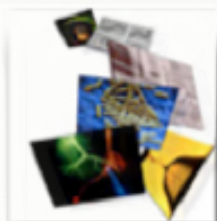




NMR
Core facility



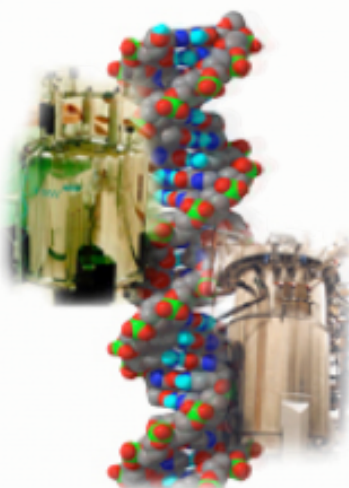
DNA : Protein
Core facility



Molecular Interactions
Core facility



Mass Spectrometry
Core facility



Combinatorial
Core facility

Advanced Biotechnology CORE Facilities



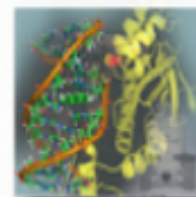
Fermentation
Core facility



Bioimaging
Core facility



Confocal
Core facility



Structural
Core facility

Welcome !!

欢迎



Goals of the Course: The primary objective of this course is to introduce students to the sophisticated technology that is / will be available in the **ABCore facilities** at Georgia State University and to provide them with some in-depth background and history to the molecular biological techniques that these technologies employ. To achieve these goals, students will be given live instruction and directed to some video experience in performing "wet lab" purification of RNA and DNA. Informational lectures will be provided, where needed, to cover the scientific background behind the techniques as well as in-depth videos that will detail how the instruments can be used. Students will be expected to maintain a legible and well organized notebook of the activities carried out/discussed throughout the course.

ATTENDANCE (70%)

ON-LINE QUESTIONS / Notebooks (30%)

Attendance: Students will be expected to attend ALL classes at the scheduled time. Owing to the nature of the course, however, some web based activities may extend beyond the assigned time. On these occasions, students who need to leave early should email / txt the instructor **in advance that they need to do so**. Failure to attend two or more class days without such notification will forfeit ALL points given for attendance.

Ethical considerations: Unless otherwise stated, all examination answers that are submitted for evaluation are considered to be the sole property and ideas of each individual student. Any student(s) caught copying or cheating will automatically receive **zero credit** for that particular submission, and possibly be subject to further disciplinary action.

Be aware of **Plagiarism**. All students should be aware of the academic honesty policy (<http://deanofstudents.gsu.edu/faculty-staff-resources/academic-honesty/>).

BIOL4905: Summer Semester '22 -CRN 51749

#	Date	Time	Lecture Description
	July 6th	9:00 am -10:00 pm	Welcome Reception
1	July 7th	1:30 pm - 4:30 pm	Introduction -ABCore -Training
2	July 8th	1:30 pm - 4:30 pm	Plasmid DNA Preparation
	July 9th	--	WEEKEND
	July 10th	--	WEEKEND
3	July 11th	1:30 pm - 4:30 pm	Proteomics I
4	July 12th	1:30 pm - 4:30 pm	Proteomics II
5	July 13th	1:30 pm - 4:30 pm	Proteomics III
6	July 14th	1:30 pm - 4:30 pm	---
7	July 15th	1:30 pm - 4:30 pm	RNA Preparation
	July 16th	--	WEEKEND
	July 17th	--	WEEKEND
8	July 18th	1:30 pm - 4:30 pm	qPCR & Robot
9	July 19th	1:30 pm - 4:30 pm	DNA Sequence Analysis
	July 20th	-	MINI BREAK
10	July 21st	1:30 pm - 4:30 pm	CDC Museum TRIP Microscopy / AFM
11	July 22nd	1:30 pm - 4:30 pm	Next Gen. DNA Sequence Analysis
	July 23rd	--	WEEKEND
	July 24th	--	WEEKEND
12	July 25th	1:30 pm - 4:30 pm	Microarray I
13	July 26th	1:30 pm - 4:30 pm	Microarray II
14	July 27th	1:30 pm - 4:30 pm	Nanostring
15	July 28th	1:30 pm - 4:30 pm	Flow Cytometry
-	July 29th	1:30 pm - 4:30 pm	- FINAL-
	July 30th - Aug 3rd	--	RECREATION

