder to `/Applications/Profex-BGMN` and double-click on the `profex.app` item.

   (b) This might produce an error that says ' "profex.app" cannot be opened because it is from an unidentified developer.' If this happens

      i. Close the error dialog.

      ii. Right-click on the `profex.app` icon, and select Open from the popup menu.

      iii. A warning might appear; go ahead and choose Open.

      iv. In the future, you should be able to simply double-click on the `profex.app` icon to open it without errors or warnings.

   (c) When `profex.app` launches, you should see the following warning dialog:
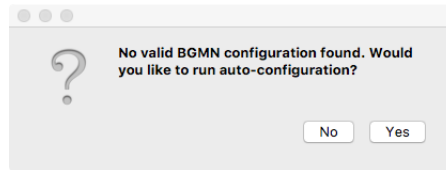
   Press the "Yes" button to run the auto-configuration.

   (d) If the auto-configuration script fails, you will see the following error dialog:
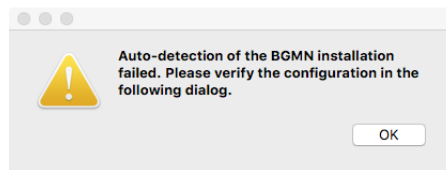
   • The Preferences window should now be visible, with the "BGMN" folder highlighed in the left sidebar.

   • Goto the first text field on the right, labeled "BGMN Executable". Click on the button to the right of the text field and navigate to the file `/Applications/Profex-BGMN/BGMNwin/bgmn`

   • Press the OK button.

   • This action should automatically populate that text field *and* the next five text fields.

- Press the "OK" button to save and close the Preferences window.

(e) On the menu bar, select `profex/Preferences`. A Preferences window will pop up.

(f) In the left sidebar of the Preferences window, single-click on

`BGMN/Repositories`

(g) On the right side of the window, look for an entry called "Structure file repositories"

(h) Click the "+" button, select the `/Applications/Profex-BGMN/BGMN-Templates/CementPhases` folder, then press the Open button.

(i) Repeat the previous step to add the following folders: `FlyAsh` and `InternalStandards`.

(j) At this point, verify that the text field for the Device file repository and the Presets repository have been automatically filled.

(k) Single click on the other items in the left sidebar and ensure that the options agree with the figures below.

