A Tool for Processing Image Tilt Pairs: ApTiltPicker

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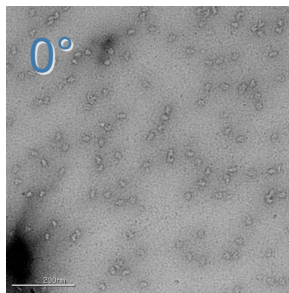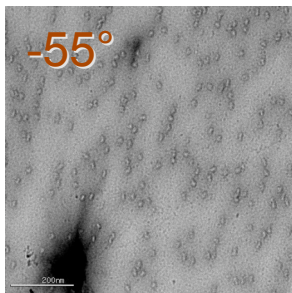THE SCRIPPS RESEARCH INSTITUTE

AMi

NRAMM
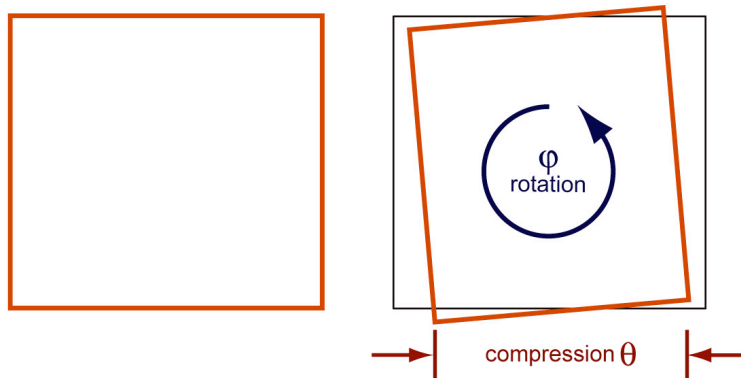

From image tilt pairs
to reconstruction

Processing Image Tilt Pairs:

- Particle picking and association*
- Tilted CTF correction
- Two-dimensional alignment and classification
- Reconstruction

* now semi-automated

-55° 0°

Relating Image Tilt Pairs

φ
rotation

compression θ

Affine Transformation Matrices

$$\begin{pmatrix} 1 & 0 \\ 0 & \cos(\theta) \end{pmatrix} \begin{pmatrix} \cos(\varphi) & \sin(\varphi) \\ -\sin(\varphi) & \cos(\varphi) \end{pmatrix} = \begin{pmatrix} \cos(\varphi) & \sin(\varphi) \\ \cos(\theta)\sin(\varphi) & \cos(\theta)\cos(\varphi) \end{pmatrix}$$

Four parameters: x and y translation,
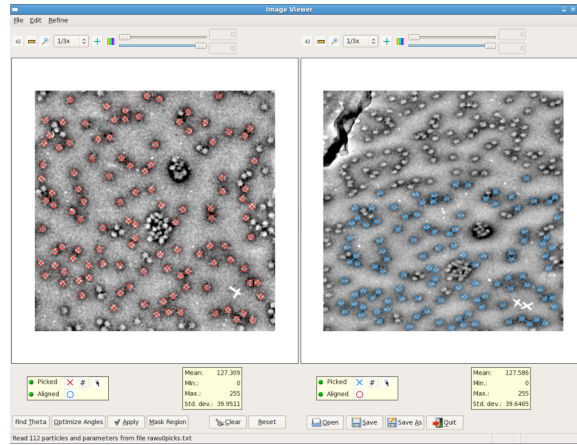tilt angle, and in-plane rotation

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Designing a new tilt picker

- Though very powerful, the existing SPIDER WEB tilt picker requires an 8-bit display and could be not easily be automated.

