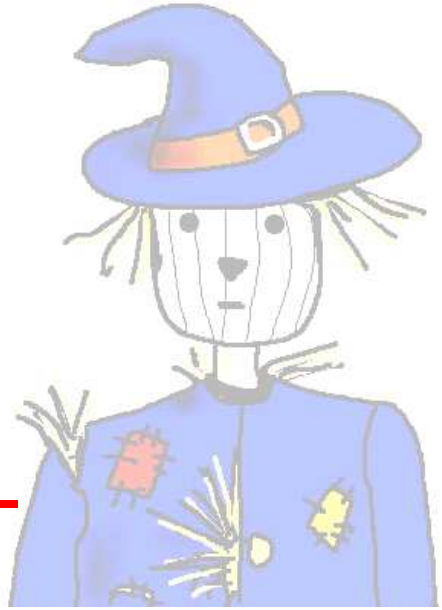
# Beamlines dedicated to high pressure research with diamond anvil cells



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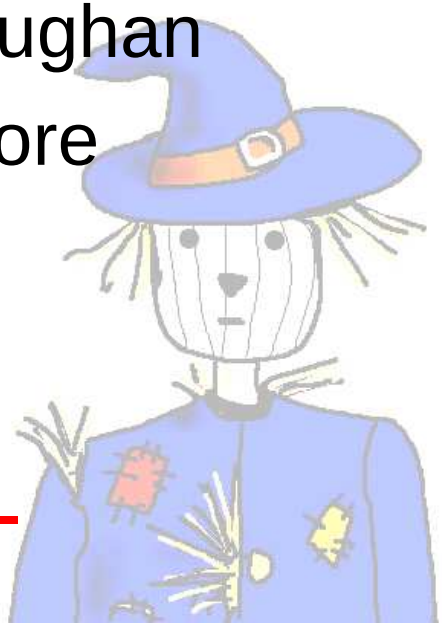
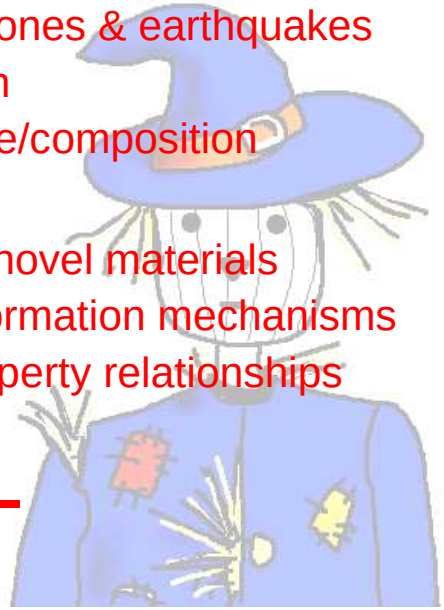
- Many more



# Scientific Drivers

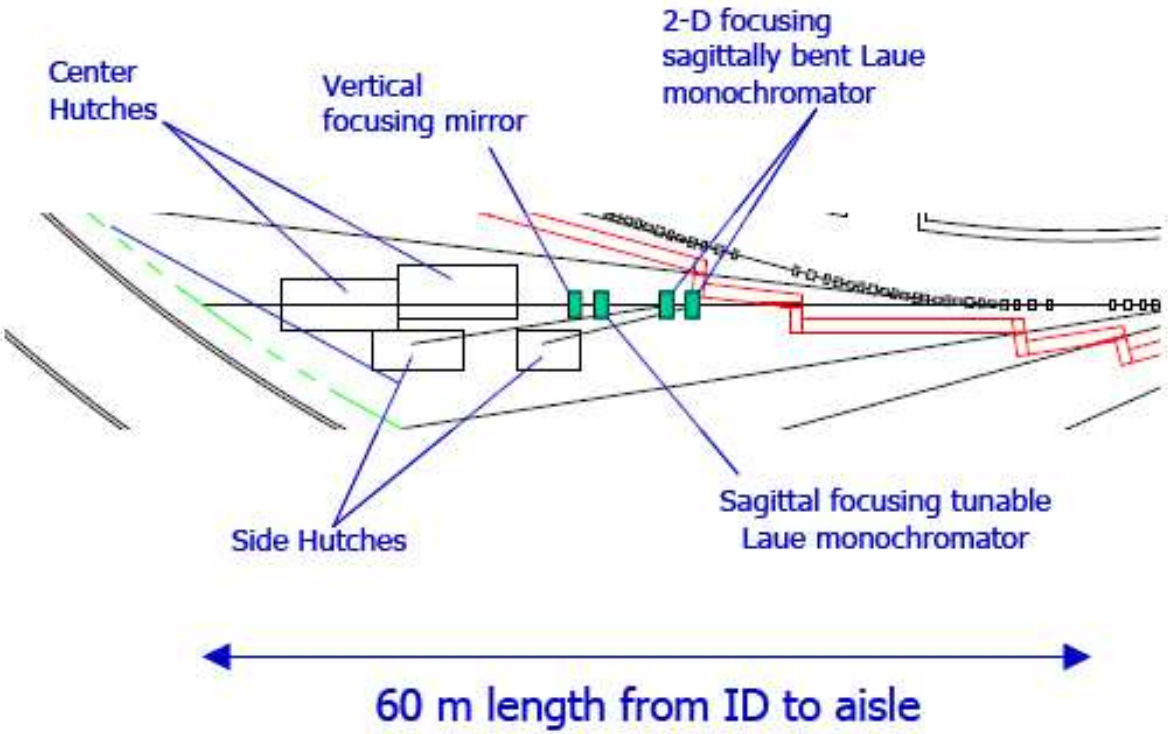
- Disordered and non-crystalline materials
  - Nano-crystalline Materials
  - Liquids and Melts
  - Partially crystalline Materials and Mineral Inclusions
    - Elasticity
    - Density
    - Structure
- Reactions
  - In situ investigations
  - Time resolved studies
- Single-crystal diffraction
  - In polycrystalline matrix

