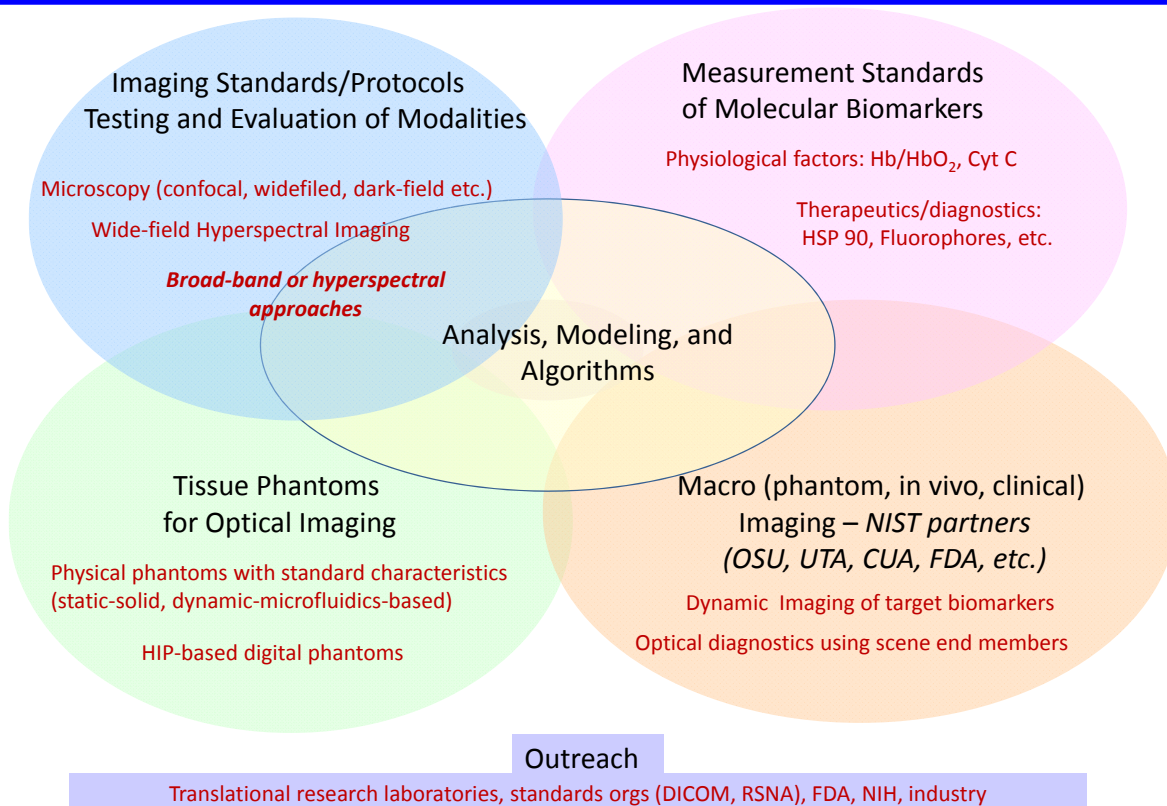


Optical Medical Imaging at NIST

Toni Litorja
Optical Radiation Group

Approach of NIST Optical Medical Imaging Program



Current Activities-In House

Quantifying a Biomarker Remotely

Uncertainty Analysis on Quantitative Imaging
Identifying and quantifying uncertainty sources

- Instrument-drift, noise, non uniformities
- Scene—geometric and radiometric factors
- Calibration and validation model being used
robustness of both the calibration model
and the analysis algorithm

Tissue Oxygenation (various partners)

How do we validate the % sat O₂ scale in the hyperspectral imaging results?

How do we compare it to other clinical oximetric methods?

What is the level of uncertainty in a % sat O₂ reading from this type of measurement?

