

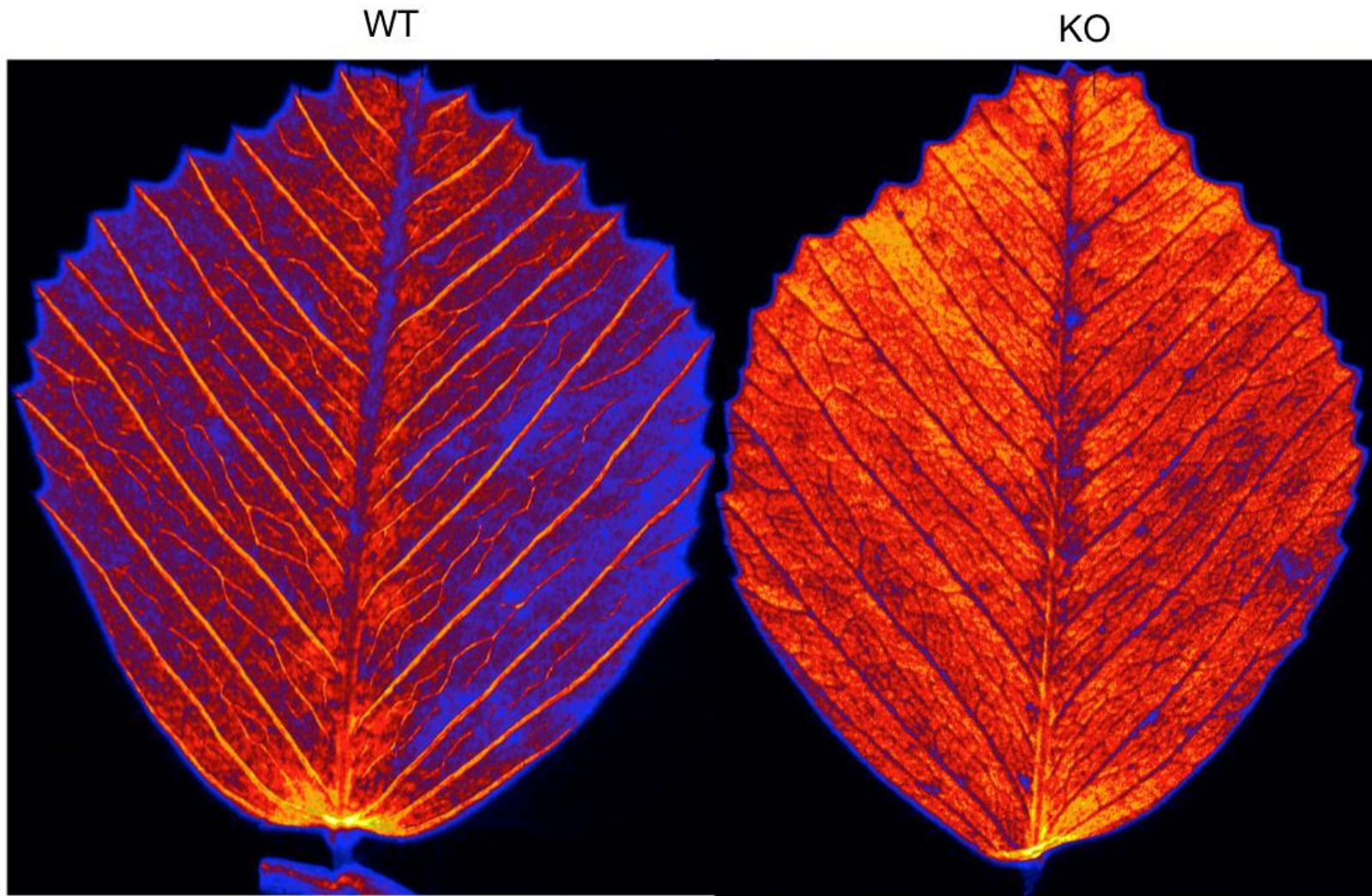
The Biological Elemental Imaging Database:

Development of a FAIR Data Sharing Platform for Elemental Imaging data in the Environmental and Life Sciences.

