

# IS3R 2023

Berlin/Germany

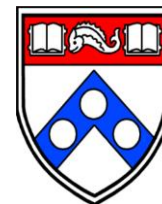
August 24–26, 2023

## **Integrated diagnostics: integration of imaging pathology and laboratory data**

Mitchell Schnall MD PhD

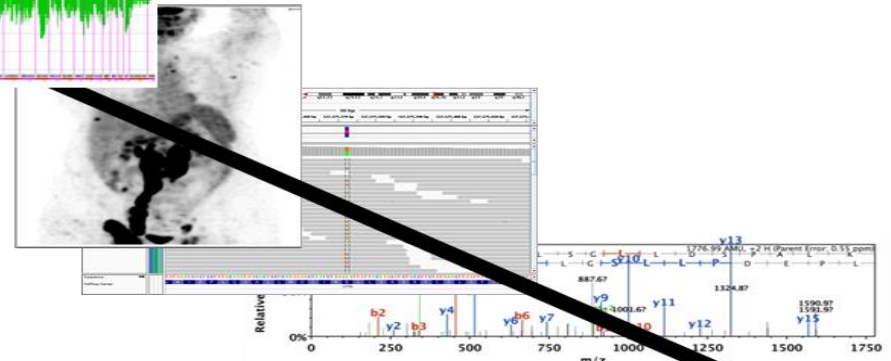
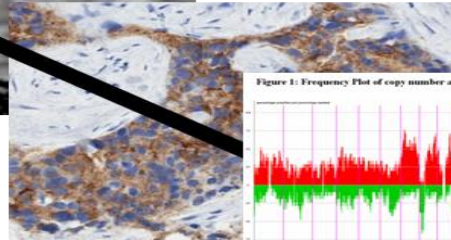
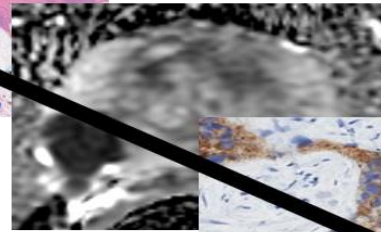
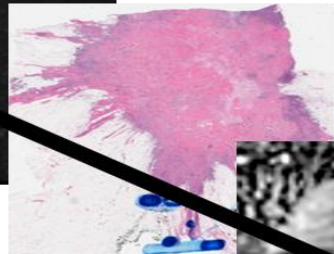
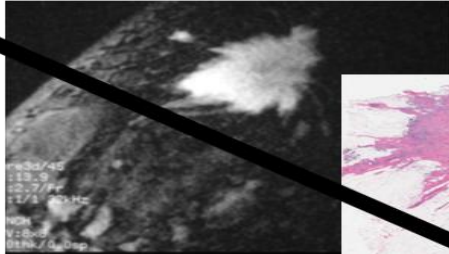
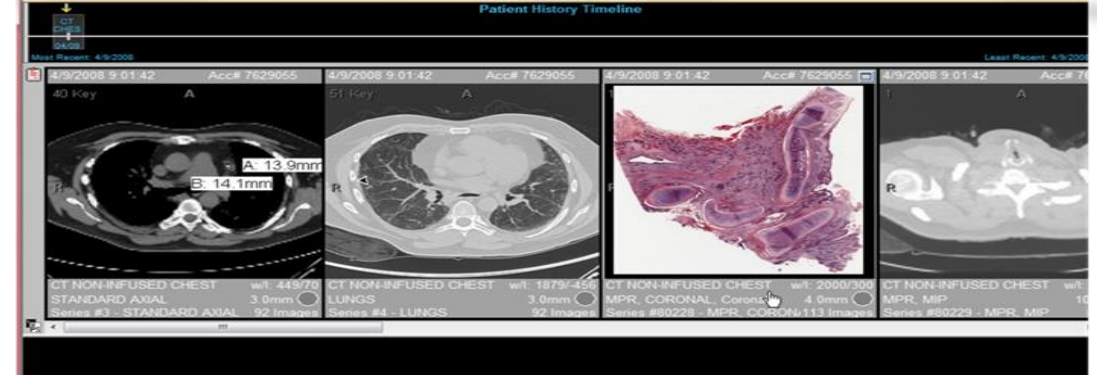
Eugene P Pendergrass  
Professor of Radiology

