VCU Core Laboratory Summary

Currently 17 active core laboratories:

Cancer Centre

- Structural Biology
- Flow Cytometry
- Nucleic Acids
- TG Mouse
- Molecular Biology/ Biological Macromolecule
- Vector Virus
- Biostats
- TDAAC (Tissue)
- CRIS (cancer research informatics)
- Behavioral Measurement

Other

- CHiPC (computing)
- MA Twin Registry
- Nanocharacterization
- Proteomic Mass Spectrometry
- Microscopy
- Bioanalytic Mass Spectrometry
- Supply Center

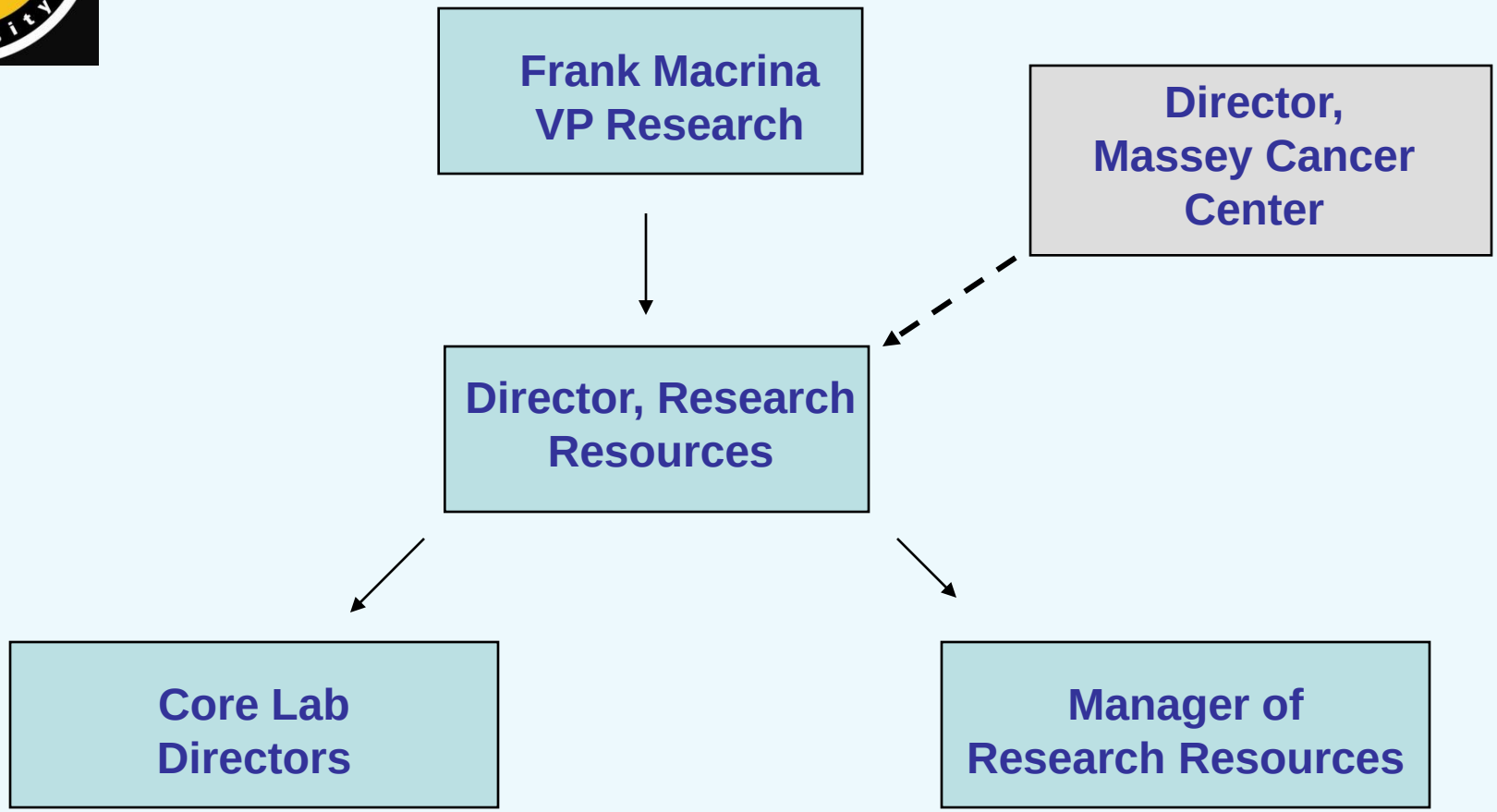
VCU Core Laboratory Summary

Historically:

- No central oversight
- Cores emerged organically
- Most were in Massey Cancer Center – not true “institutional” cores
- Limited strategic planning
- Unsustainable financials
- Heavy dependence on philanthropy

Transition to a centralized model long overdue!!