- Create “ground-truth” testbed, i.e., dynamic tissue phantom
- At the same time, remote sensing analysis approach of scene based decomposition to find the most important contributors to reflectance signal
- Full uncertainty analysis of the measurement—investigate sources of uncertainties

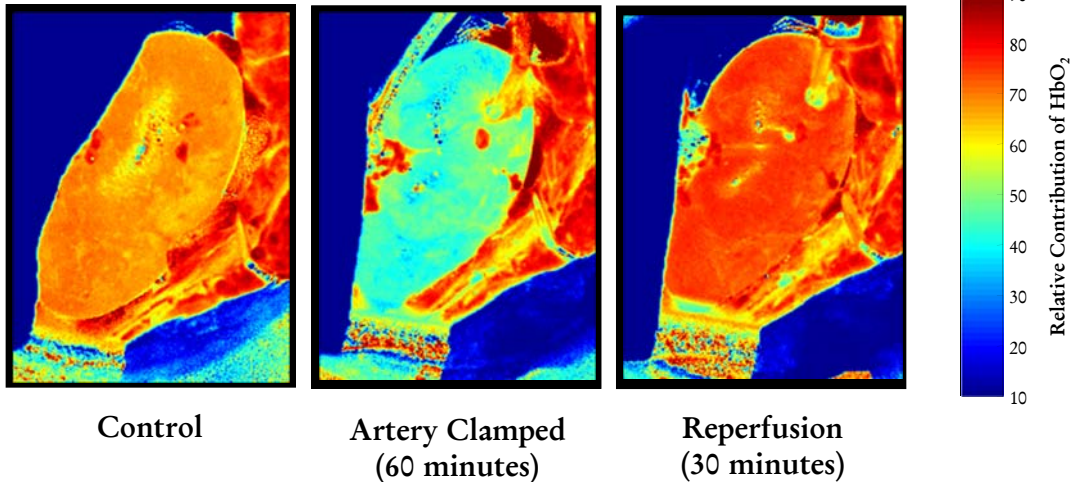
Tissue Oxygenation

Kidney Surgery DLP Hyperspectral Imaging System

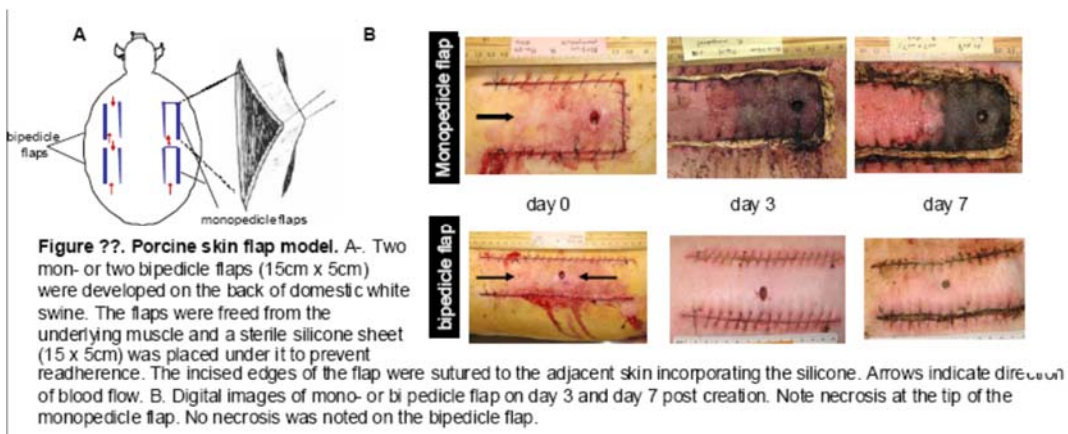
Stationary detection, source waveband scanning