SUMMER INSTITUTE CALENDAR 2022

SUN	MON	TUE	WED	THU	FRI	SAT
						July 02
						Early Arrival Airport Arrivals and Check-in
July 03	04	05	06	07	08	09
Early Arrival Airport Arrivals and Check-in	Airport Arrivals and Check-in 6:00pm: 4th of July Celebrations	9:30am-12pm: Campus tour, Panther ID & ISSS Check-in 12-2pm Lunch 2:00-6:00pm, Shuttle to local grocery store	9:30am-11:30am ISSS, OII, & Housing Orientation & Presentation 2:30-4:30pm: Welcome Reception and Buddy Meet & Greet Event	Classes begin! 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 INTRO - TRAINING	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA PREPARATION	Free Day
10	11	12	13	14	15	16
12:00-4:00pm: The World Coca-Cola and Georgia Aquarium	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS I	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS III 6:00-10:00pm: Atlantic Station Shopping & Movie (Sign-up)	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS IV ?	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 RNA PREPARATION	6:00-9:00pm: Dinner in America (Sign-up)
17	18	19	20	21	22	23
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 qPCR & AUTOMATION	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA SEQUENCING	MINI BREAK	9-11:20am: Morning course CDC TRIP 1:30-4:30pm: BIOL4905 MICROSCOPY / AFM	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30 - 4:30pm: BIOL4905 NEXT GEN SEQ. 5:30-7:30pm: Meet & Greet BBQ event @ The Commons	9:00am - 6:00pm: Outlet Mall
24	25	26	27	28	29	30
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 MICROARRAY I	9-11:20am: Morning course 12:30 - 1:30pm: Lunch and LearnGrad School Info Session 2:00 - 5:00pm: BIOL4905 MICROARRAY II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 NANOSTRING	Last day of classes 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 FLOW CYTOMETRY	FINALS	Free Day
31	August 01	02	03	04		
Free Day	Activity Day at the Recreation Center (Sign-up)	Free Day	9:30-11:00am: Georgia Capitol Tour (Sign-up) 2:00-4:00pm: Closing Reception	Departures (check-out at 12:00pm)		

Note: Students may arrive prior to the program date with an extra charge of \$35 per night. Earliest day to check-in to University Commons is July 2.

Legend:

Orange: Courses Blue: Lunch Break Red: Sign-up events



NMR
Core facility



DNA : Protein
Core facility



Molecular Interactions
Core facility



Mass Spectrometry
Core facility



Combinatorial
Core facility



Advanced Biotechnology CORE Facilities

Director: Houghton

Cell, Protein & DNA
Core facility



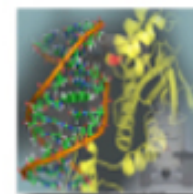
Fermentation
Core facility



Bioimaging
Core facility



Confocal
Core facility



Structural
Core facility



Petit Life Science Center



Natural Science Center

Center for
BIOTECHNOLOGY
& DRUG DESIGN

ABC Core Facilitie

Genomics Core Facility

WORKFLOW

1. MICROARRAY CYPIC/CHIP PRESSION
2. TARGET PREPARATION
3. TARGET HYBRIDIZATION
4. FLUIDICS
5. PROBE ARRAY WASH AND STAIN
6. PROBE ARRAY SCAN
7. DATA ANALYSIS

3. Fluidics station 450: wash & stain chip

4. Affymetrix GeneChip Scanner 7G

Report



Atomic Force Microscopy Core Facility

What is AFM and How does it work?

Atomic force Microscope (AFM) operates by measuring attractive or repulsive forces between a probe or "tip" and the sample. The tip is located at the end of a leaf spring or "cantilever". A laser beam is reflected off the cantilever. Any angular deflection of the cantilever caused by the change of the force between tip and sample is represented by the angular deflection of the laser beam. Images are taken by scanning the sample relative to the tip and measuring the deflection of the cantilever as a function of lateral position. Different from traditional microscope, image from AFM is three dimensional.