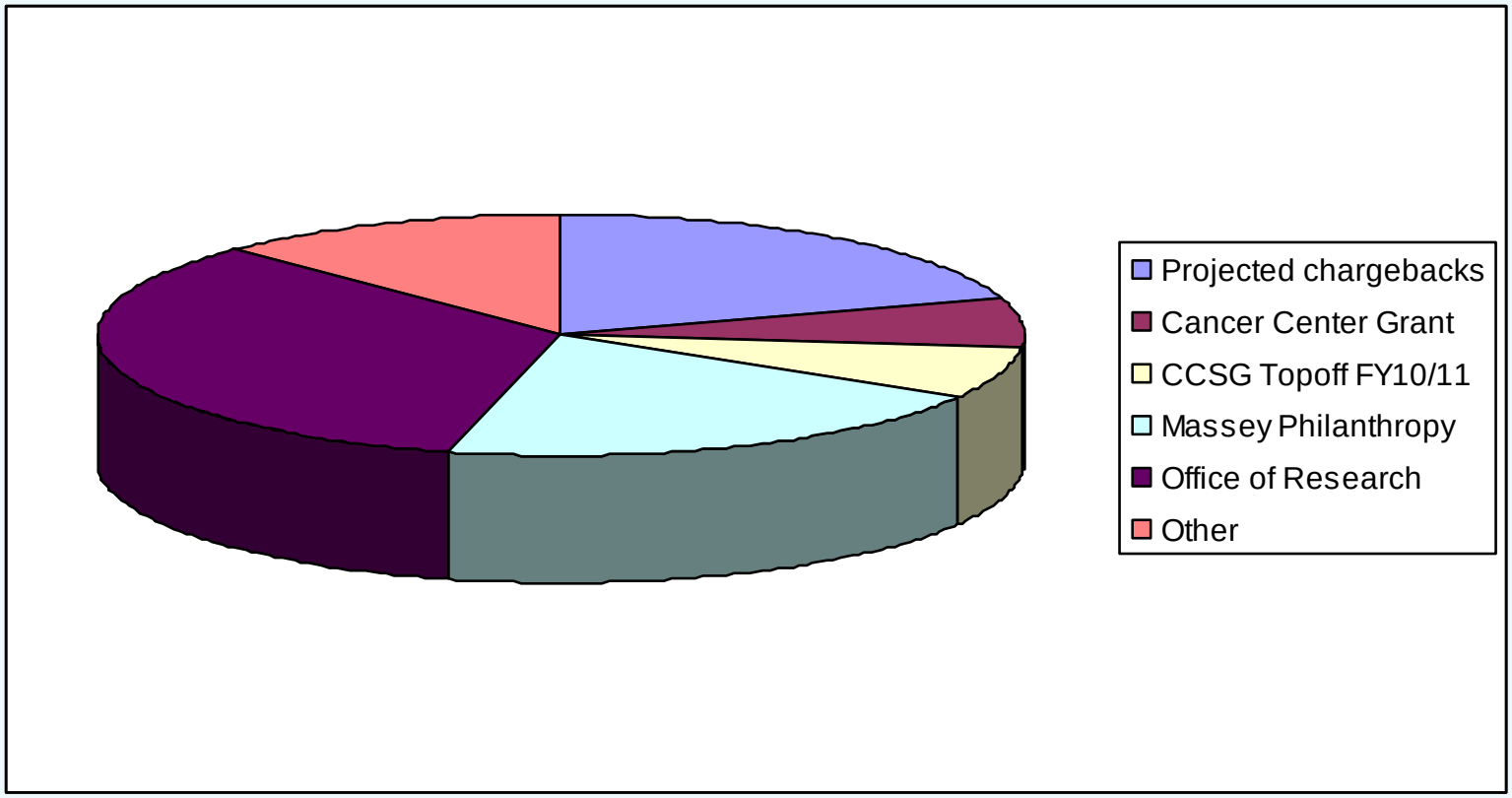
VCU Core Laboratory Organization



All institutional cores are now organized under the Office of the VP Research

VCU Core Laboratory Funding

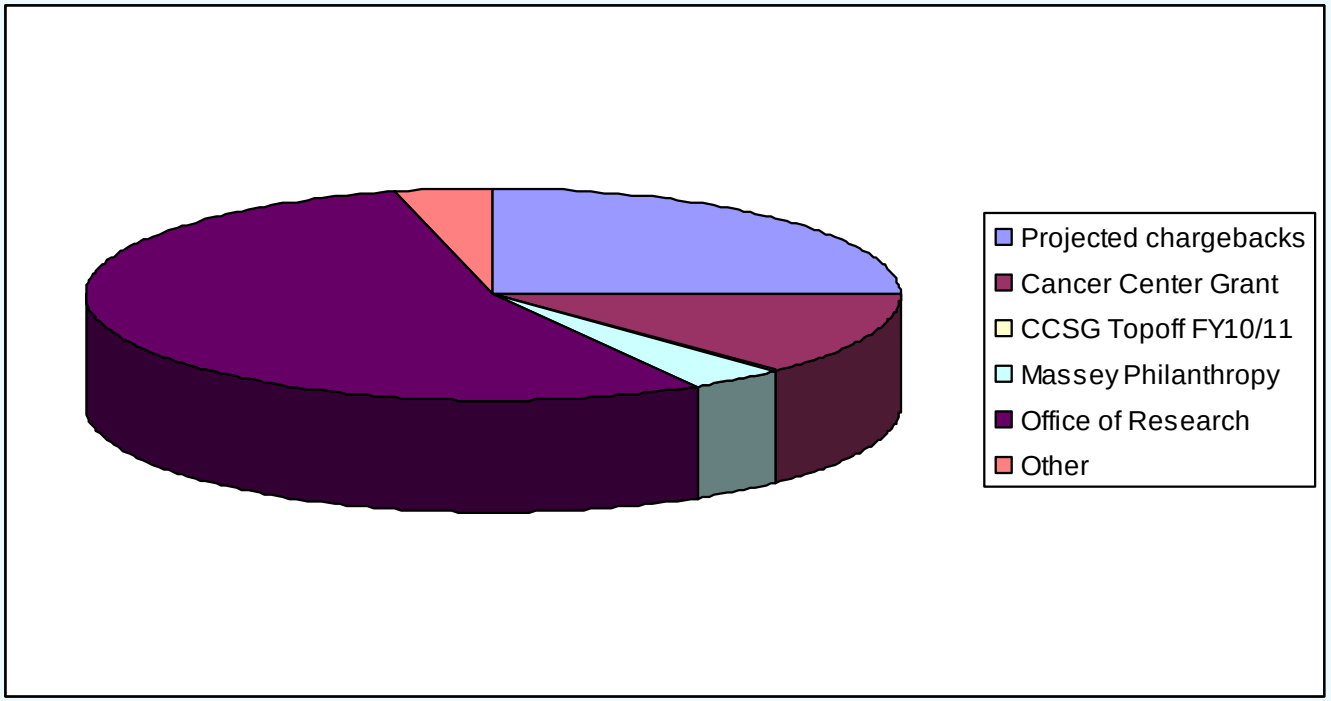
Projections FY 2010



Approximate $3.5 Million total “revenues”

VCU Core Laboratory Funding

Projections FY 2014



Approximate $3.8 Million total “revenues”

Significant financial challenge in future as philanthropic support is phased out

Nanomaterials Characterization Core

www.nano.vcu.edu/NCC/NCC.html

Everett Carpenter, Ph.D. Director

- Hitachi SU-70 Scanning Electron Microscope (SEM)
- JOEL JSM-5610 SEM with EDS capability
- ESCAlab 250 X-ray photoelectron spectrometer
- VEECO IKON Atomic Force Microscope

Coming 2010: HEETF funded Small-angle X-ray scattering (SAXS) system

