

# Stack alignment

*Adam Hitchcock* (McMaster)

**GOAL:** Illustrate procedures for aligning stacks

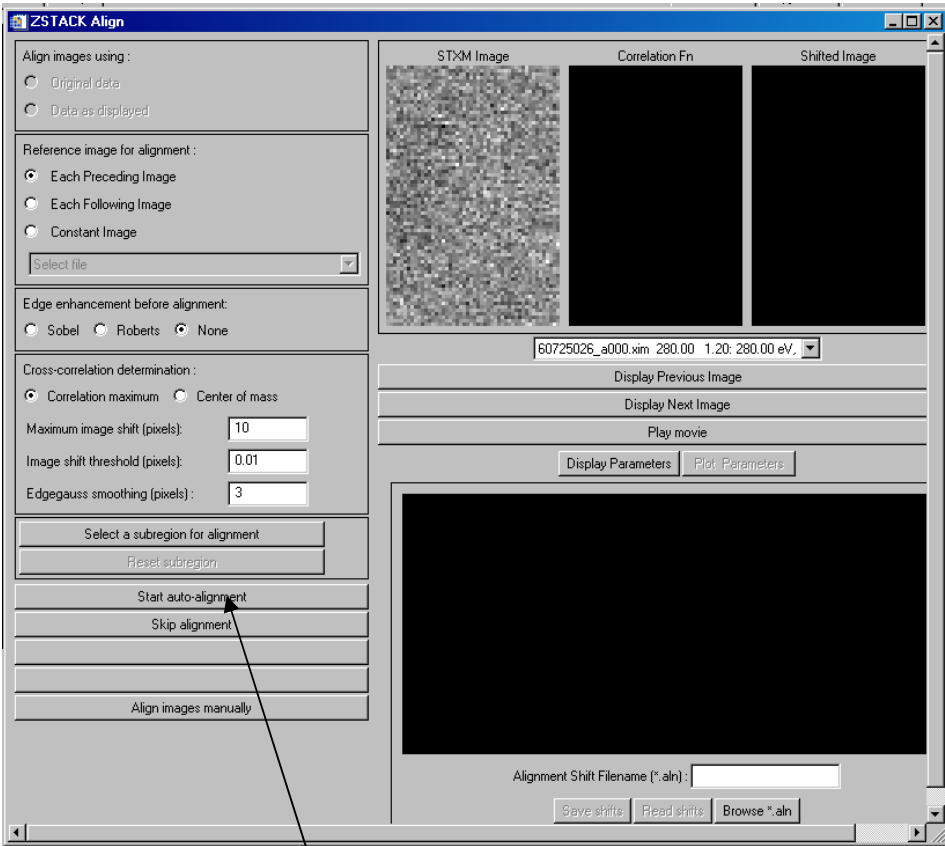
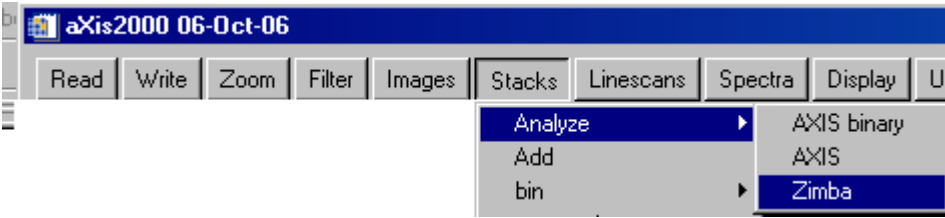
**DATA:** 60725026 Carbon nanotube (Alexandre Felten, run by Daniel HC)