Tracy Punshon



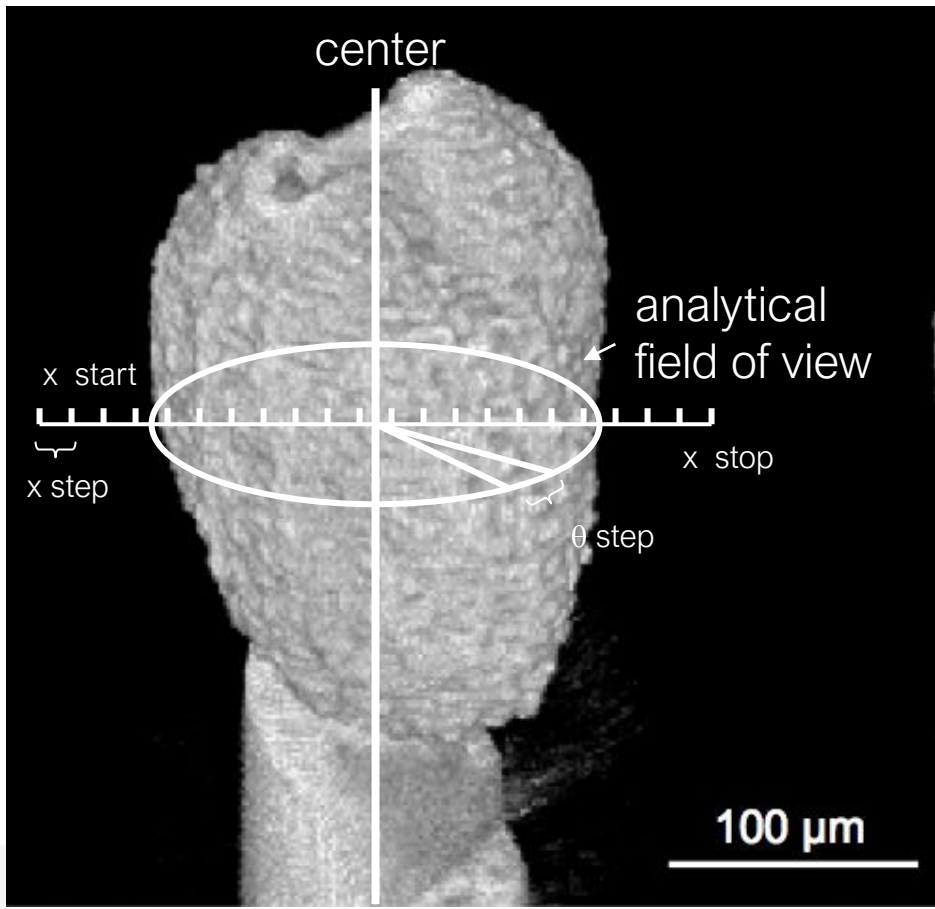
Examples of data: 2D mapping



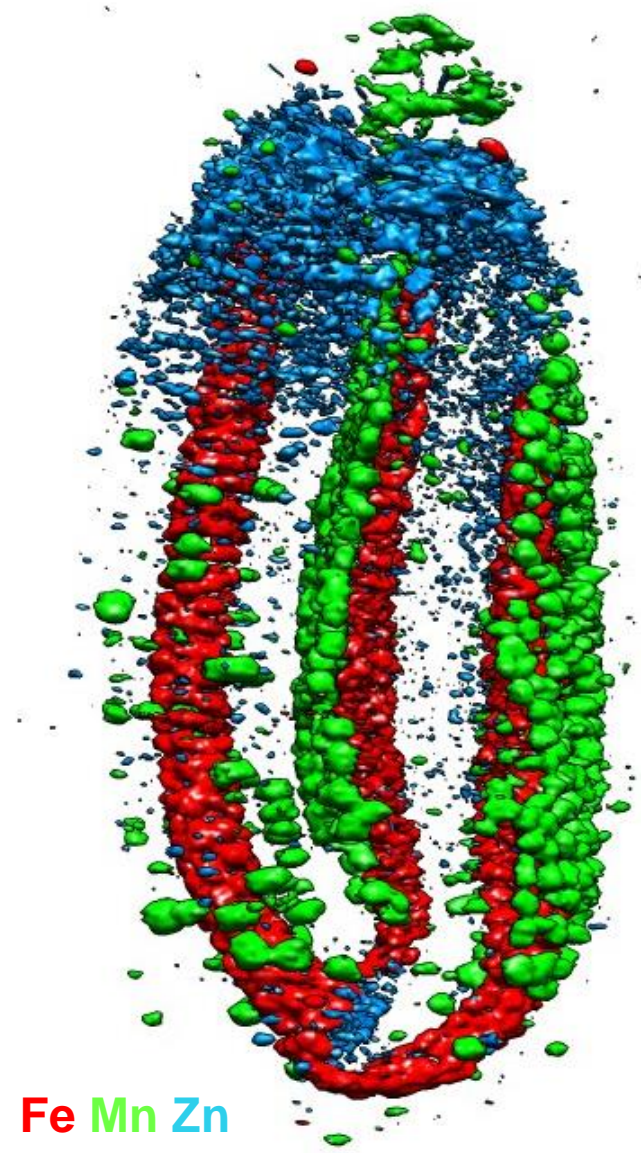
Calcium in leaves of transgenic Alfalfa