- **Goal:** to build a new picker from *Leginon* graphical interface that mimics the features of WEB
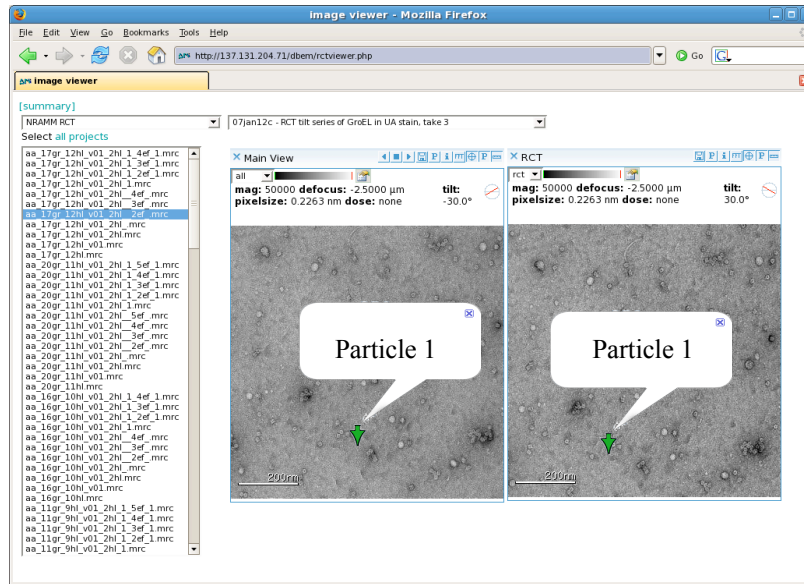
Simple Tilt Picker

- **Leginon** for two images
- First develop *database-free* version
  - No database required
  - Pick particles by hand
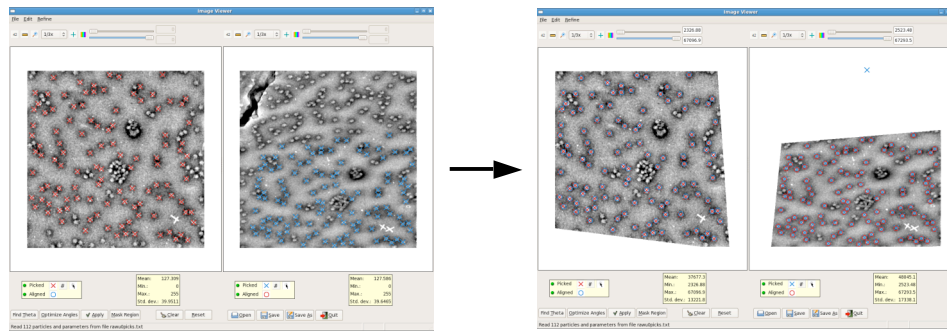 - Calculate tilt parameters
  - Save results to a file

Semi-automated methods for particle matching

Gordon conference proposal
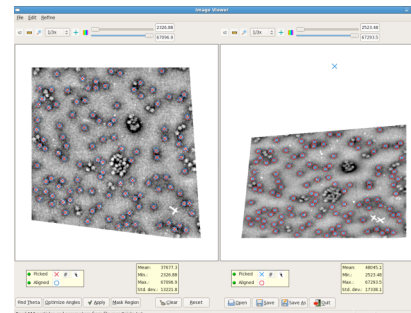
Streamlined Tilt Picker

- Second develop a "pipeline" version

  - Import tilt angle from DB
  - Manually pick 1 particle pair!
  - Import particles from DB
  - Calculate tilt parameters
  - Save picks and parameters to DB

Appion Tilt Picker is Available Now!

- Visit: *http://appion.org*

- Free and open source

- Minimal requirements:

  - Python -- scripting language
  - Numpy & Scipy -- numerical processing for python
  - wxPython -- cross platform GUI
  - Python imaging library (PIL) -- image tools library

  (all available under recent Fedora & Ubuntu Linux distros)

Acknowledgements

- Michael Radermacher
- Bridget Carragher
- Clint Potter

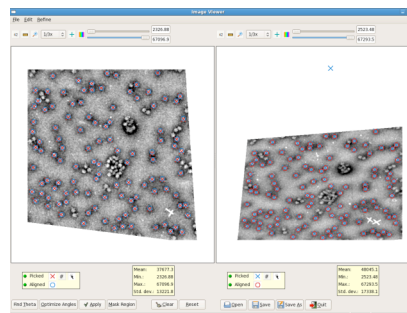- Scott Stagg
- Denis Fellman
- Jim Pulokas

- Edward Brignole
- Rest of AMI group

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END TALK