VCU's newest core - opened in 2009!

Proteomic Mass Spectrometry Core

www.vcu.edu/csbc/msrsbc

Kristina Nelson, Ph.D.
Director

- LCQ Deca XP+ MS
- Micromass Quadropole-time of flight (Q-tof) MS
- Micromass LCTT LC-MS workstation
- Several other LC systems

Coming 2010: High mass accuracy Orbitrap grade instrument with nanoLC front end acquired with HEETF funds!

Nucleic Acids Research Facilities

http://www.narf.vcu.edu/ Sanger Hall 5-050

Gregory Buck, Ph.D.
Director

- DNA Sequencing core
- Oligo synthesis core
- Real Time PCR core
- Microarray core
- ABI freezer programme
- Seqweb – web based GCG bioinformatics suite

Nucleic Acids Research Facilities

ABI Prism® 7900 Sequence Detection System

Quantitative Real-Time PCR
Using TAQMAN chemistry

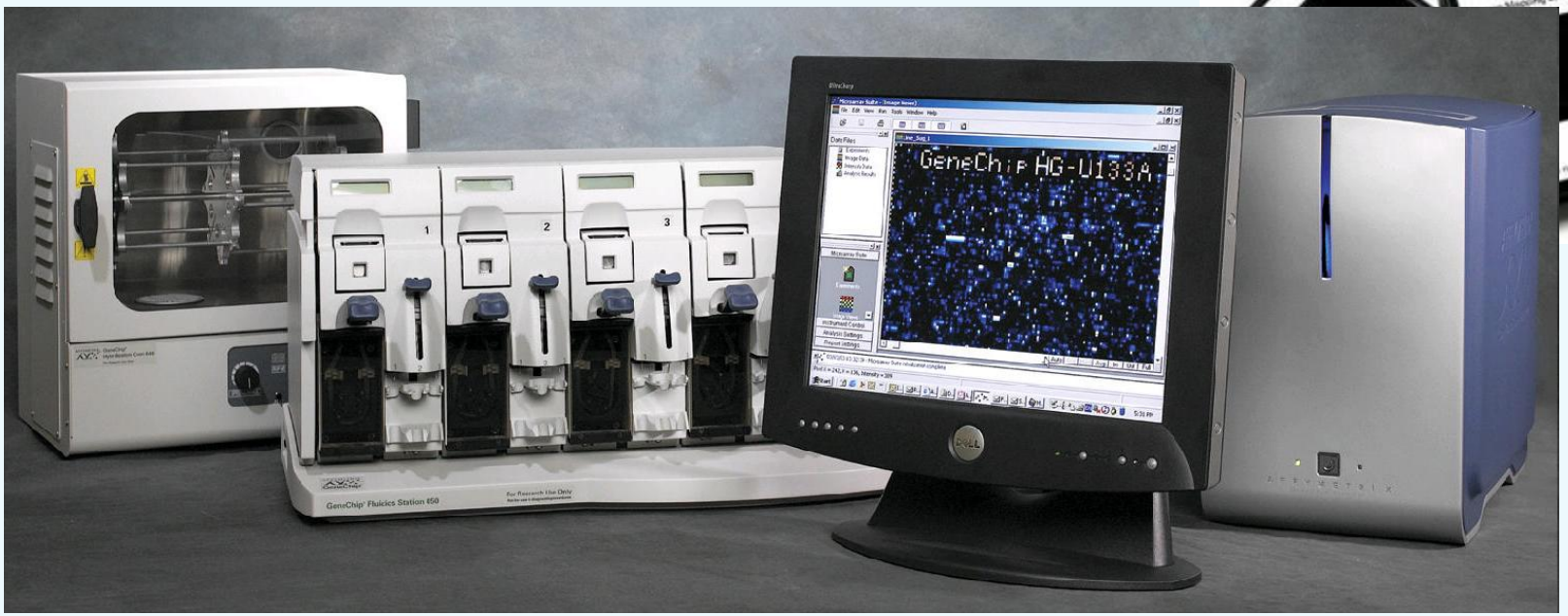
- mRNA quantitation
- sequence detection of SNPs