Zuzak, et al

Images from Pig Kidney with Arterial Only Clamping

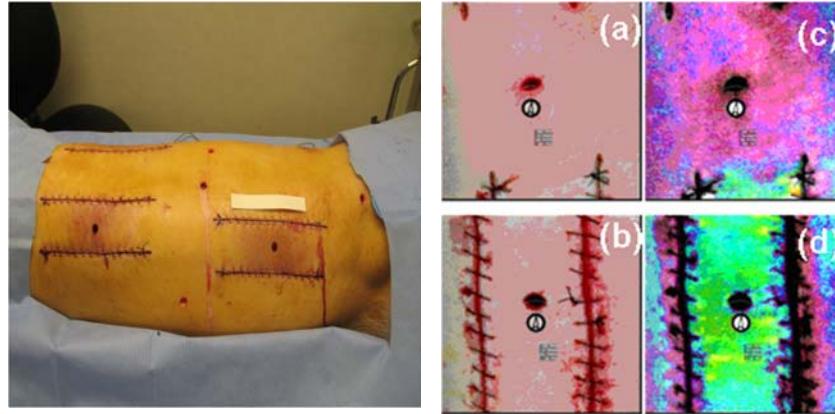


Animal Model in Collaboration with OSU



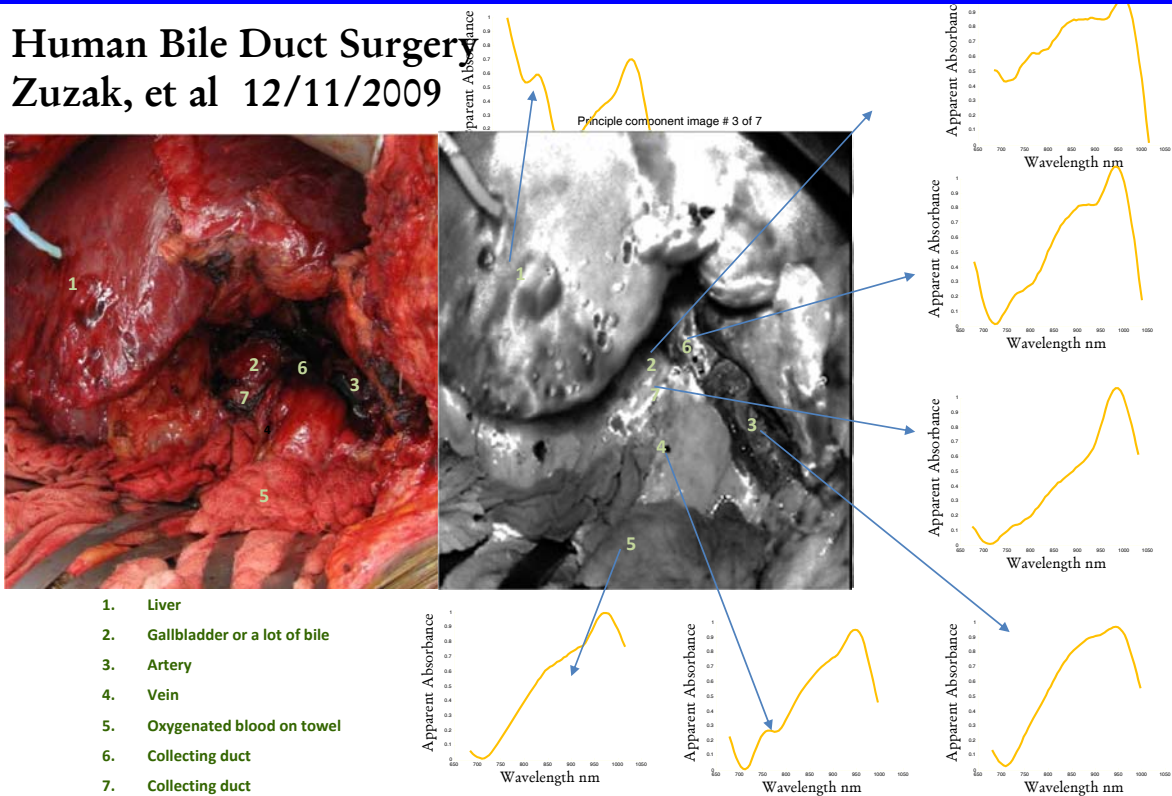
Animal model cont'd

Using spatially scanning hyperspectral imager



Feature Classification with Confidence Statistics

Human Bile Duct Surgery
Zuzak, et al 12/11/2009



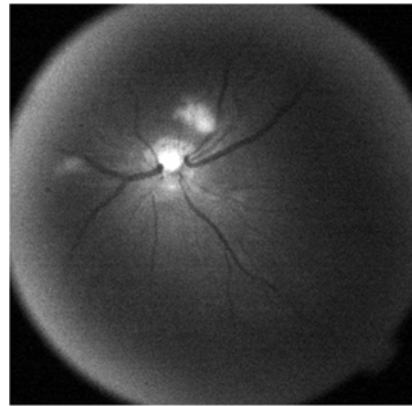
Quantifying Bilirubin in Tissue

Similar problem to oxygenation except there's nothing to ratio against

Patient clinical lab data available
(de-identified)

Calibration model using pure bilirubin
(optical bench) and using accepted