Penn Medicine



# Structure and biology across length scale

$10^1$



Radiology



Pathology

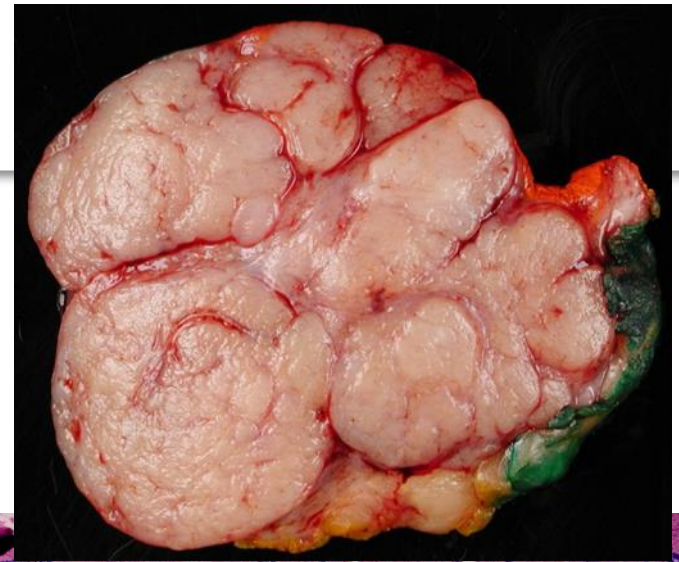
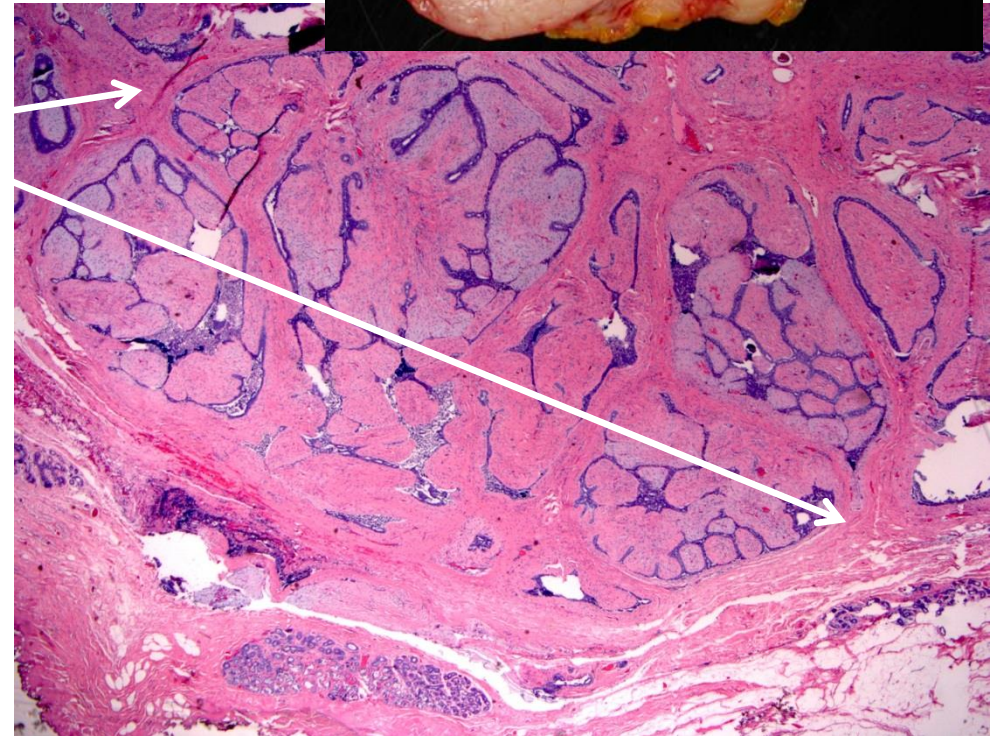
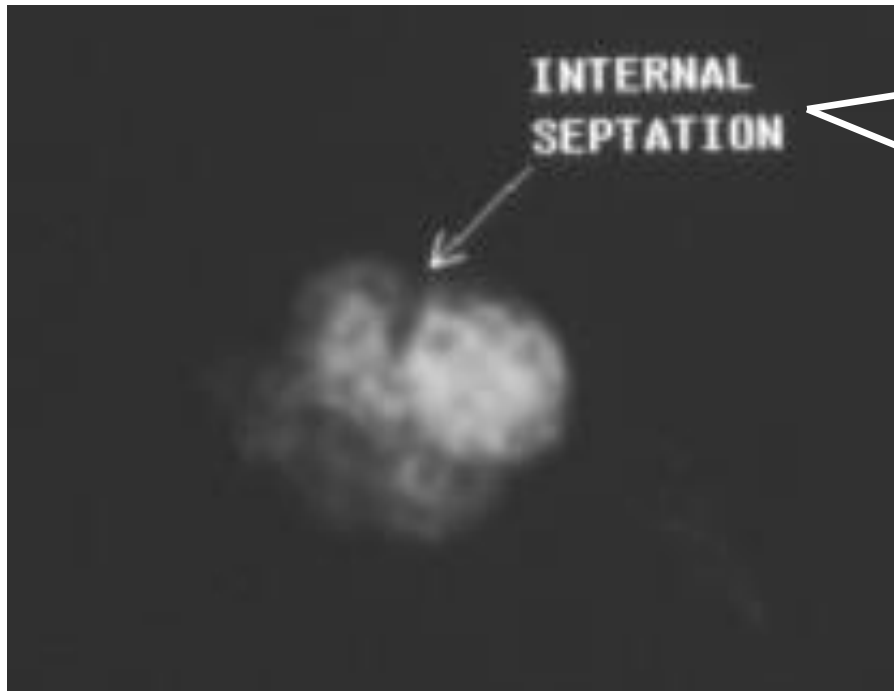