ABI DNA synthesizer

- Convenience
- ~24 hr turn around
- biotinylated & fluorescent oligos
- HPLC purification

Nucleic Acids Research Facilities

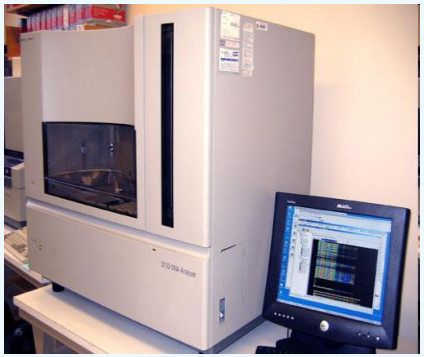
Microarray core



Fully equipped for hybridization and image acquisition of Affymetrix gene chips, including Human Genome U133A 2.0 and Mouse Genome 430A 2.0 chips

Nucleic Acids Research Facilities

- "Traditional" Sanger sequencing by capillary electrophoresis : ABI 3730
  - choice for routine sequencing
- **"Next Generation" sequencing:**
  - 454 Genome Sequencer FLX
    - $4x10^5$ 250 bp reads in one run
    - whole genome sequencing
  - Illumina/Solexa 1G
    - 6×10^7 25 bp reads in one run
    - re-sequencing and variant detection



ABI 3730 Genetic Analyzer

454 Genome Sequencer FLX

Illumina 1G

Nucleic Acids Research Facilities

Illumina BeadStation 500

Multiple applications:

Illumina Beadstation 500

- **SNP Genotyping** – linkage and fine mapping
  – multiplex up to 1536 SNP loci/rxn
- **Methylation profiling**

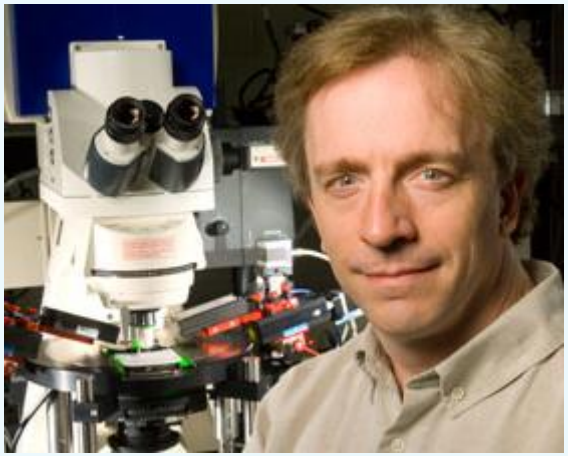
- epigenetic changes on a genome-wide scale!

- **Bead Arrays** - Genome-wide expression profiling

Microscopy Facility

www.vcu.edu/anatomy/microscopy/

Sanger Hall 9th Floor

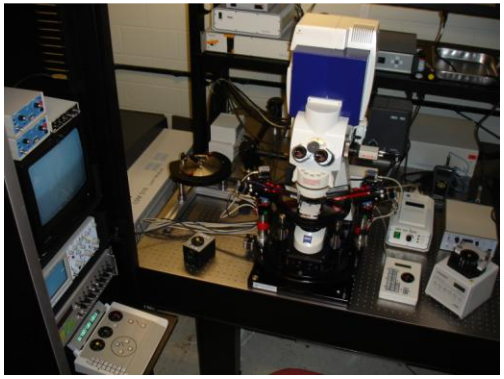


S.C. Henderson, Ph.D.
Director

- Access to advanced equipment
- Instruction
- Consultation
- Collaboration
- Service
- Grant applications