Applications in protein structure analysis

AFM can be used in analyzing protein structure after system is loaded to the flat surface. like *glutinin*, *antimicrobial* (mycolic acid) loaded to the flat surface, or *lipids* (Droplet Protein) (APES) mica, give discharge images, or images (Droplet Protein) (lipids) (protein). The scanning can either in air, after sample is dried, or in liquid, in like buffer or medium.


DNA Sequencing Core Facility
 Ping L. Jiang (pjia@gsu.edu) / 404.413.5370


Principle of DNA sequencing

- Single sequencing (Sanger/Pyrosequencing)

What happens to Your DNA

Ideal Results

Results that are not so great

high GC

possible secondary structure

Troubleshooting 1: Template problems

Troubleshooting 3: Cleaning problems

A little expertise just around the corner

Principle of DNA sequencing

- Sanger sequencing (dideoxy/nucleotide method)

What happens to Your DNA

Step 3

A little expertise just around the corner

Welcome
Cell

is three dimensional.

Flow Cytometry

Debby Walhall@walthall@gs

Instrument/Services Analysis Software

Divs Software
FACSanto and FACSAria

Welcome
Cell, Protein and DNA Core Facilities



About

Welcome to GSU
Cell - Protein - DNA
Core Facilities

Resources



Services

Learn about some of the services that the core facility offers

Instrumentation

Find out what equipment and facilities are available for your use

Contacts
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 Tel: 404-413-5390 | Email: jhoughton@gsu.edu

Debby Walthall
 Research Scientist
 Tel: 404-413-5363 | Email: dwaltall@gsu.edu

What's New?



ore Facility

Georgia State University

3. Image Quantitation

Sample Analysis and Detection: Image Analysis and Quantification

Spot picker and Protein and Peptide digestion

Automated Protein Digestion

Automated or Manual Protein Digestion

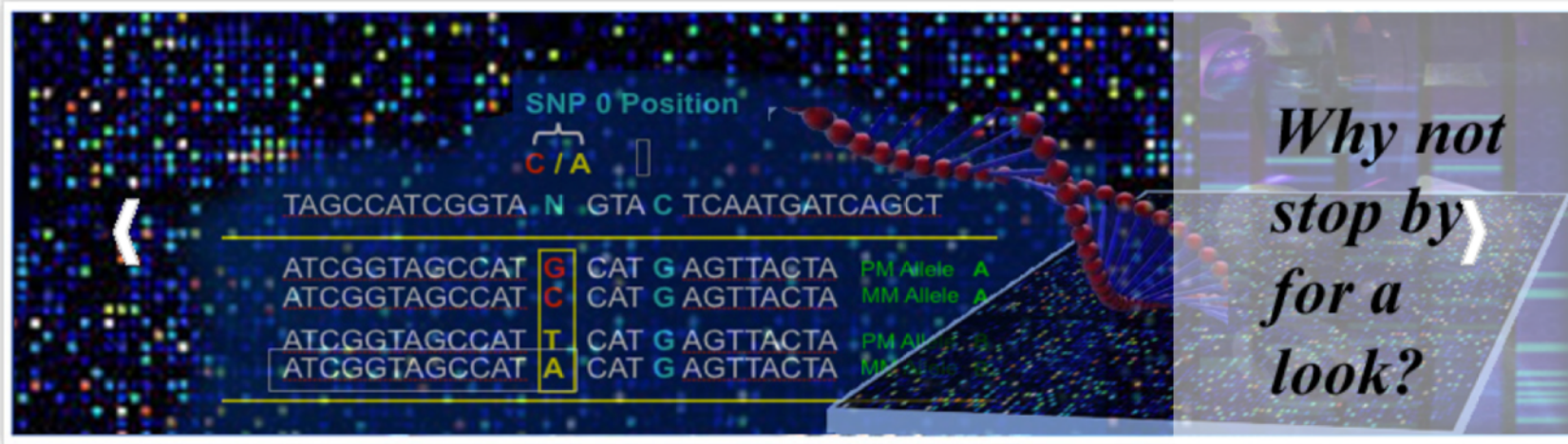
S. TOF/TOF MALDI Mass spectrometry and Data Analysis & db search

Protein Identification

Protein	Score	Protein	Score
Protein 1	1000	Protein 2	950
Protein 3	900	Protein 4	850
Protein 5	800	Protein 6	750
Protein 7	700	Protein 8	650
Protein 9	600	Protein 10	550
Protein 11	500	Protein 12	450
Protein 13	400	Protein 14	350
Protein 15	300	Protein 16	250
Protein 17	200	Protein 18	150
Protein 19	100	Protein 20	50

Saturday, November 28, 2009

<http://biotech.gsu.edu/core>



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Services

Learn about
some of the
services that
the core
facility
offers



Instrumentation

Find out what equipment
and facilities are
available for
your use



What's New?