"Omics"

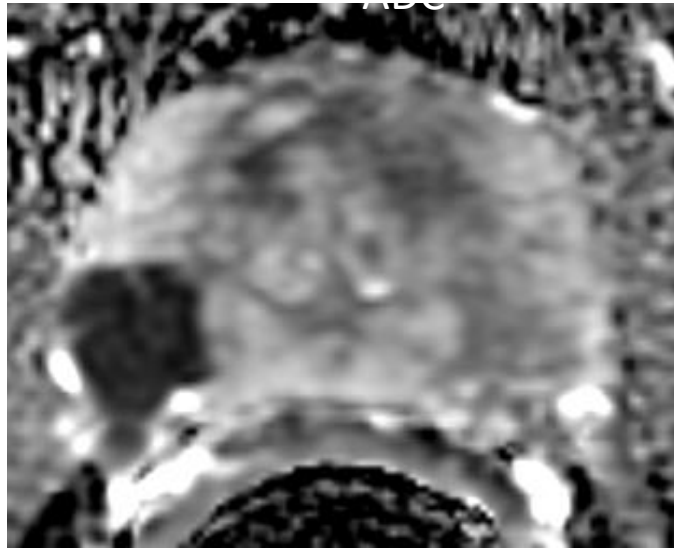
$10^{-10}$



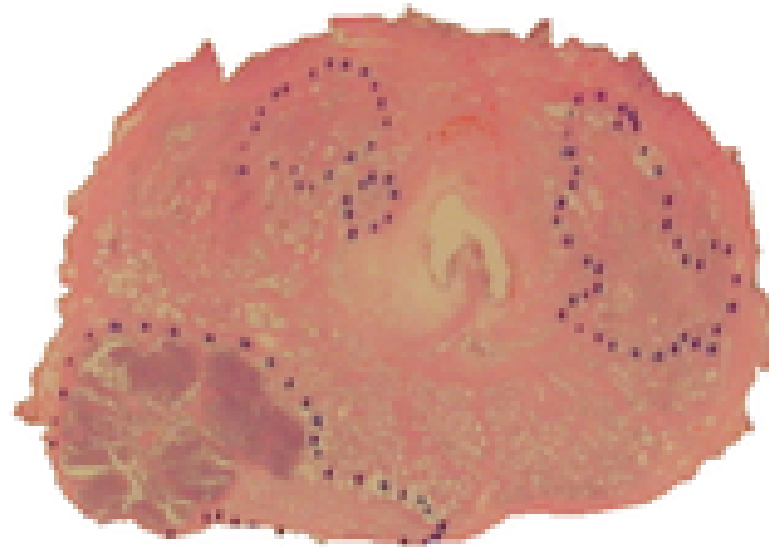
# Anatomic Features: Fibroadenoma



# 62 yo