Microscopy Facility

- multi-photon laser scanning microscope
- confocal laser scanning microscope
- multi-channel TIRF microscope
- widefield fluorescence microscope
- transmission electron microscope (TEM)
- scanning electron microscope (SEM)
- scanning probe atomic force microscope
- stereology system
- microdissection system
- multi-dimensional image analysis
- deconvolution
- live cell imaging
- FRET / FRAP
- molecular localization
- cyro-ultramicrotomy



Transgenic/ Knock Out Mouse Core

http://www.massey.vcu.edu/research/?pid=2003

Jolene Windle, Ph.D.
Director

- Transgenic mouse production
- Knock-out/knock-in mouse production
  - ES cell electroporation
  - Colony selection and screening
  - Blastocyst injection
- Mouse line re-derivation
- Embryo cryopreservation
- DNA purification and genotyping
- Consultation on project and vector design,
- Training in mouse husbandry protocols, *etc.*

Structural Biology Shared Resource

http://www.massey.vcu.edu/research/?pid=2002

Jan Chlebowski, Ph.D.
Director/Coordinator

- X –ray crystallography
  - H. T. Wright, Ph.D.
  - Martin Safo Ph.D.
- NMR spectroscopy
  - J. Neel Scarsdale, Ph.D.
- Molecular Modeling Facility
  - Glen Kellogg, Ph.D.

Structural Biology Shared Resource

Molecular Modeling Resources

Glen Kellog, Ph.D.

- Hardware

  16 SGI graphics Workstations
  Linux File Server
  Laser Printers

- Software

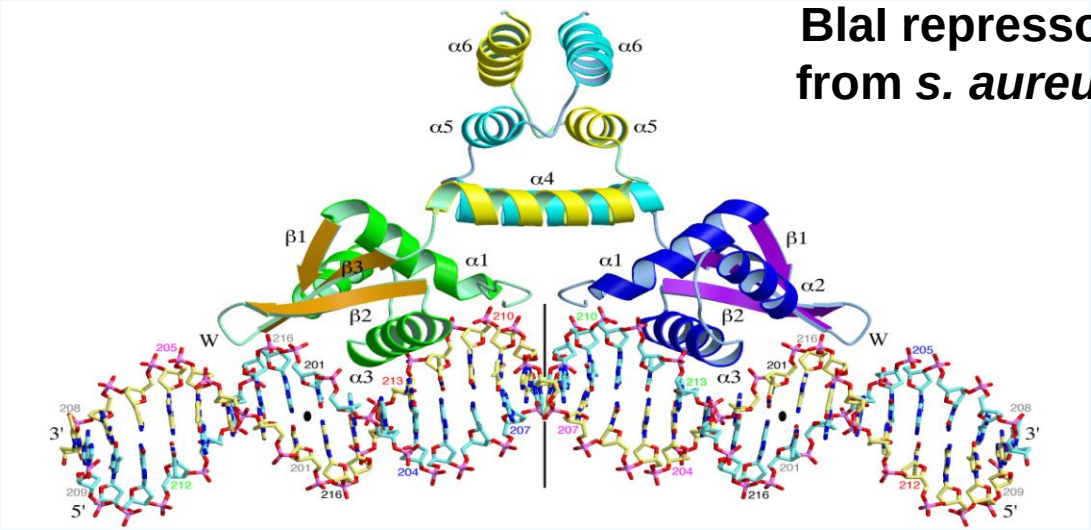
  Sybyl • HINT •
  Insight II
  Bioplymer • Delphi
  Felix • Homology
  Other Modeling Software
  Databases:
    - NCI 3D
    - Pomona MedChem

  Developmental Software

Structural Biology Shared Resource

X –ray crystallography resources

Martin Safo, Ph.D.



BlaI repressor from *s. aureus*

- Raxis-IV++ imaging plate detection system
- X-Stream cryogenic system
- MicroMax-007 high frequency rotating anode
- Blue Max-Flux Confocal optical system
- Raxis-IV++ 2θ stage
- CrytalClear software (data acquisition and processing)

Structural Biology Shared Resource

NMR Spectroscopy Resources

J. Neel Scarsdale, Ph.D.

Brand New

600 and 700 MHz

Bruker NMR instruments

installed summer 2009 are

available NOW!!

Biological Macromolecule Core

www.pubinfo.vcu.edu/mlbiocre Sanger Hall 6-047

Shirley Taylor, Ph.D.,
Director

Darrell Peterson, Ph.D.,
Co-director

- Routine molecular biology procedures
  - Mini, midi, maxi scale plasmid preps
  - Bacterial transformation
  - Insert purification
  - Genomic DNA, RNA, and miRNA isolation
  - siRNAs from Invitrogen and Qiagen
- Custom Services
  - Custom subcloning
  - Library screening
- Site directed mutagenesis
- *Recombinant protein production*

Biological Macromolecule core now provides protein purification services as a major new activity!!