## METHOD:

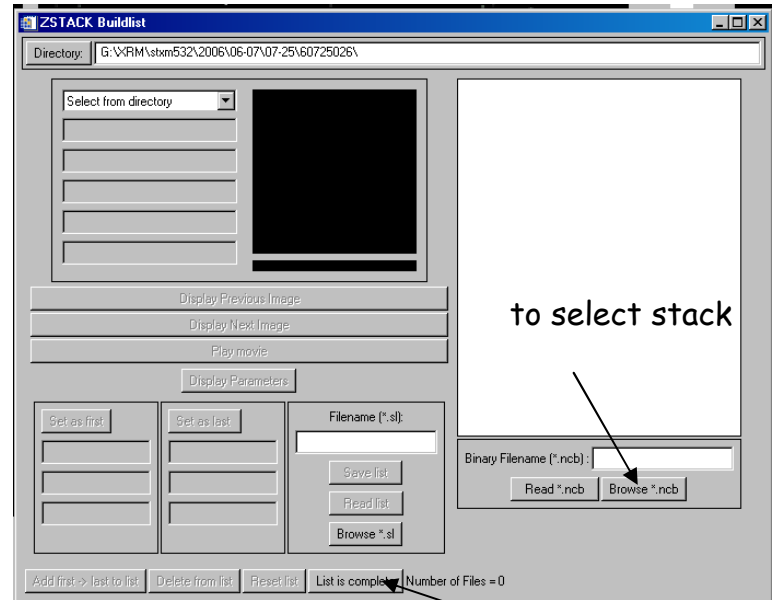
1. Process stack to OD (STXM) or Io-normalized (TEY, PEEM) => [StackOD.ncb](#)
  2. Examine stack in a viewer (binary or Zimba) - if pattern seems to shift position as play movie - need aligning
  3. Use zimba\_stack\_align - try all defaults
  4. If seemed to go well (no sudden jumps), save alignment values => [StackOD.aln](#)
  5. , then proceed to Zstack\_analyze,  
select reference region and play movie to evaluate quality of alignment  
If good - you are done - go to **step 6**
- If align did not work well, reset, and try some of the following
- a) use a sub region which emphasizes a high contrast structure with both x and y components
  - b) start the alignment at a high contrast image
  - c) use constant image (of strong contrast), rather than preceding (default) or following image
  - d) use centre of mass rather than maximum
6. read stack into stack\_analyze and read the stack.aln file when asked for alignment info
  7. Write stack => [StackODa.ncb](#)

In some cases, it is possible to get good alignment in the region of the carbon signal, but not the pre-edge (just too little contrast), In such cases you can edit the [\\*.aln](#) file and simply replace the incorrect pixel-shift values by ones that are more reasonable in the pre-edge energies

# Align via Zstack\_align

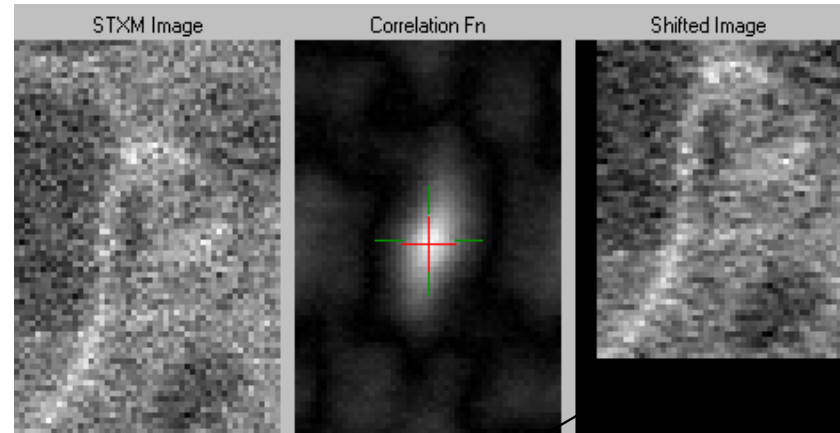


Try the default. NB starting in pre-edge where there is no contrast is probably not a good idea!