Find out what's new in
the Cell - Protein -
DNA Core Facilities



(Level I) General Access Instrumentation

Effectively low maintenance, “relatively” generic, but technically proficient instrumentation that is normally operated by graduate researchers and other research personnel on a daily, routine basis .

(Level II) Specialized Instrumentation

High maintenance, sophisticated instrumentation, available for operation by general graduate researchers and technical support staff after they have received specific and thorough training in the appropriate use of the technology.

(Level III) Centralized Instrumentation / Service

(a) DNA Purification & Sequencing (mapping)

(b) Genomics / Proteomics

(c) Atomic Force Microscopy

(d) Mass Spectrometry/NMR

(e) Cell Analysis / Sorting

High maintenance, highly sophisticated instrumentation, operated by qualified, technical personnel.

Level I

**General Access Equipment
(relatively low maintenance)**



from permeablizing cell membranes -
Gene Pulse Electroporation System (BioRad).....

..to Cell breaking -**Sonifier 450**
 (Branson -top right)
 and
 French Press (Aminco)





Lyophilizer (LabConco)



**Liquid scintillation Counter LS6500
(Beckman)**

**Thermocyclers
(Eppendorff)**



Automated Protein Separation



**AKTA
Explorers / Purifiers (GE)**



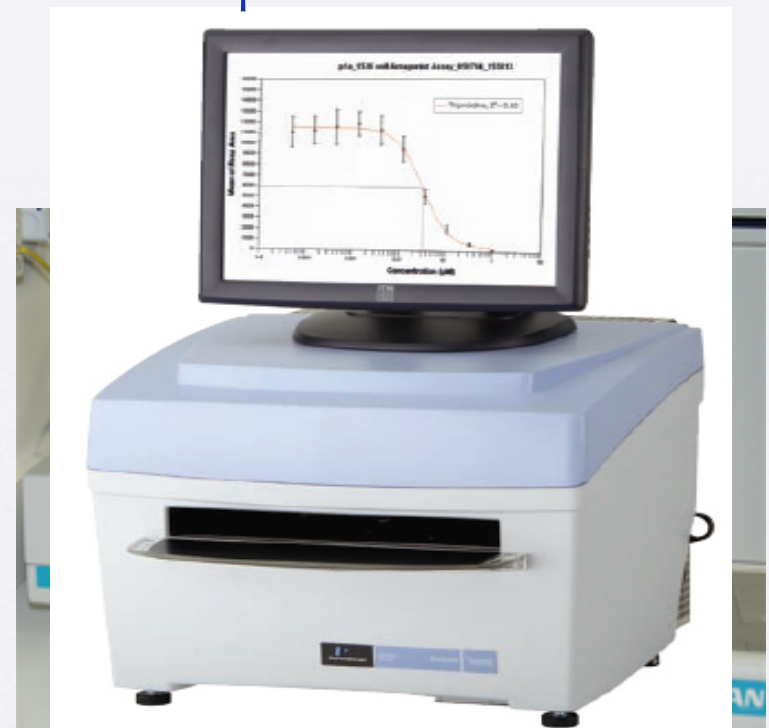


Victor X3 plate-reader
(Perkin Elmer)