Examples of data: 3D tomography

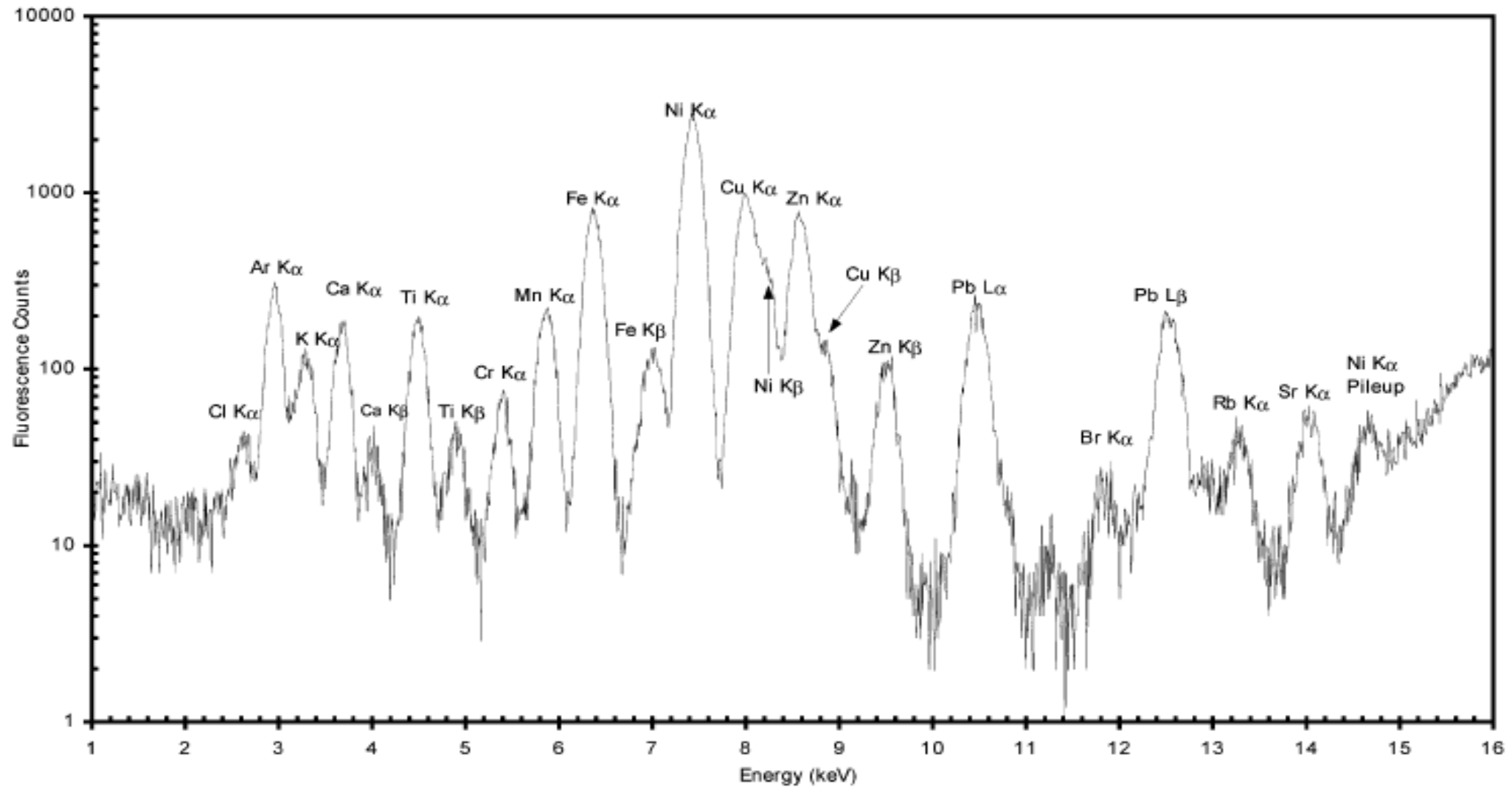


Silica fiber holding an *Arabidopsis thaliana* seed