Center for High Performance Computing (CHiPC)

http://www.vcu.edu/csbc/bccl/

Gregory Buck, Ph.D.
Director

- Supports computationally intensive projects of all descriptions including bioinformatics and structural modeling
- Currently maintains a very heavily utilized 496 node “Beowulf class” cluster.
- >40% of use comes from medical campus

Center for High Performance Computing (CHiPC)

- Demand for processor cycles at VCU doubles every eighteen months and is accelerating

- Harris Hall server room renovation:

  Phase I: Grand opening November 2009

Supports up to 2500 processor nodes

- 4x Infiniband initiative: will provide networking infrastructure for a sub-cluster that is highly optimized for multiprocessing jobs. A single Gromacs job should scale properly to at least 64 processors, NAMD to 128 processors

Flow Cytometry Shared Resource

www.massey.vcu.edu/research/?pid=1995

Dan Conrad, Ph.D.
Director

Flow Cytometry

Analysis: **Full range of analyses including DNA/cell cycle, 4-color immunofluorescence, apoptosis, viability/cytotoxicity, membrane potential**

Sorting: **Sterile or clean sorting of viable or fixed cells with >95% purity**

Autocloning: **Sorting >1 cell into media-filled plates, 6-96 wells, or into PCR plates**

High Speed Sorting: **Sterile, 1- to 4-way sorting with >95% purity**

Confocal Imaging

Also offered in this core!!

Flow Cytometry Shared Resource

Moflo High Speed Cell Sorter

XL-MCL Flow Cytometer

Elite Flow Cytometer and Sorter

Now operational!
BD FACSAria Cell-Sorting System

Tissue & Data Acquisition & Analysis Core

www.pathology.vcu.edu/research/TDAAC/

Carleton Garrett, M.D., Ph.D. Director

- **Sample processing**

Catherine Demur, Ph.D.

  – obtain biomolecules for analysis

  – gene expression analysis

Amy Ladd, Ph.D.

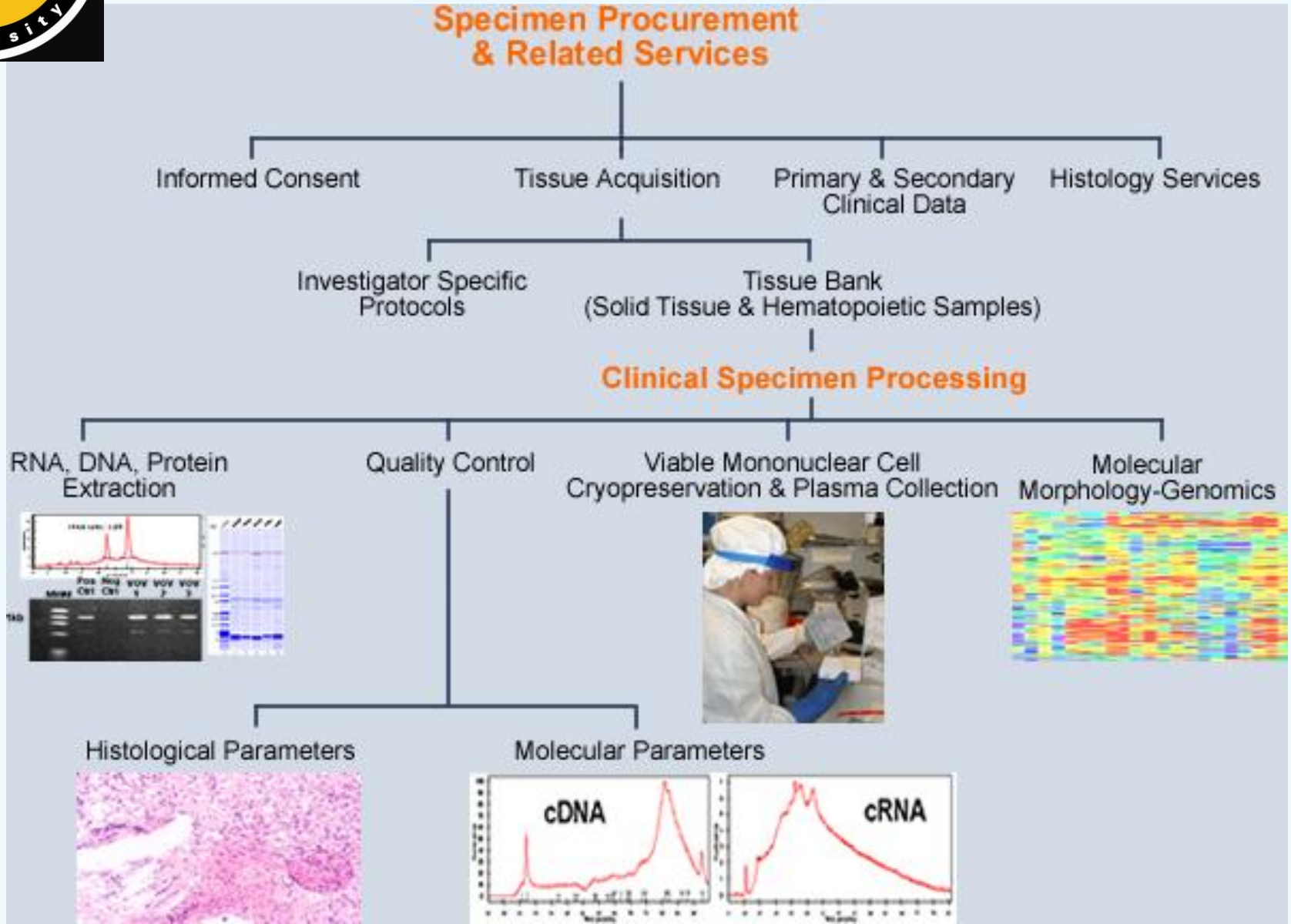
  – Laser Capture Microdissection

- **Clinical annotation**

Lynne T Penberthy, M.D. Ph.D.