Assorted Micro-Plate Readers



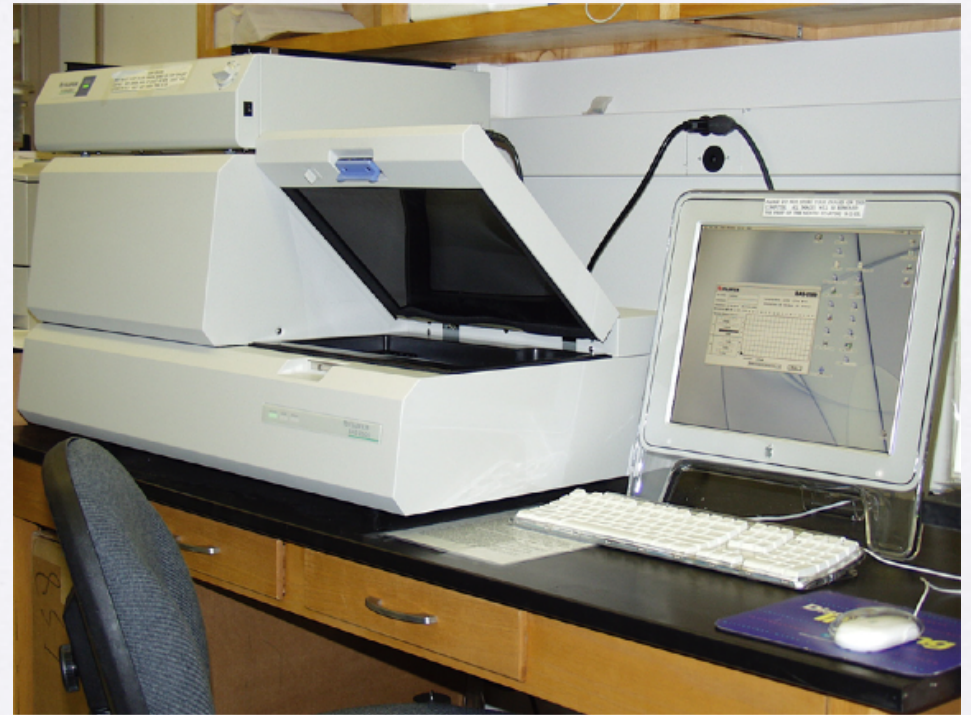
Spectramax iD5



EnSpire Multimode Plate Reader



Omega UV-Imaging System
(Ultra-Lum)



Phosphoimager
(Fuji) Model **Bas 2500**



UVP GelDoc
Gel documentation imaging system



Fluorescent Bioimaging System

Typhoon 7000R Ge (Zyco)

Chemi-Luminescence Image Analyzer

(Fuji) Model LAS-4000-mini





Optima MAX-XF

Table-top Optima model-

**Assorted Centrifuges
and
Ultracentrifuges-**

to the Analytical XLA-X1

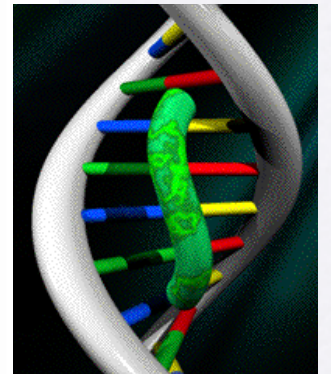
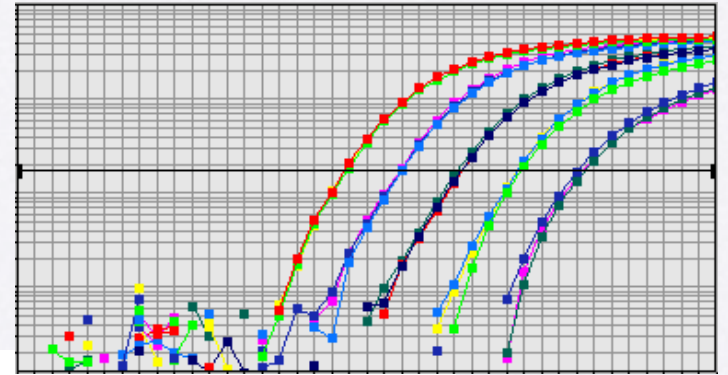