clinical lab standard calibration protocols

Image component analysis for signal
contributors (e.g. Hb)



Other OMI activities (wide field imaging)

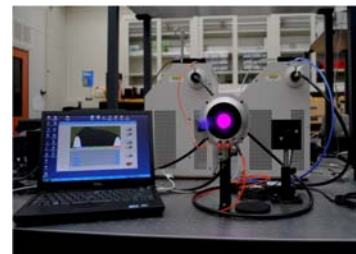
Image pre-processing (pre-analysis) techniques
procedures for correcting images prior to analysis

Development of **tissue phantoms** (artifact) and
digital (Hyperspectral Image Projector HIP) for
optical systems calibration and development

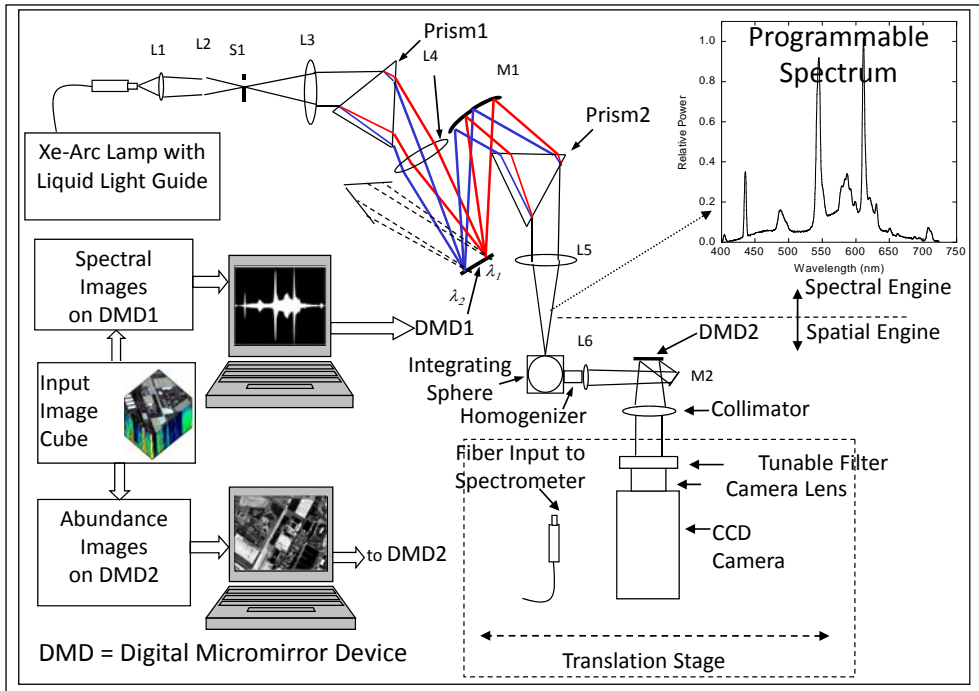
Enhanced contrast illuminant

Calibration tools development

standard materials, protocols



Hyperspectral Image Projector



Digital Tissue Phantom Result