Male PSA15

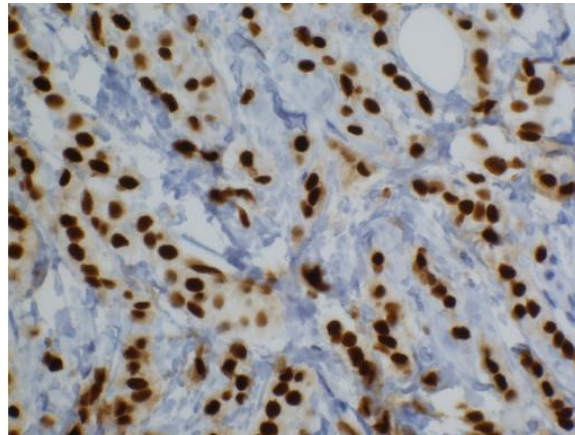


ADC Map

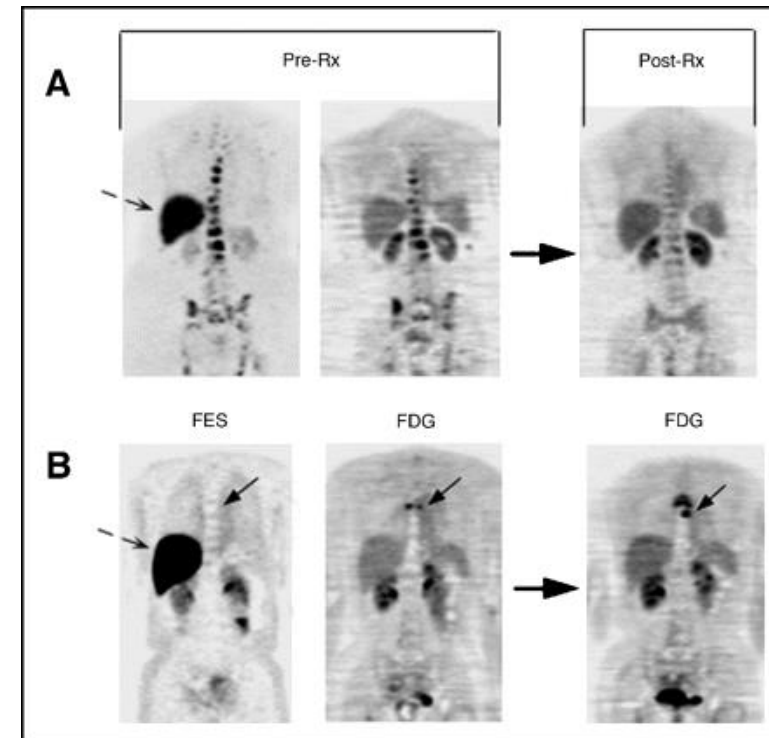
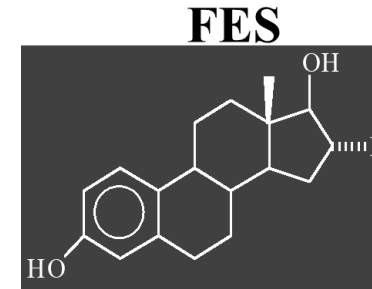