Level II

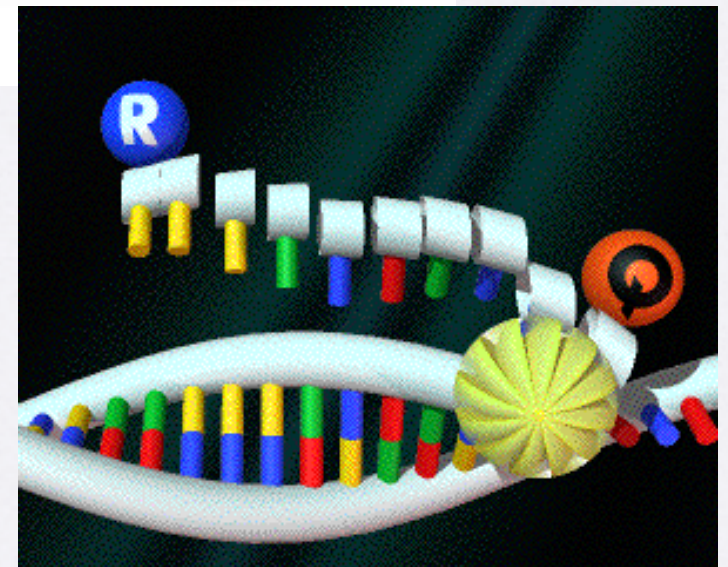
**Specialized Equipment
(high maintenance)**