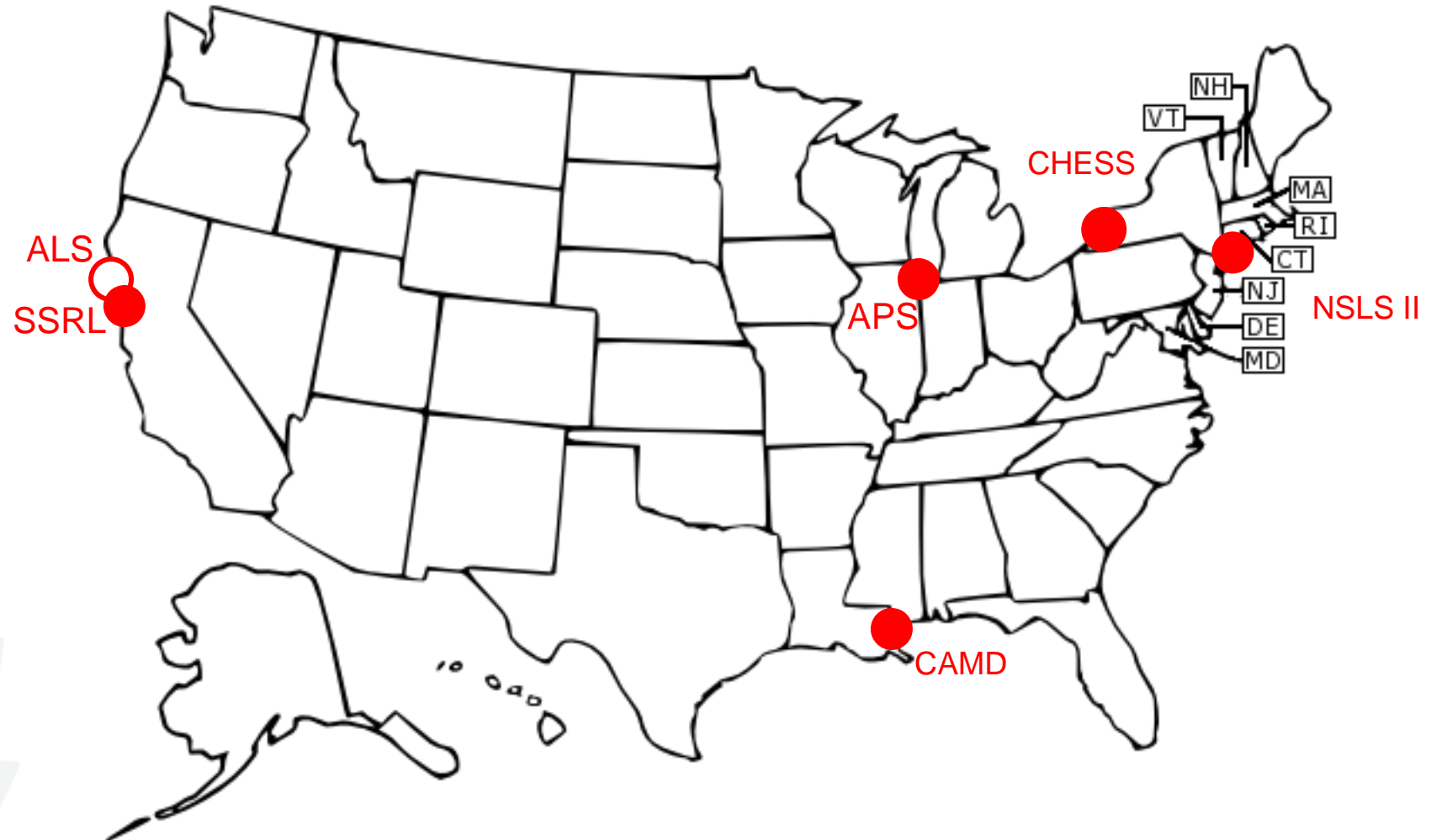
Fe Mn Zn

Elemental imaging techniques



Hard X-ray Beamlines

- Multiple beamlines doing Hard X-ray Fluorescence Mapping:

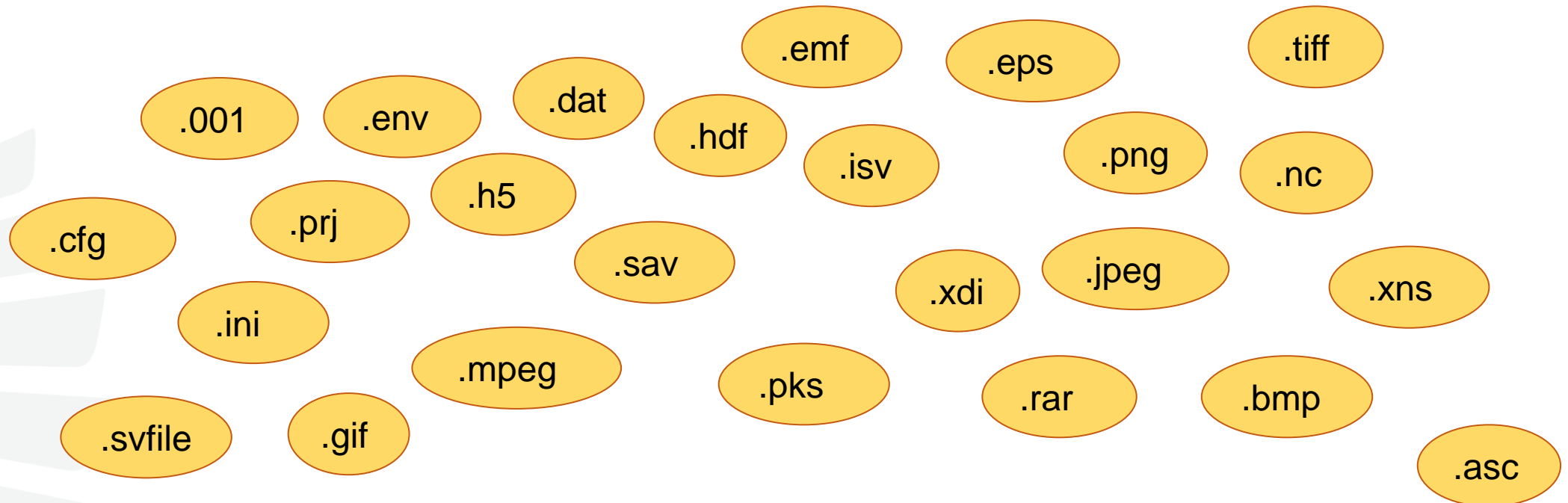




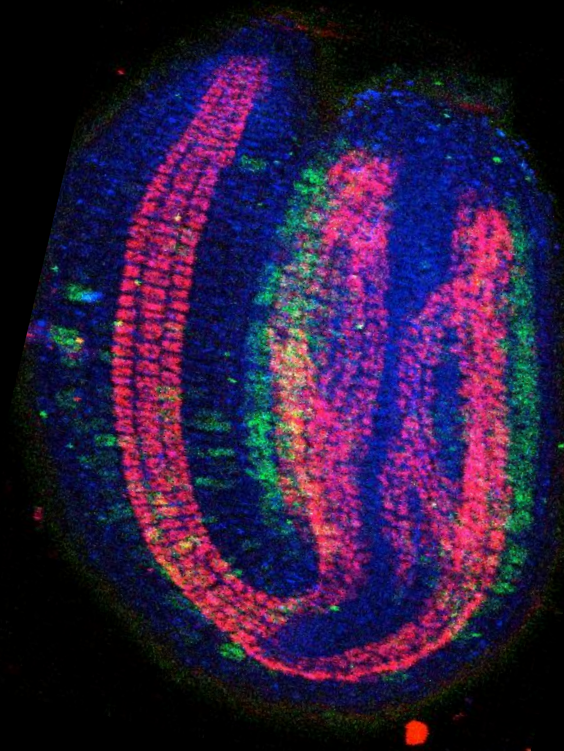
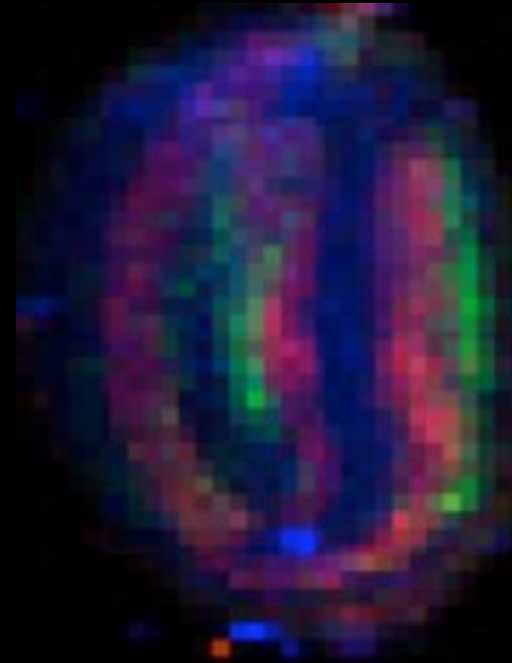
- No organized data archives of any kind
- Dizzying array of file formats
- Each beamline has its own evolving software
- Difficult to convert to a standardized format
- Legacy data is lost if unpublished



