8th X-ray Scattering School

21st - 23rd June 2016

SSRL
Some Announcements

- All of today and tomorrow and day after morning we will be in this bldg. (bldg. 53)

- This bldg. will lock at 6:30 pm.

- Tomorrow and day after we will have afternoon sessions at beamlines.
  - But please meet in the foyer outside at 1:20pm and we will walk down together to the beamlines

- Group Photo: At the first coffee break we will gather for a group photo.
More Announcements

• There are sign-up sheets in the back for the hands-on sessions at the back.

• We can not physically accommodate more than 10-12 people in any session. So if the sign-up sheet already has 12 people we will close that session.

• If you are interested in learning more about SLAC and the science it does, there a 15 min film that you can watch in the orientation theater (on this floor but in the front)

• If you have user badge please bring it. If you don’t have one or it is not current please talk to Michelle.
Lunch

• You are own your own for lunch.

• SLAC café (on 2nd floor is one option). Starbucks near the guesthouse is the other option.

• Grill order at SLAC café take time. You can pre-order them via an or web portal. (google SLACafe)

• We will start the afternoon sessions on time so please do not be late.
Some of the Scientific problem we study
See Atomic Scale Structures

- Take Photographs
- Make Movies
To Take Photographs

Need Light
Light must interact with the sample

- Transparent
  - Nothing to see

- Scatters

- Absorbs/re-emits
  (Resonance)

Jun-sik’s talk
To Take Photographs

Need a Camera
How does a (simple) Camera Work?
Full Field imaging is a “wave” phenomena - interference pattern $\rightarrow$ dark and light stops $\rightarrow$ image

Rayleigh’s Criteria

Image Resolution $\sim \frac{\lambda}{\sin(\theta)}$

High Resolution $\rightarrow$ short wavelength $\rightarrow$ X-rays
Anna's Talk
Resolution of Full Field Camera

Full Field imaging is a “wave” phenomena - interference pattern $\rightarrow$ dark and light stops $\rightarrow$ image

Rayleigh’s Criteria

Image Resolution $\sim \frac{\lambda}{\sin(\theta)} + \text{lens Aberrations}$

X-ray lens with resolution better than $\sim 10\text{nm}$ don’t exist: Can’t see atoms yet
Can We Create an Image without a Lens?

\[ Q = \frac{4\pi \sin(\theta)}{\lambda} \]
This is what we will talk about for the next three days.