Level III

**Centralized Equipment. Service
and Molecular Analysis**

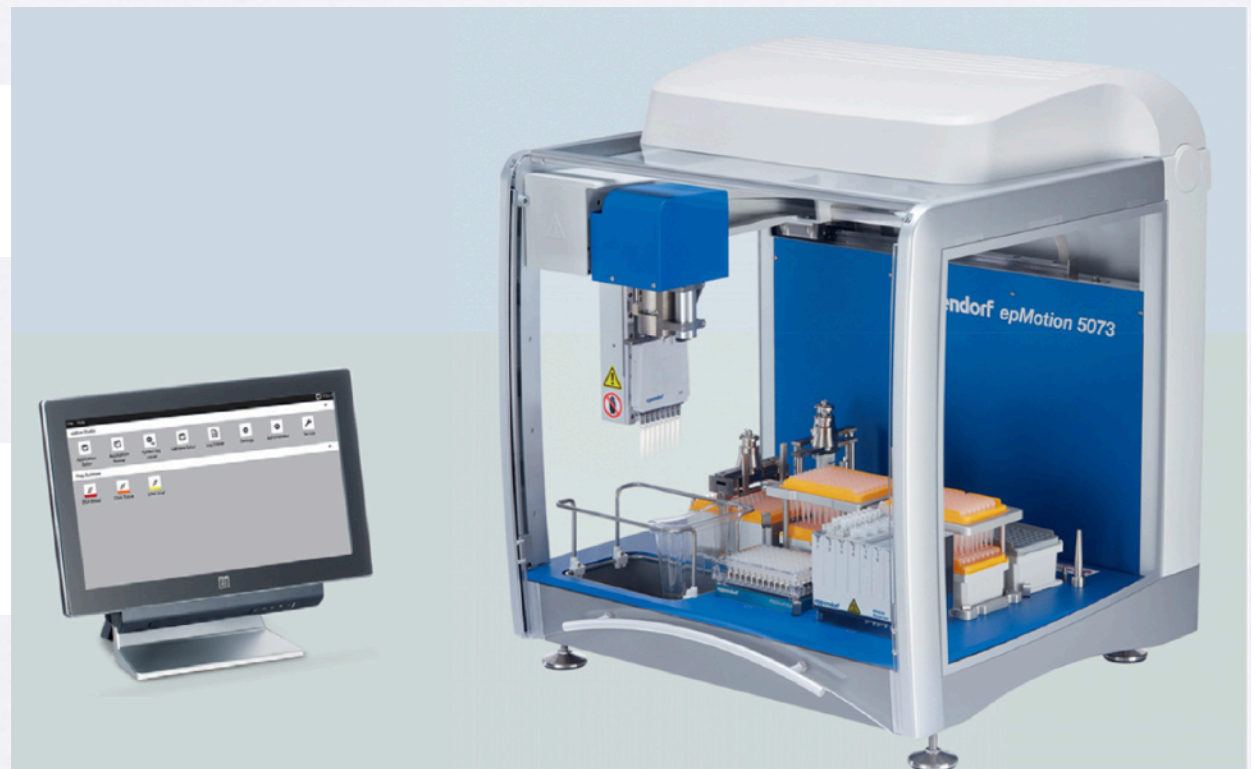


Quantitative PCR (qPCR)
Amplification of DNA/RNA
Models ABI/Life 7500 FAST,

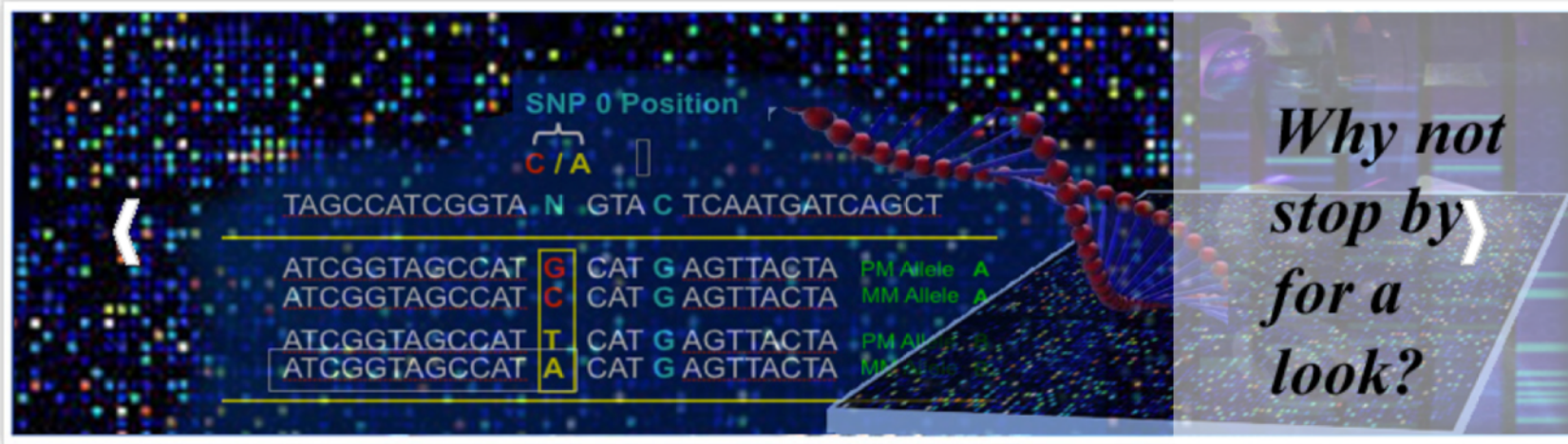




**Robotic
Workstation
Integra Assist Plus
(Integra)**



**Epimotion 5073
(Eppendorf)**



Welcome

Cell, Protein and DNA Core Facilities

About

Welcome to GSU
Cell - Protein - DNA
Core Facilities



Resources

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to your
questions
here



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Services

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some of the
services that
the core
facility offers



Instrumentation

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your use



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Find out what's new in
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DNA Core Facilities





GSU Biology Core Facility

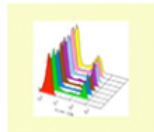
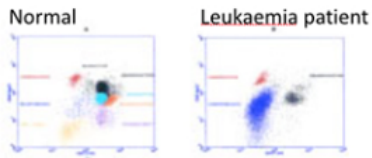
Supporting Life Sciences at GSU

http://biotech.gsu.edu/core_facility/index.html

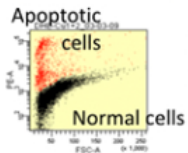


Flow Cytometry

Profiling Cells

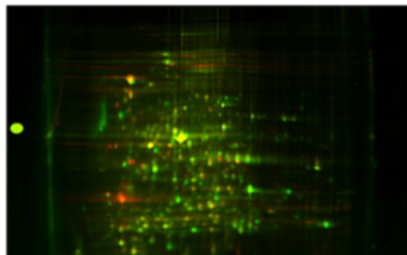
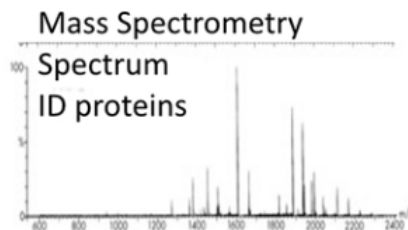