to read stack

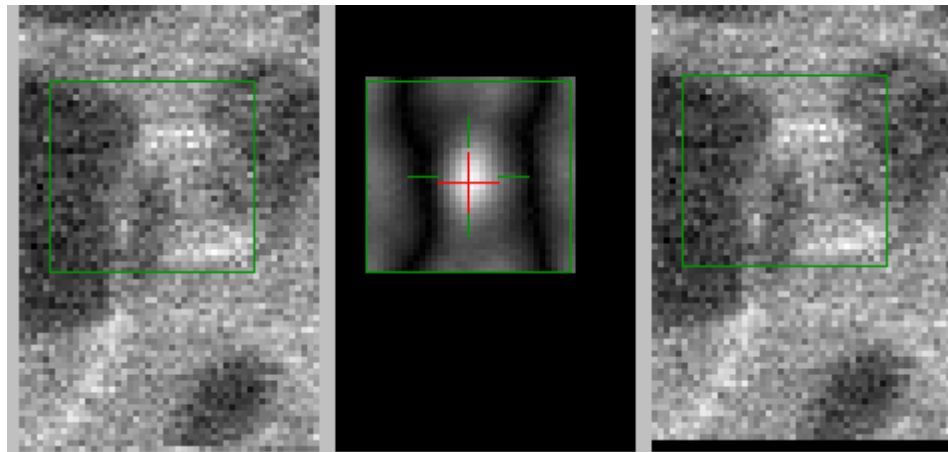
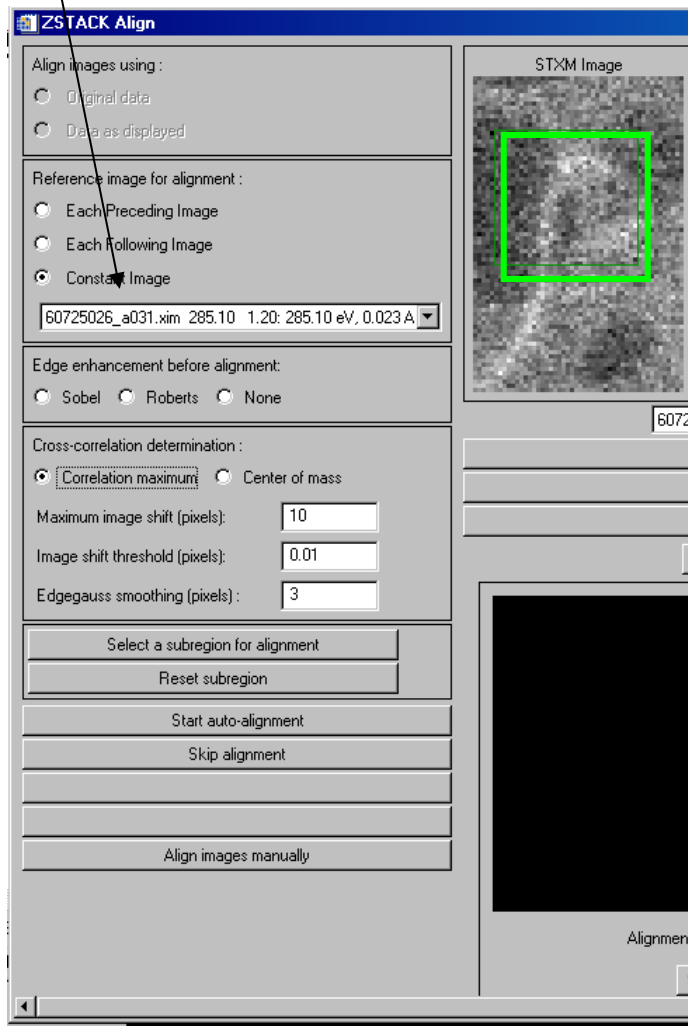
Default, starting at 285 eV



a bad alignment - should not lose that much of image area - the STXM was working well in July

# Using constant image

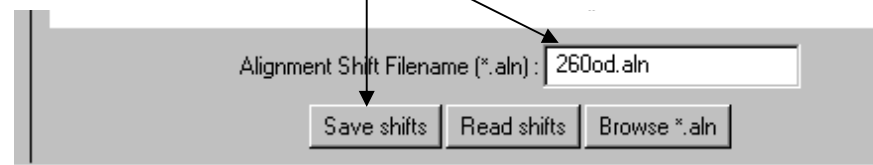
reference constant image; sub-region; correl-max



much better alignment - lose relatively few pixels, and no "hopping around"

