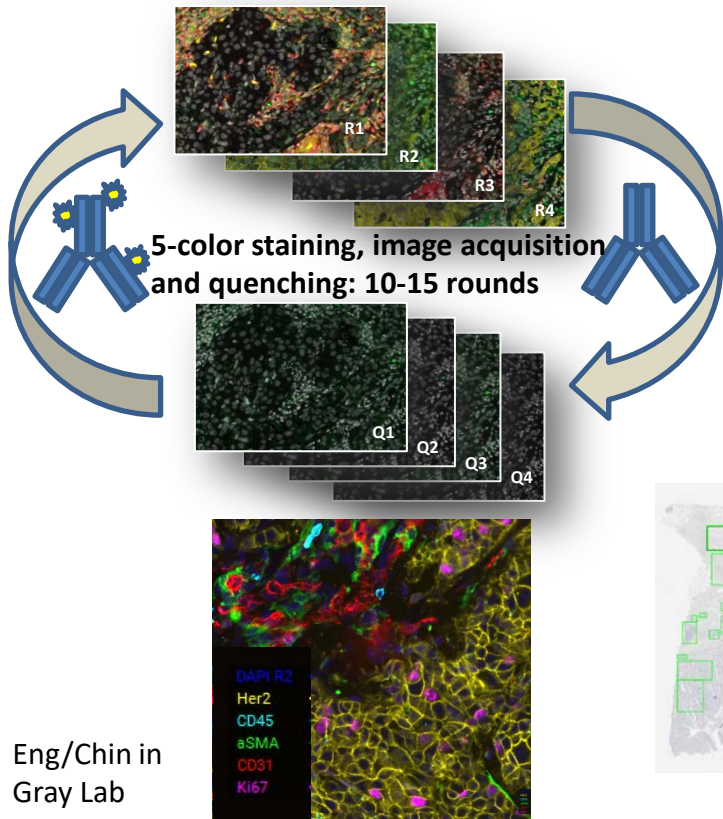# Leveraging OME tools in highly multi-channel imaging

suggestions to make it even better
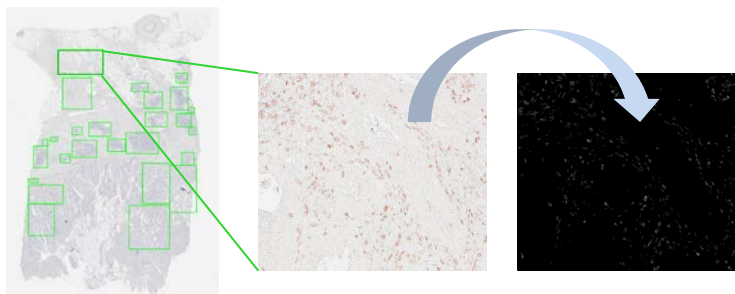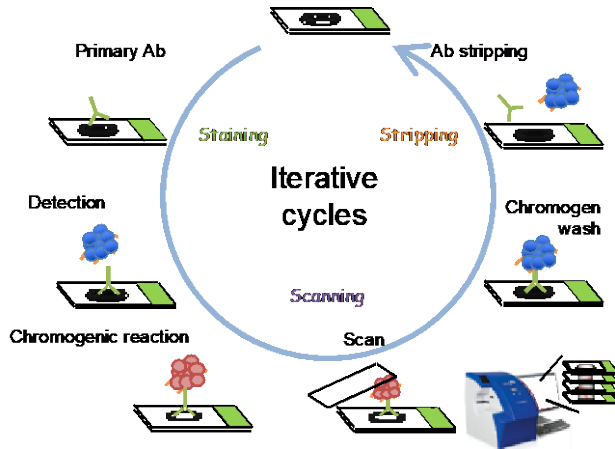
Damir Sudar – Quantitative Imaging Systems LLC &
Oregon Health & Science University, Portland, OR, USA

Highly multiplex imaging approaches

Cyclic Immunofluor. ((t-)CycIF)

5-color staining, image acquisition and quenching: 10-15 rounds

R1 R2 R3 R4

Q1 Q2 Q3 Q4

DAPI R2
Her2
CD45
aSMA
CD31
Ki67

Eng/Chin in Gray Lab

Multiplex IHC (mIHC)

Primary Ab
Staining
Ab stripping
Stripping
Detection
Iterative cycles
Chromogen wash
Chromogenic reaction
Scanning
Scan

Betts/Sivagnanam in Coussens Lab

CycIF-like:
GE/Cytiva Cell-DIVE
Cell IDx UltraPlex
Miltenyi MICS

mIHC-like
UltiVue InSituPlex

Oligo-based:
CODEX
PCL Ab-Oligo
DNA/RNA PAINT

Mass-spec-based:
MIBI
Hyperion/CyTOF

How OME tools are helping now

- Bio-Formats (+ Glencoe) tools: importing/converting
  - dealing with all those odd-ball formats out there
- OME-TIFF & model: capable file/metadata format
  - tiles/pyramids, N channels, exchange standards, single-file,
- OMERO: storing/organizing/accessing/visualizing
  - multi-channel viz, access from analysis software,

Bio-Formats – better?