Interoperability



Arabidopsis seed Columbia-0

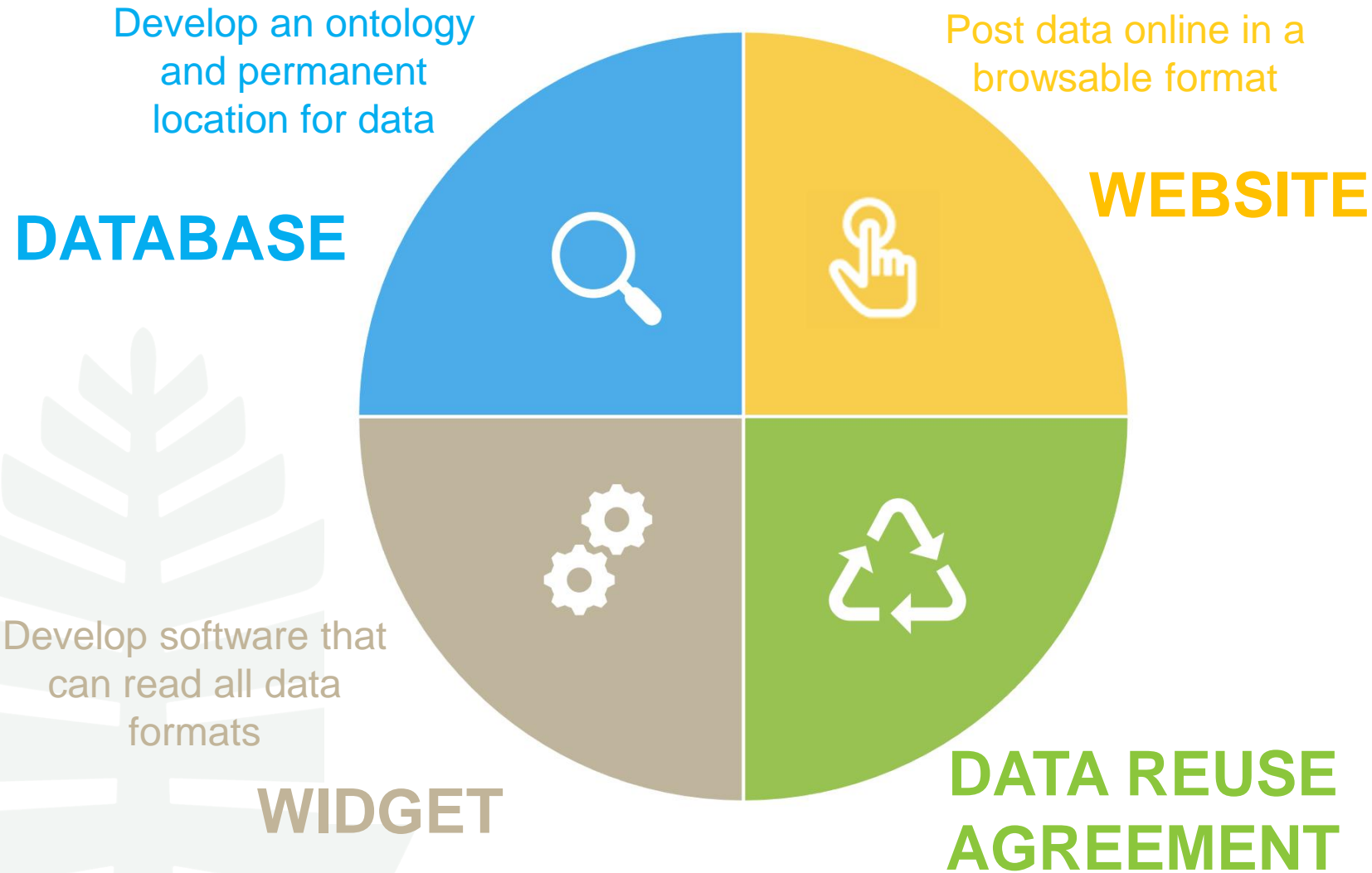


Beam dimensions	10 x 7 μm
Dwell time/pixel	200 milliseconds
Beamline	X26A
Synchrotron	NSLS

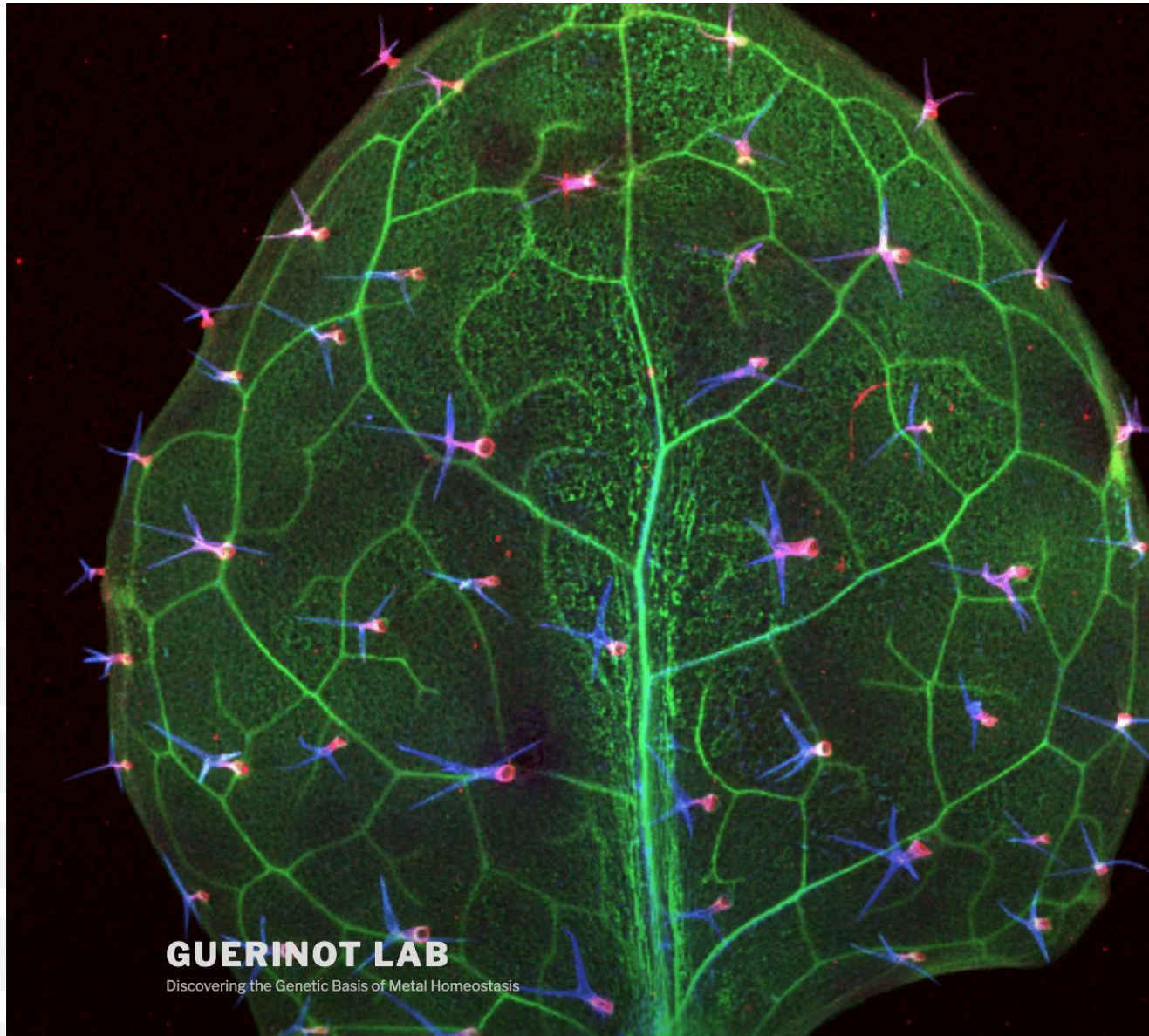
Beam dimensions	0.7 x 0.7 μm
Dwell time/pixel	13 milliseconds
Beamline	13-ID-E
Synchrotron	APS