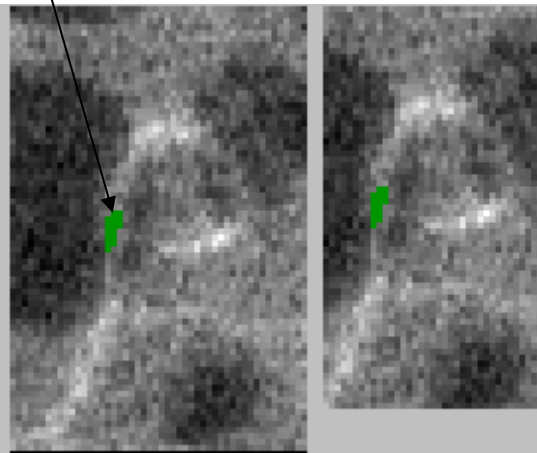
NB if filename info is in zimba-compatible format the X, Y-pixel shifts for each image are displayed. Not the case here

Saved alignment values

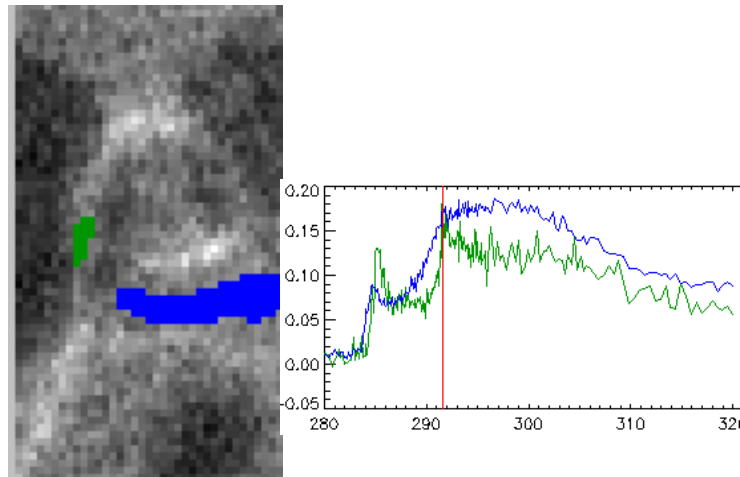


# Checking alignment : Zstack\_analyze

select a **SMALL** region with well defined shape and good contrast. Play movie and look closely if the image moves under the region selector. If not good alignment - but perhaps have lost some useful data here



It plays well. If desired, could 'rescue' the lost area at the bottom by editing the \*.aln file to remove big jumps in pre-edge region



```
! X-Y Pixel shifts after alignment
! Dragbox [5, 39, 30, 62] used
! Aligned to constant image, 60725026_a031.xim
285.10 1.20
! Correlation maximum determined by 3-pt quadratic fit
! No edge enhancement
! Maximum allowed shift of 10 pixels
! Shift threshold of 0.01 pixels
! Edgegauss smoothing of 3 pixels
ALIGN(0, 31, 0, 0, 10, 0.01, 3, 5, 39, 30, 62, -1
PLOTIT(201
60725026_a000.xim 280.00 1.20, 0.8299, -0.8916
60725026_a001.xim 280.20 1.20, -0.6541, 0.8181
60725026_a002.xim 280.40 1.20, 0.2591, 0.8317
60725026_a003.xim 280.60 1.20, -4.1147, -0.0281
60725026_a004.xim 280.80 1.20, -7.8148, -1.2448
60725026_a005.xim 281.00 1.20, -0.9043, 1.9011
60725026_a006.xim 281.20 1.20, 0.9109, -1.8123
60725026_a007.xim 281.40 1.20, 1.9252, 2.9902
60725026_a008.xim 281.60 1.20, 1.9918, 0.5882
60725026_a009.xim 281.80 1.20, -1.1348, -1.9340
60725026_a010.xim 282.00 1.20, 0.6782, 3.6340
60725026_a011.xim 282.20 1.20, 0.7667, -1.0877
60725026_a012.xim 282.40 1.20, 1.2780, -0.2383
60725026_a013.xim 282.60 1.20, -0.9543, 2.1559
60725026_a014.xim 282.80 1.20, 4.9516, -0.0309
60725026_a015.xim 283.00 1.20, -1.5813, 0.8339
60725026_a016.xim 283.20 1.20, -0.7167, -3.0599
60725026_a017.xim 283.40 1.20, 0.1395, -1.2466
60725026_a018.xim 283.60 1.20, 0.9076, 0.7813
60725026_a019.xim 283.80 1.20, -0.0790, -0.2074
60725026_a020.xim 284.00 1.20, 0.8349, -0.8832
60725026_a021.xim 284.10 1.20, -0.2767, -0.0072
60725026_a022.xim 284.20 1.20, -0.2554, -0.1042
60725026_a023.xim 284.30 1.20, -0.0891, 0.2712
60725026_a024.xim 284.40 1.20, 0.3921, 0.5819
60725026_a025.xim 284.50 1.20, 0.1864, 1.1209
60725026_a026.xim 284.60 1.20, -0.2343, -0.5770
60725026_a027.xim 284.70 1.20, 0.0745, -0.1765
60725026_a028.xim 284.80 1.20, -0.6659, -0.8407
60725026_a029.xim 284.90 1.20, 0.1247, 0.8758
60725026_a030.xim 285.00 1.20, -0.0312, 0.2140
60725026_a031.xim 285.10 1.20, 0.0000, 0.0000
```