CLARE TEMPANY MD; BWH

# Role for in vivo ER “staining”



*Mankoff et al*



- Anatomic Stage
- Tumor grade
- Molecular profile
- Status of tumor Markers

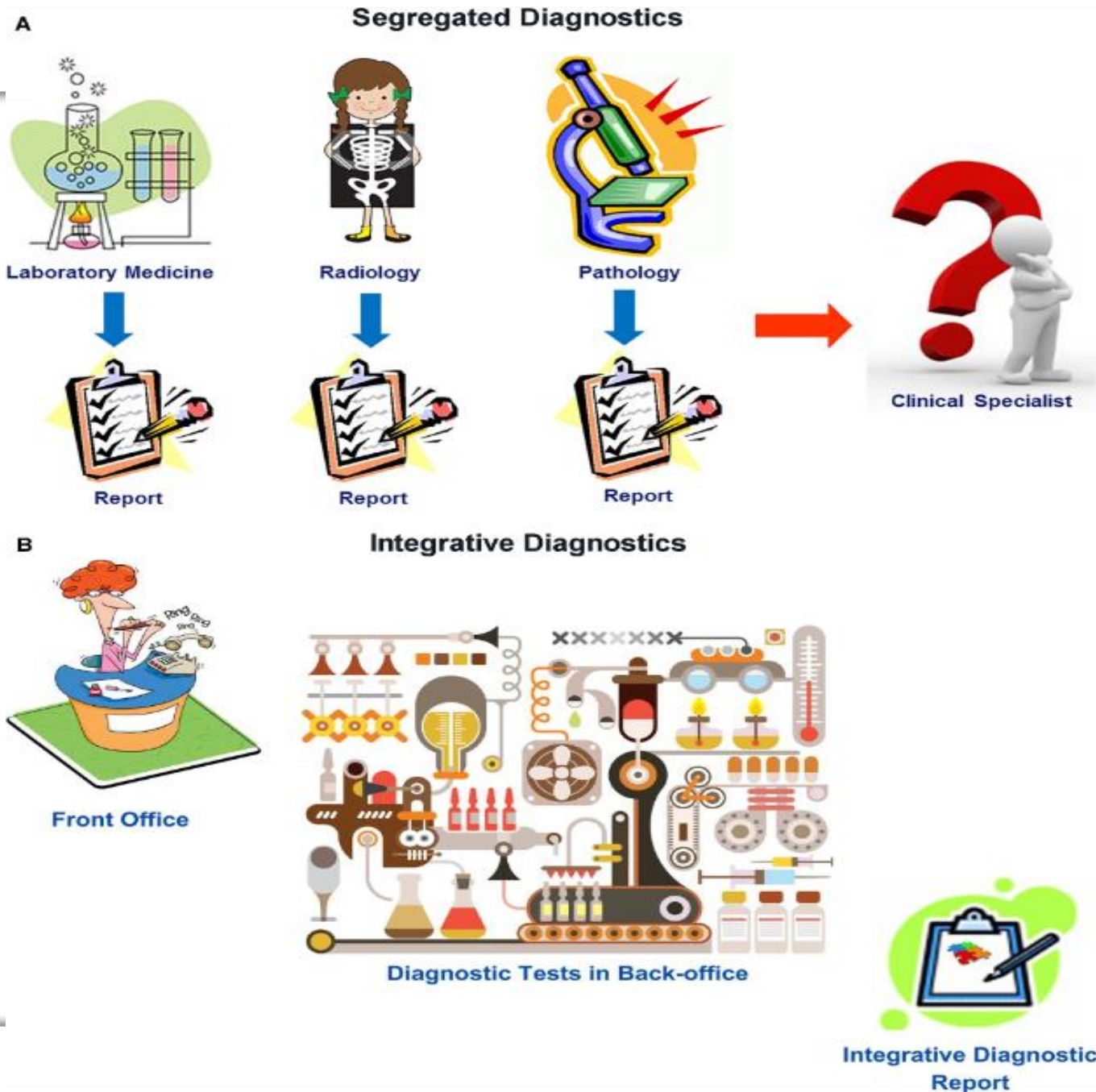
Tumor Type	Marker
Prostate	PSA, 4K score
HCC	AFP
Colon	CEA, Mucin
Ovarian	CA-125
NET	Chromogranin -A
Pancreatic	CA 19-9
Breast	Oncotype DX