TDAAC is a *portal of entry* for VCU investigators to access *human tissue samples* to support IRB approved research projects.

Tissue & Data Acquisition & Analysis Core



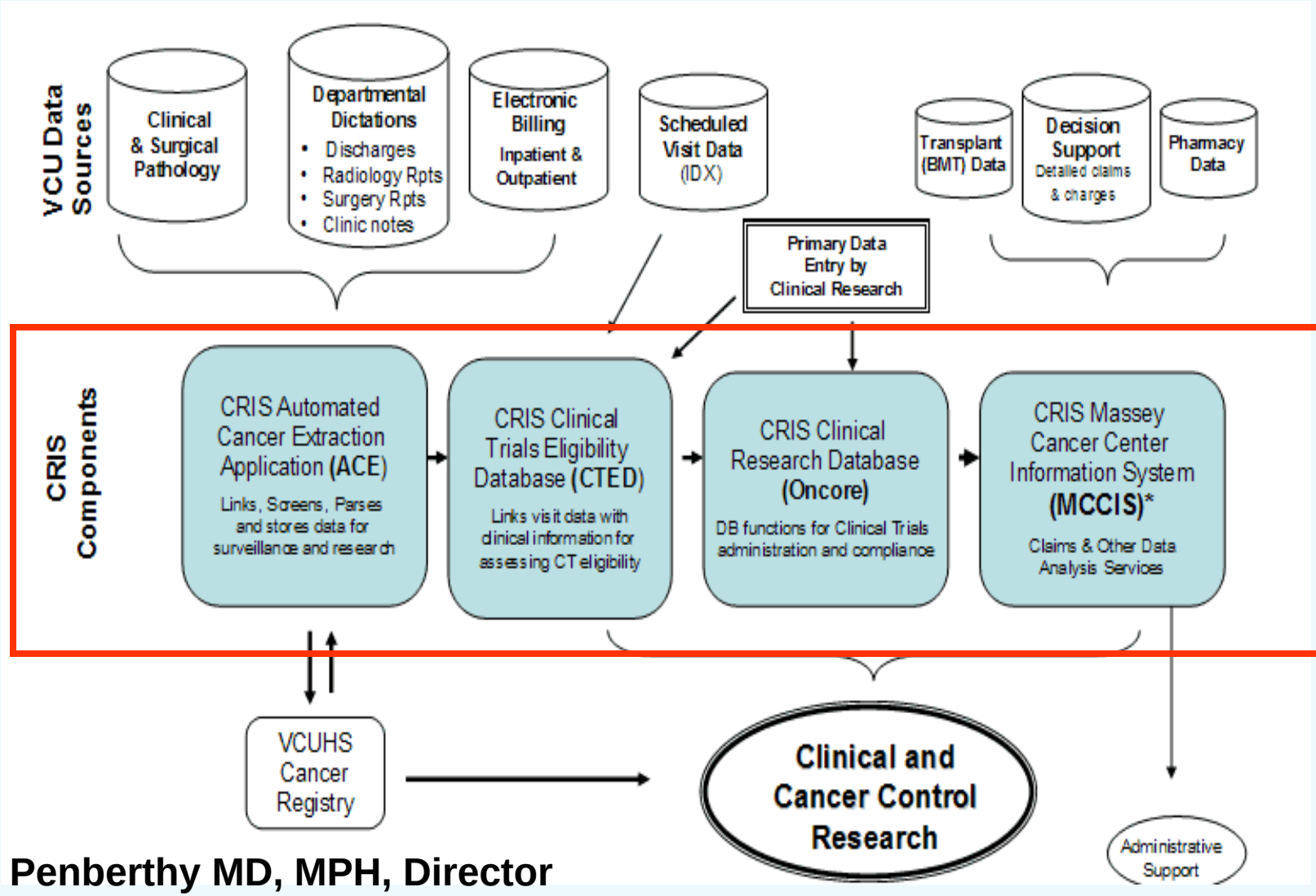
Clinical Trials and Research Specimen Processing Service

www.pathology.vcu.edu/clinical/outreach/research.html

- **Routine Clinical Laboratory Testing**
  - Chemistry, Hematology, Immunology, Microbiology, Molecular Testing
  - Anatomic Pathology
- **Specimen Collection (Phlebotomy, Urine Collection)**
- **Specimen Processing Services**
  - Processing for Central & PK/PD laboratories
  - Centrifugation (custom rcf & temp)
  - Custom aliquotting
  - Storage at flexible temperatures (-70°C, -20°C, 4 C, RT)
  - Shipping (Certified for diagnostic, infect, IATA, Hazmat)