Database purpose and creator

Dartmouth College



James Gibson



Professor Mary Lou Guerinot




<https://sites.dartmouth.edu/guerinot-lab/>

Workflow (final)


DATA FROM
ELEMENTAL
IMAGING
COMMUNITY

DATA



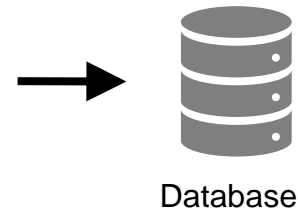
.h52 .dat
.h5 .hdf5 .asc
.h53 .h50 .h51

METADATA



Scanned with CamScanner

Develop ontology & clean



Biological
Elemental
Imaging
Database



Browse



Compare



Reuse

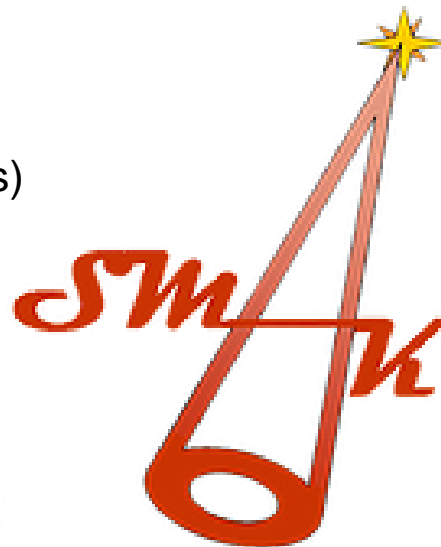
Meta database



Digitize,
develop ontology
& clean

- FORMATS:

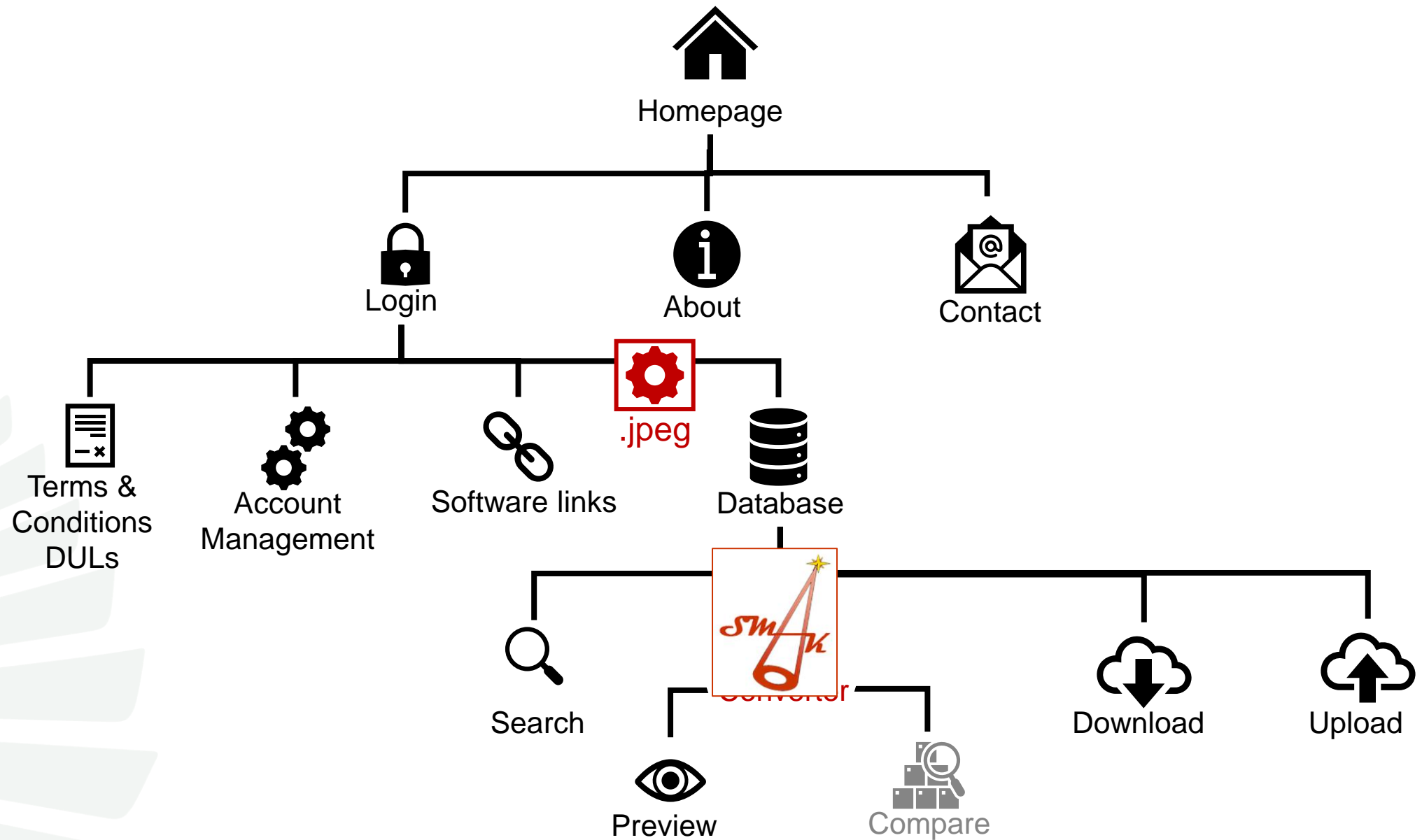
- SSRL Microscan files (HDF)
- SSRL SCANE ASCII files (format for saved files)
- SSRL MGScan ASCII files
- SSRL Super grid files
- GSE-CARS files (ASCII and HDF)
- PNC-CAT files (ASCII and HDF)
- MAPS format h5 files
- MRCAT files
- CLS BIO-XAS image HDF files
- Image and Stack files from AXIS2000 (XIM and NCB)
- NSLS-II SRX HDF saved data format
- SOLEIL data flyscan formats (NXS)
- SOLEIL step scan formats (NXS)
- ALS beamline 10.3.2 files
- RGB files from Diamond
- JPG, TIFF, GIF, BMP image formats
- non-synchrotron elemental mapping files (CSV)