could replace with 0.

# Analysis of nanotubes after alignment

seems a bit thin for these types of C films



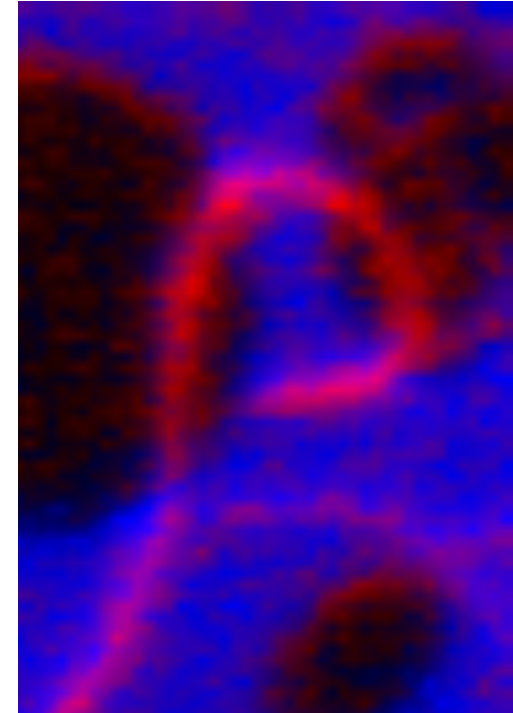
13



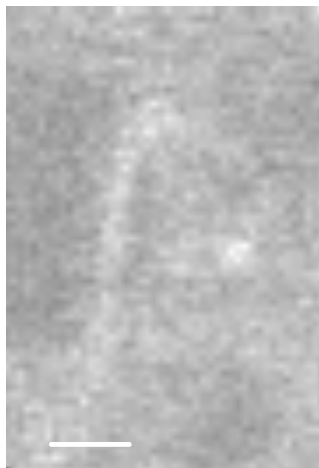
13



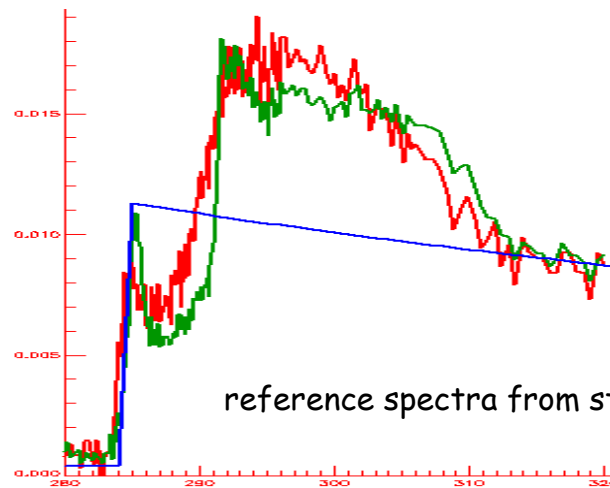
clipped some -ve then rescaled



good fit - nothing missing



0.03



I am not sure why the thickness is coming this thin !!!

reference spectra from stack 31; adjusted for  $d=2.2 \text{ g/cm}$