Cancer Research Informatics and Services

www.massey.vcu.edu/research/?pid=2176



Lynne Penberthy MD, MPH, Director

Cancer Research Informatics and Services

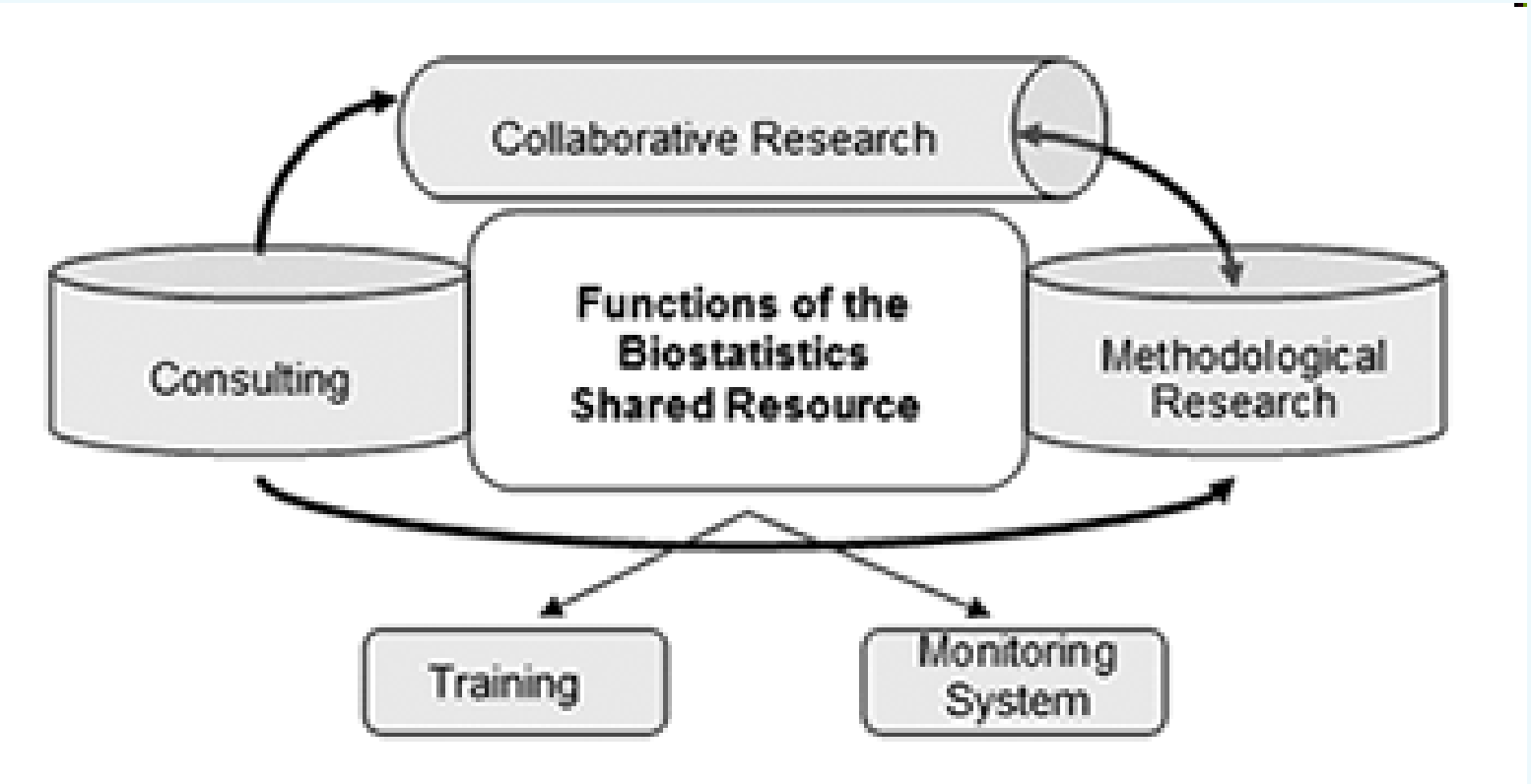
In addition to data and informatics support, services provided by CRIS include:

- Population sample estimates.
- Study sample creation.
- Consulting for grant applications.
- Analysis of data.
- Creation of customized data sets.
- Query development and report development.

Lynne Penberthy MD, MPH, Director

Biostatistics Shared Resource Facility

http://www.massey.vcu.edu/research/?pid=1994



BSR consultations are FREE for MCC members!

Mid-Atlantic Twin Registry

www.matr.vcu.edu

- Population-based registry of twin pairs from Virginia, North Carolina, and South Carolina

- ~300,000 identical and fraternal twin pairs born between 1915 and 1998

- Assist with identifying twin pairs, research compliance, assurance of privacy, etc.

One of the world's largest twin registries!

Developmental Cores & Future directions

- Behavioral Measurement
  - Dr. L. Dumenci
  - BMs relevant for cancer research
  - Psychometric evaluation of existing measures
- Lipidomics
  - Dr. Sarah Spiegel
  - 4000 QTRAP and a 3200 QTRAP instruments now available
  - Seeking to expand user base
- Small Molecule Bioanalytic MS
  - Dr. Thomas Karnes
  - ABI QTrap 4000