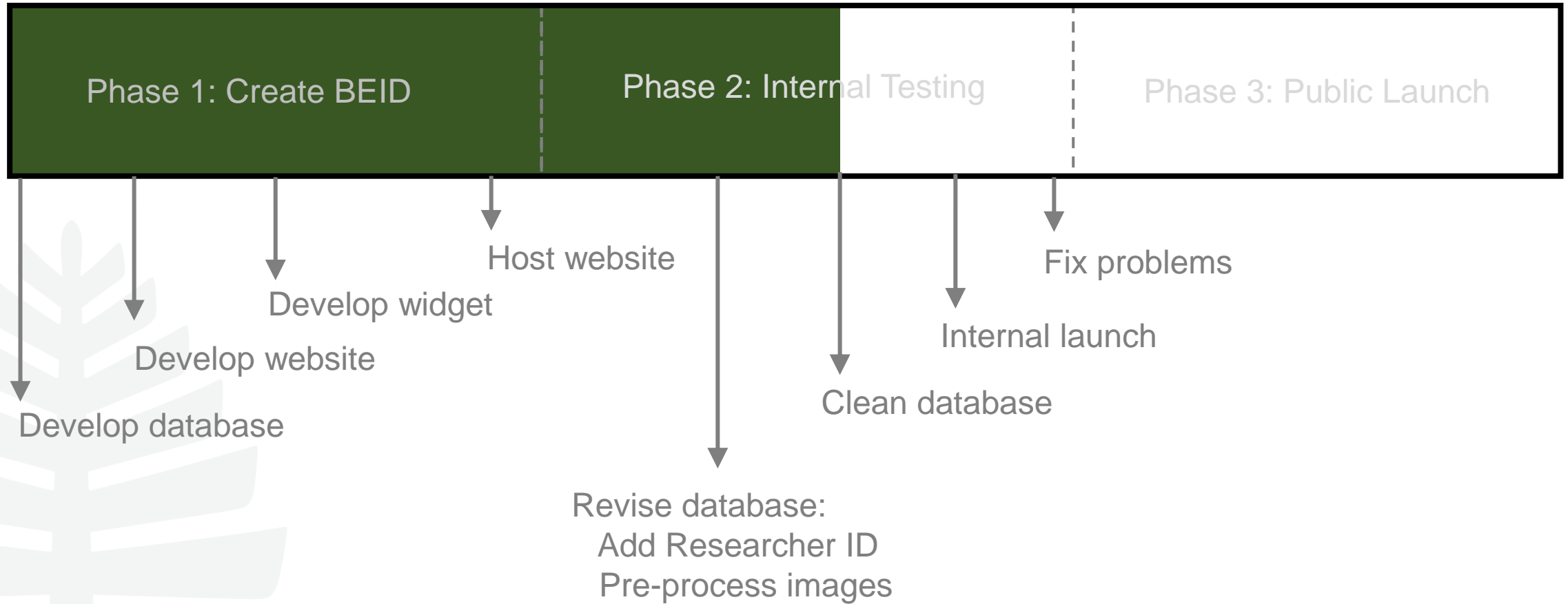
Sam Webb
Beamline Scientist &
Developer



Interoperability









National Institute of
Environmental Health Sciences

Superfund Research Program

NIEHS P42ES0 7373 Dartmouth Superfund Research Program

NIEHS P42ES010349 Administrative Supplement



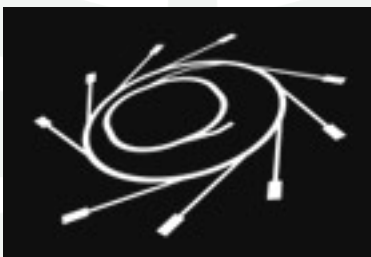
Department of Energy:
National Synchrotron Facilities

Stanford Synchrotron Radiation Laboratory
Stanford Linear Accelerator Center



BROOKHAVEN
NATIONAL LABORATORY

Argonne 
NATIONAL LABORATORY



Australian Synchrotron