- Earths' & Planetary interior
  - Inner structure of planetary bodies
  - Subduction zones & earthquakes
  - Differentiation
  - Core structure/composition
- Materials
  - Synthesis of novel materials
  - Reaction & formation mechanisms
  - Structure-property relationships



# General Layout

- Fixed Energy Station
- Variable Energy Station



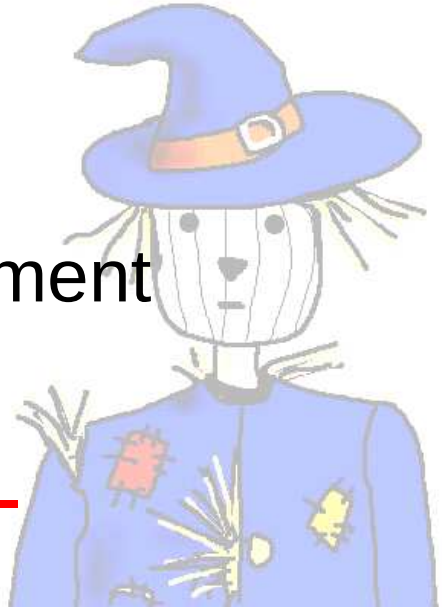

**Source**

Super Conducting Wiggler

Dampening Wiggler

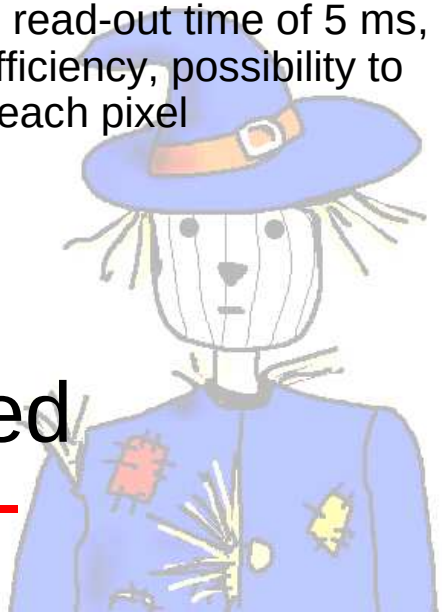
# Fixed Energy Station

- E ~ 35-40 keV
- Minimum beamsize < 1 μm
  - Mirrors?
  - Lenses?
- Laser heating with beam shaping
  - Ytterbium fiber laser
  - $CO_2$ laser
- Online ruby fluorescence measurement
- Online *in situ* micro-Raman



# Fixed Energy Station

- Detectors
  - Large Area Detector
    - Image Plate
    - CCD Detector
    - Hybrid Pixel Array Detectors
      - no readout noise, superior signal-to-noise ratio, read-out time of 5 ms, 20bit dynamic range, high detective quantum efficiency, possibility to suppress fluorescence by energy threshold for each pixel
- What kind of experiments?
  - Crystalline materials
- Updated X17B3 could be moved