(l) Press the "OK" button at the bottom of the window to save and close the Preferences.
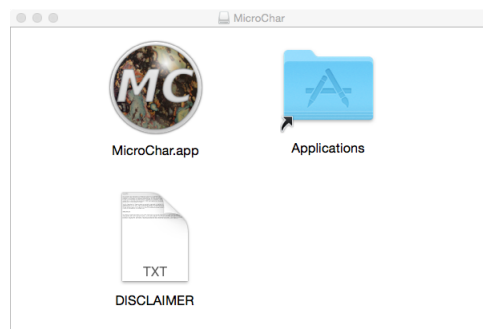
(m) Close the Profex application.
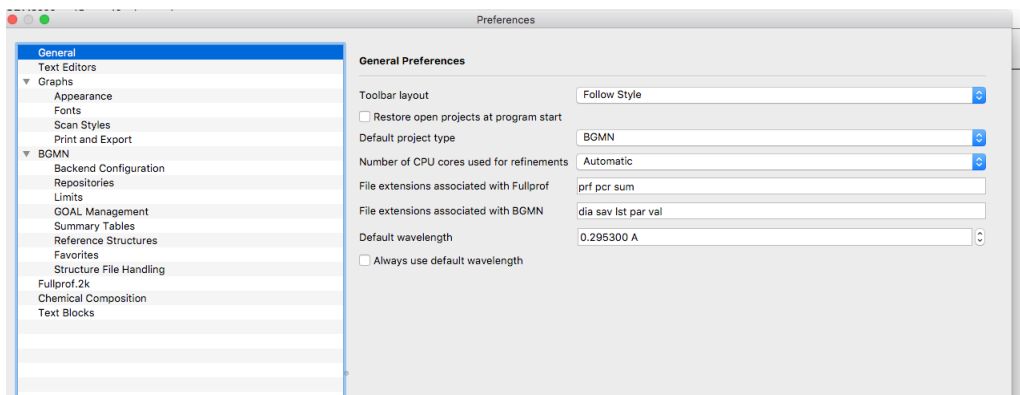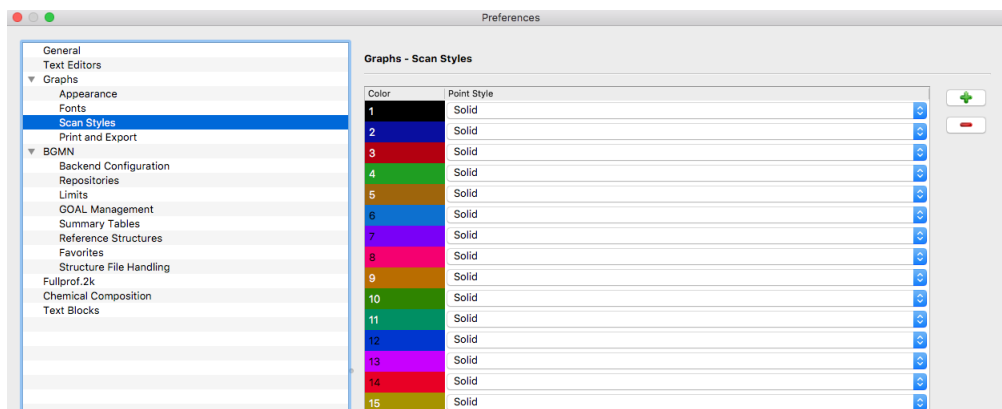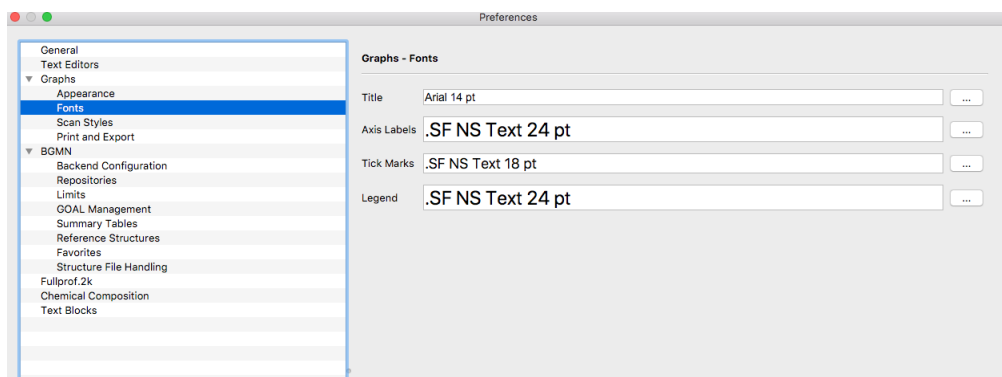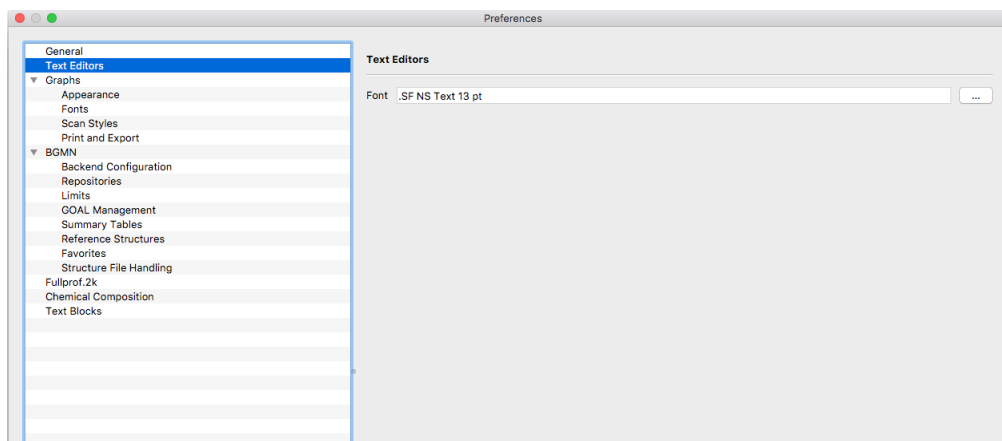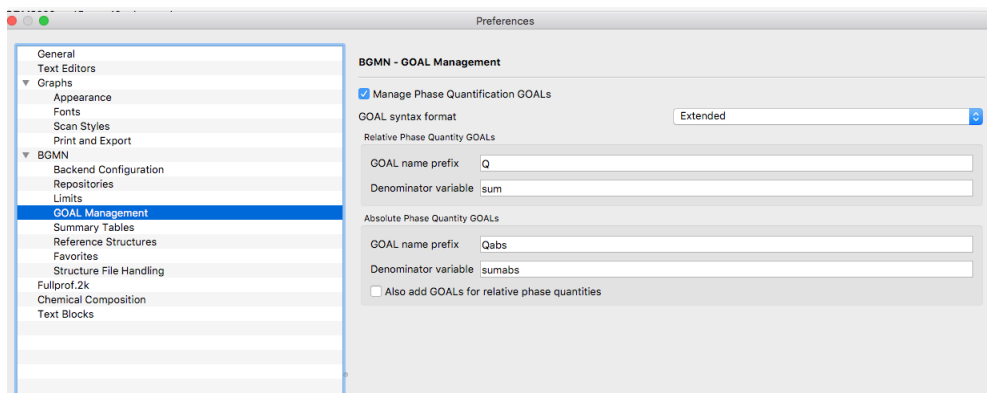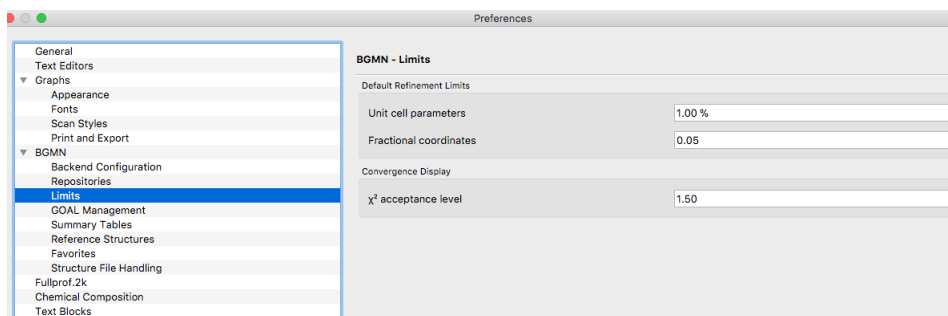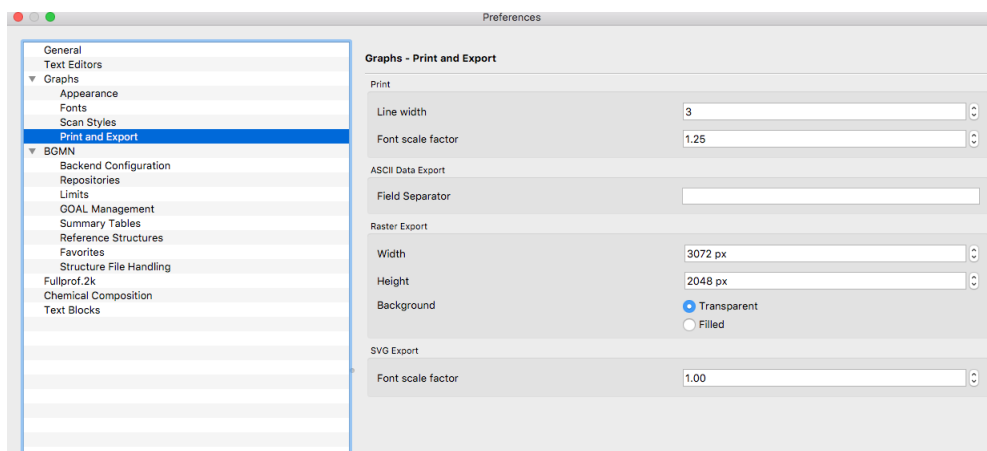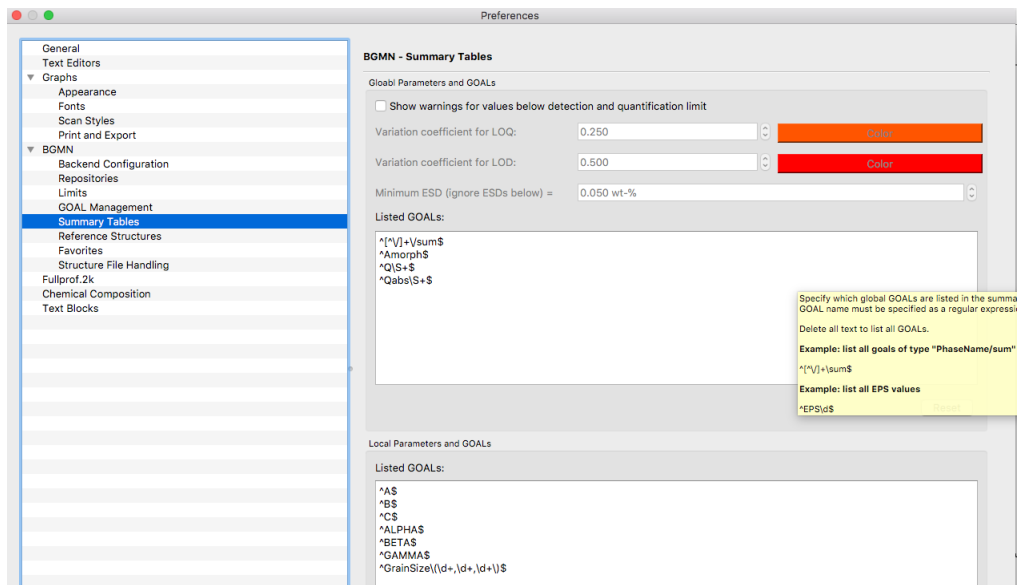
MicroChar

1. Download the application.

    (a) Open a web browser and go to `https://www.nist.gov/services-resources/software/microchar/`

    (b) Download the Mac Installation Package on the right side of the page

    (c) Download the user guide.

2. On your computer, double-click on the downloaded `MicroChar.dmg`

3. Drag the MicroChar icon on the left to the image of the Applications folder on right.

4. Move the user guide to a convenient place on your computer.