# Integrative diagnostics: the time is now—a report from the International Society for Strategic Studies in Radiology

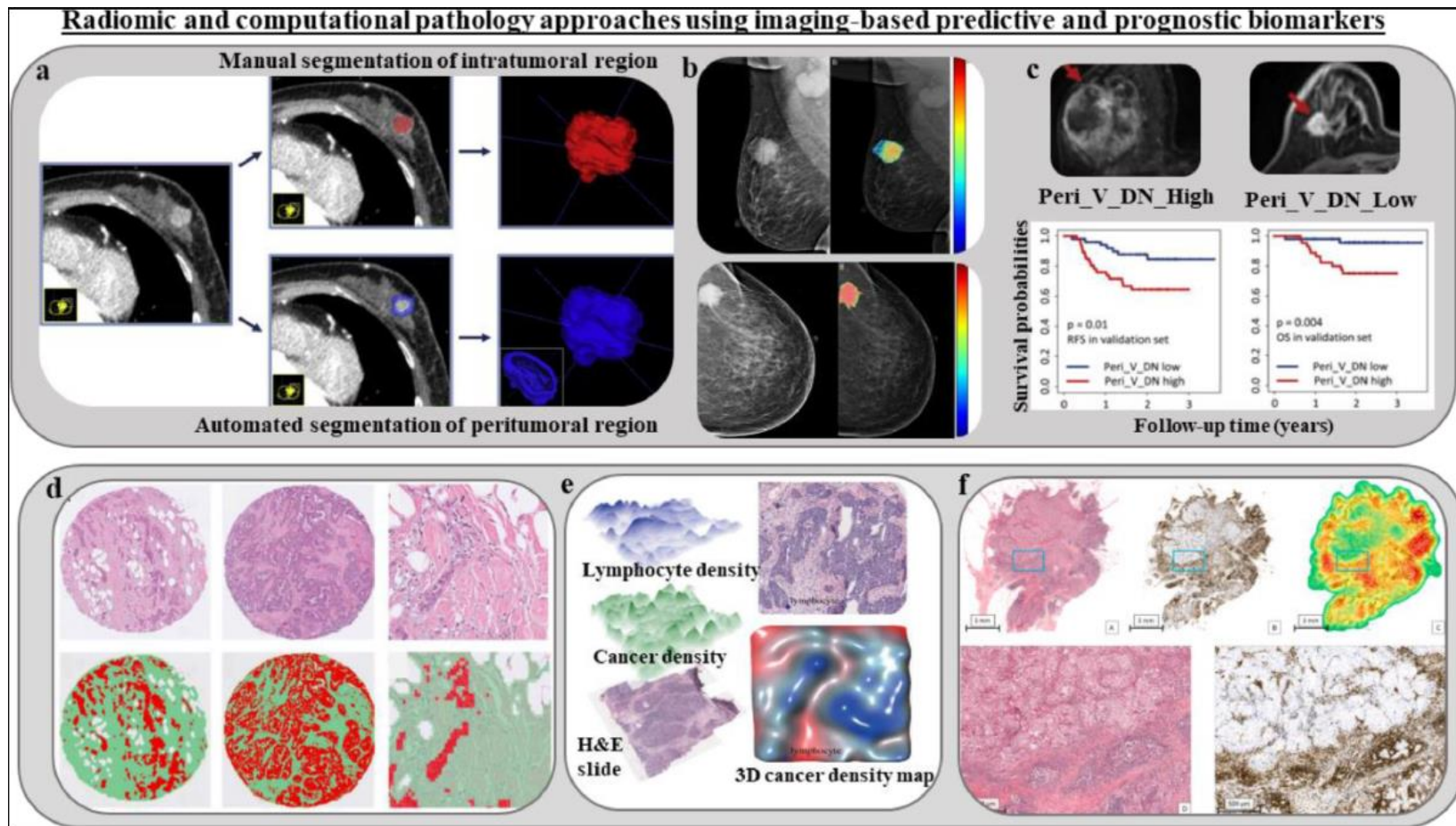
Norman J. Beauchamp<sup>1</sup>, R. Nick Bryan<sup>2\*</sup>, Marilyn M. Bui<sup>3</sup>, Gabriel P. Krestin<sup>4</sup>, Geraldine B. McGinty<sup>5</sup>, Carolyn C. Meltzer<sup>6</sup> and Michael Neumaier<sup>7</sup>