# Variable Energy Station

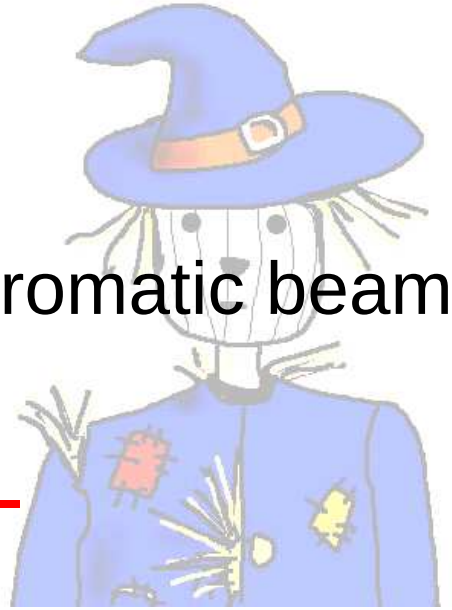
- E ~ 30-100 keV tunable
- Minimum beamsize < 5 μm at 100 keV
  - Long mirrors
- Optimized for total scattering
  - Collimation and slits for 100 keV beam
- Laser heating
  - Ytterbium fiber laser & $CO_2$ laser
- Mirco-Raman / online ruby system

# Variable Energy Station

- Detectors
  - Large area coverage
    - Image Plate
    - CCD Detector
    - Diode Array Detectors
    - Hybrid Pixel Array Detectors
- What kind of experiments?
  - Disordered, partially crystalline, nano-crystalline and amorphous Materials
  - Liquid & Melts

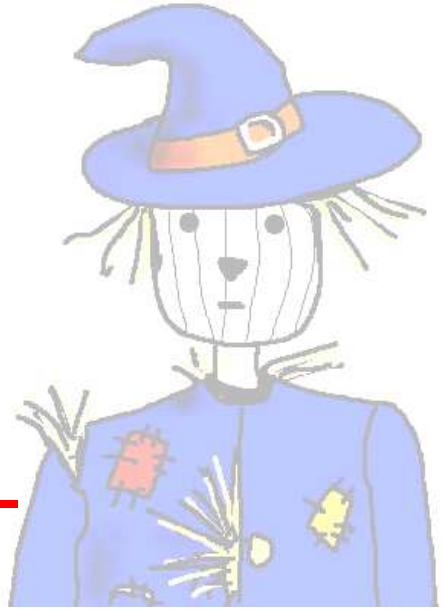
# Is there need for …?

- On-line Brillouin system?
- Imaging capabilities?
- Low temperature capabilities?
  - Second table for variable energy station
- White beam capabilities?
  - On variable energy station
  - Same beam position as monochromatic beam
- Goniometer?



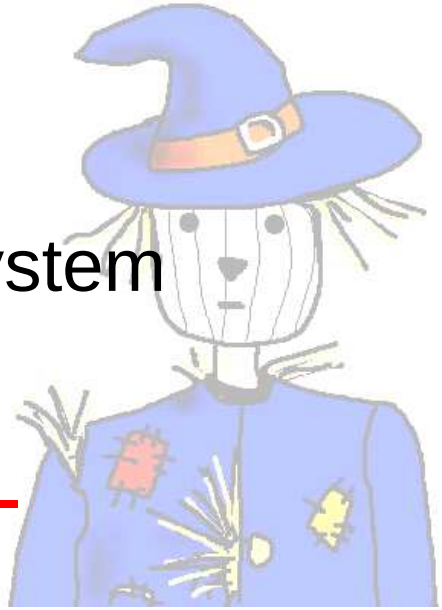
# R & D

- Detectors
  - Area detectors / Detector Arrays
    - e.g. Hybrid Pixel Array Detectors for high energy diffraction
- Optics
  - Monochromator
  - Focusing
    - Mirrors / Lenses
- Software
  - Single-crystal in polycrystalline matrix
- What else?



# Support Laboratory

- Gas loading
- Preparation Area
  - Microscopes
  - Mechanical, spark erosion and laser micro-drill system
  - Staging (Paris-Edinburgh type cells)
  - Inert atmosphere loading / glove box
  - Fume hood, Furnaces
- Off line Raman system, Brillouin system
- Off line laser heating system



# Next Steps

- Beamline Advisory Team (BAT)
- High Pressure Working Group
  - High pressure capabilities at most of NSLS-II beamlines
- X17B3
  - Upgrade plan for the next 7 years