- Community: pressure our vendors to move to standard formats and STOP releasing new proprietary formats – make full standard formats support a condition of a sale
- OME & Glencoe teams: please maintain and expand support for proprietary formats

OME-TIFF/OME-XML model – better!

- Compression – better lossless and lossy
  - decent fast lossy may be adequate for some WSI images – current JPEG2K is not very effective
- Revive OME Files (C++ library) and use that to provide full high-performance Python support
- Next generation containers and metadata model
  - Josh Moore and Caterina Strambio talks!!

OMERO – better!!

- Full function HTTP/RESTful access as full alternative to ZeroC/ICE APIs
  - Avoid ICE requirements on clients; make C++ clients on Windows possible
  - Avoid problematic firewall issues
  - Permit horizontal scaling
- How?
  - Make deployment of micro-services standard; use ms-pixelbuffer for bulk access
  - Full libraries (Python first) based on the above

QiTissue – C++/Qt integrated app for CycIF
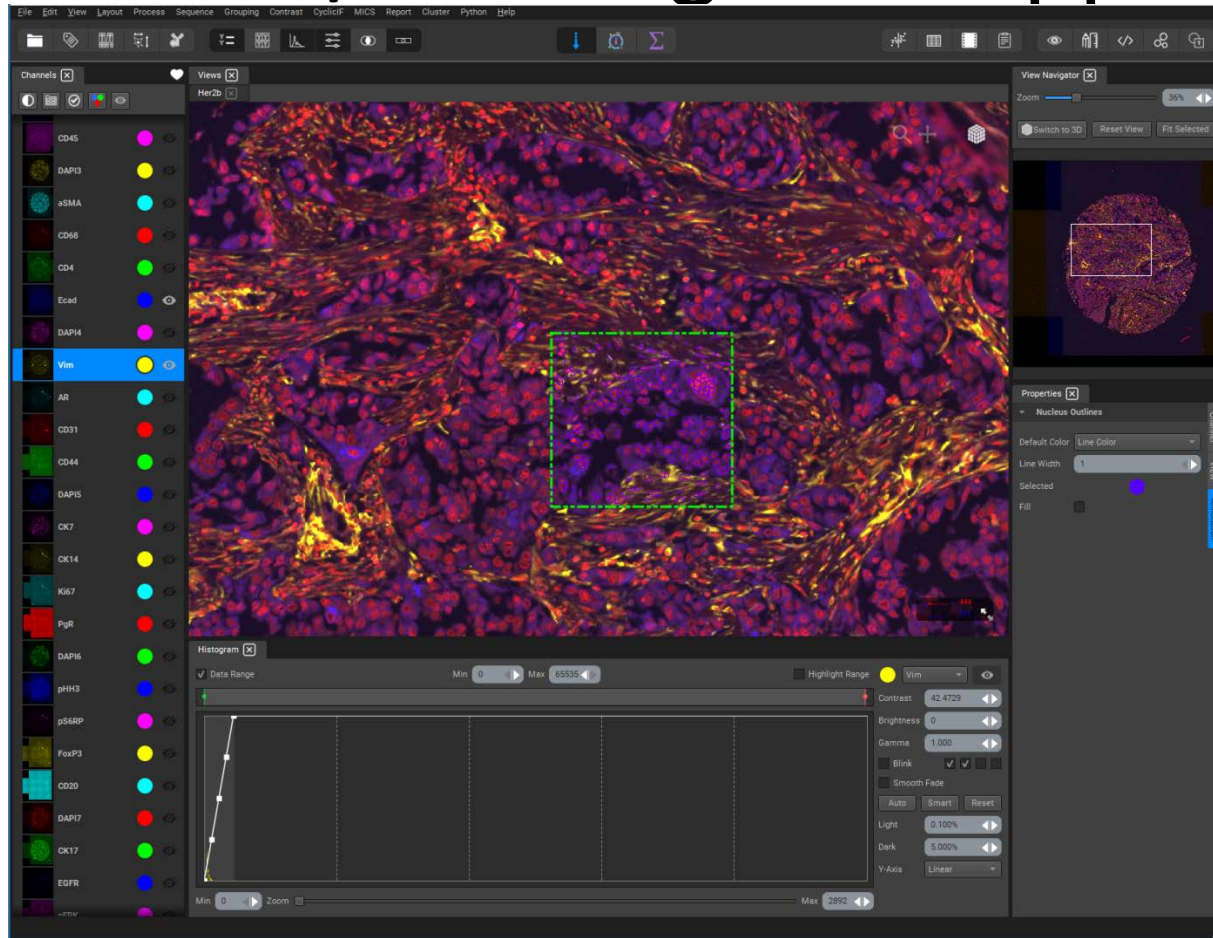
OMERO (2) – better!!

- Add visualization/interaction for per-channel annotations
  - OME-XML model supports it but needs better definition
- Improve organization abilities
  - Further develop the (ROI) folders concept?
  - Improved search (beyond Lucene) and result display