# A Review of AI-Based Radiomics and Computational Pathology Approaches in Triple-Negative Breast Cancer: Current Applications and Perspectives

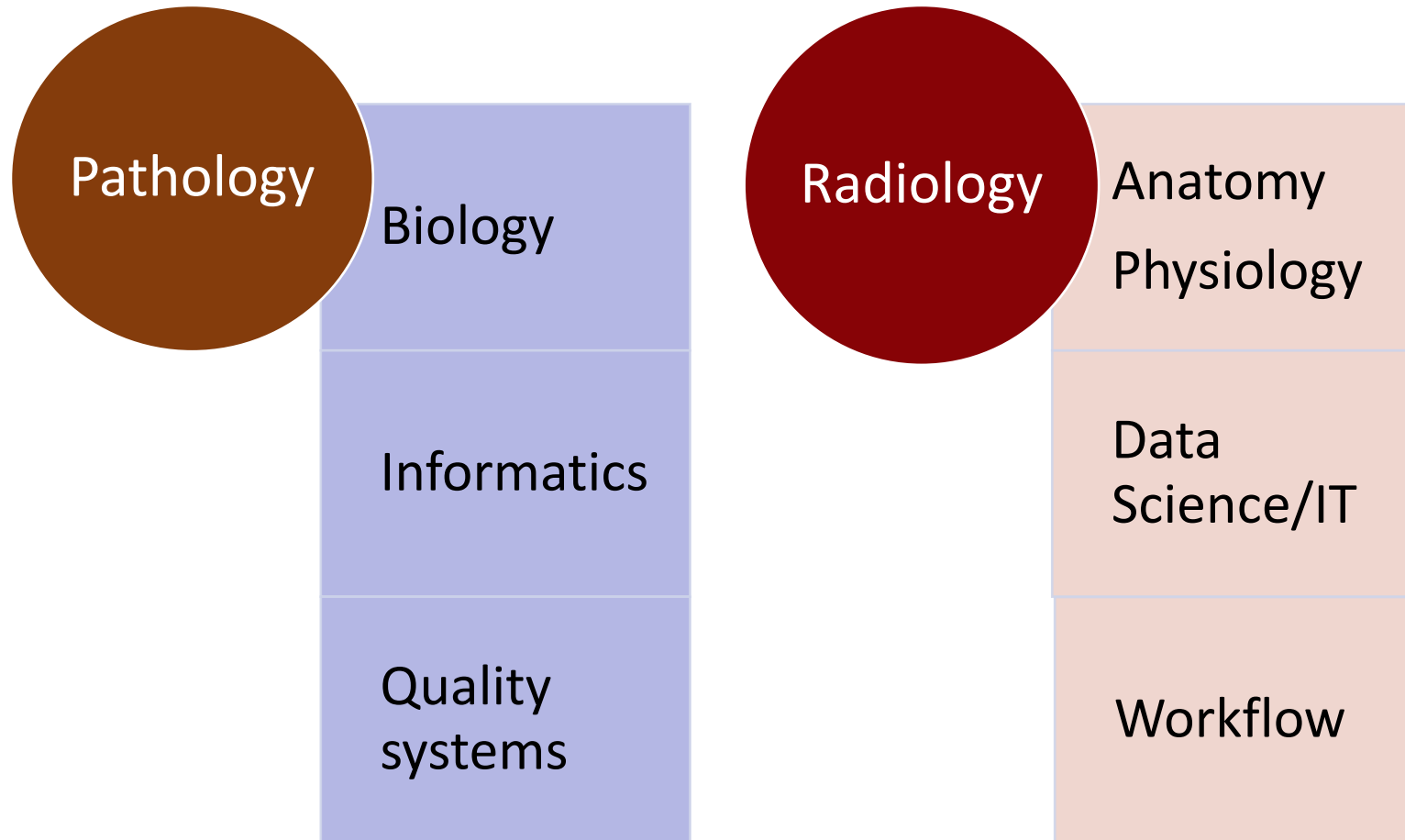
Germán Corredor,<sup>1,2,#</sup> Sarvika Bharadwaj,<sup>1,#</sup> Tilak Pathak,<sup>1</sup>  
 Vidya Sankar Viswanathan,<sup>1</sup> Paula Toro,<sup>3</sup> Anant Madabhushi<sup>1,4</sup>

Clin Breast Cancer. 2023 Jun 21;S1526-8209(23)00161-1.





# Complementary strengths



**PATHOLOGY &  
LABORATORY MEDICINE**



**RADIOLOGY**



# INTEGRATED DIAGNOSTICS



## PROCESS

- Decision Support
- Diagnostic Pathways
- Coordinated Testing
- Results Management



## DATA

- Data Standards
- Data Aggregation
- Phenotype View
- Diagnostic Analytics



## VALUE

- Increase Diagnostic Efficiency and Accuracy
- Improve Patient Experience



## EDUCATION

- Enhance UME/GME
- Combined Fellowship in Image Analytics



## RESEARCH

- AI/Machine Learning on Integrated Data
- Develop Novel Diagnostic Apps
- Collaborative Projects to Enhance Precision Medicine



**Penn Medicine**

# Research Opportunities

- **Diagnostic Data Science Center**
  - Joint radiology pathology program integrating image analytics, biomedical informatics, machine learning, diagnostic decision support, text mining, integrated ontologies
- **Molecular imaging across scales**
  - Probe development, labeling strategies, banking strategy
- **Image guided point of care Diagnostics**
- **Diagnostics implementation science**
- **Diagnostic effectiveness**
  - Develop models of evaluating effectiveness of diagnostics, metrics of value, measuring appropriate utilization, proper integration into practice guidelines



# Summary

- Diagnostics is critical to precision medicine
- This should put Radiology and Pathology on a collision course
  - Radiology and pathology use complementary approaches to interrogating similar anatomy/biology
  - Radiology and Pathology have many similar operational and clinical challenges and complementary strengths
  - Closer integration of Radiology and pathology will improve the diagnostic process.



15<sup>th</sup> Biennial Symposium  
of the International  
Society for Strategic  
Studies in Radiology

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