See effects of different drugs on Cell cycle



Apoptosis - programmed cell death

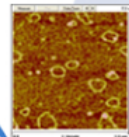
Cellular Functions



Atomic Force Microscopy

Imaging at the Ångström level

Protein structure analysis



Protein Expression

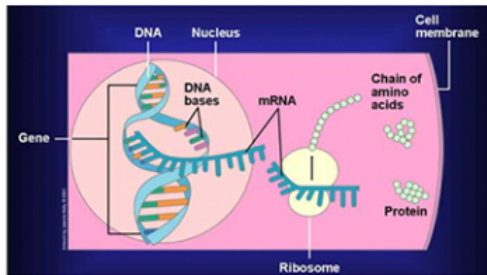
Proteomics

Profiling Proteins

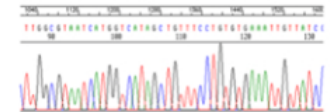
2D Protein gel
Protein separation using
Electric charge and molecular weight

DNA

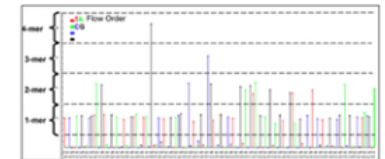
Replication



Sanger Sequencing –
>800 base pairs/run



High Throughput Genomic Sequencing –
100,000 base pairs/run



RNA Expression

Microarray: Analysis

Profiling mRNA



Colour of pin-point dots demonstrates the presence / absence of gene sequences



GSU Biology Core Facility

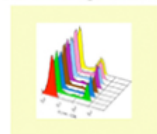
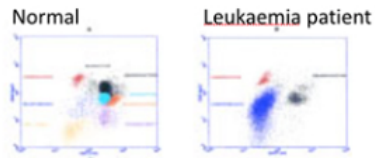
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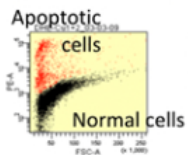


Flow Cytometry

Profiling Cells

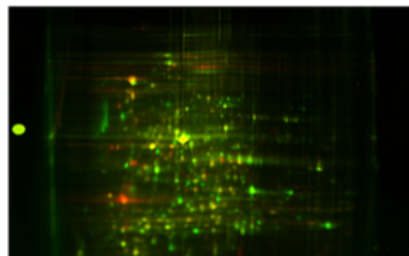
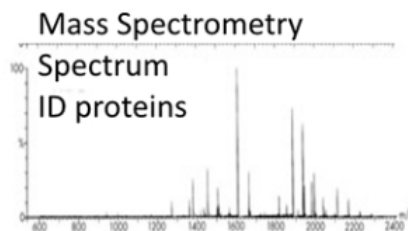


See effects of different drugs on Cell cycle



Apoptosis - programmed cell death

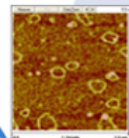
Cellular Functions



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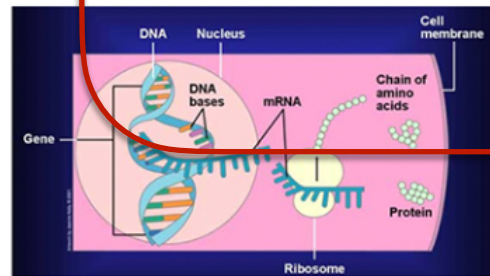
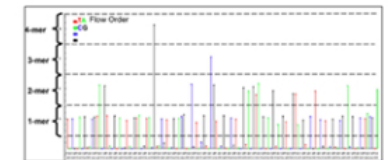
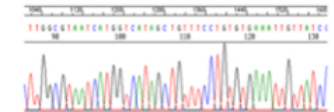


Sanger Sequencing –
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High Throughput Genomic Sequencing –
100,000 base pairs/run

DNA Sequence Analysis:

Profiling DNA



RNA Expression

Microarray: Analysis

Profiling mRNA



Colour of pin-point dots demonstrates the presence / absence of gene sequences

Protein Expression

Proteomics

Profiling Proteins

2D Protein gel
Protein separation using
Electric charge and molecular weight



GSU Biology Core Facility

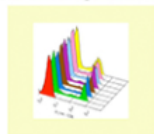
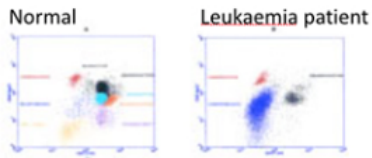
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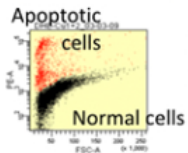


Flow Cytometry

Profiling Cells

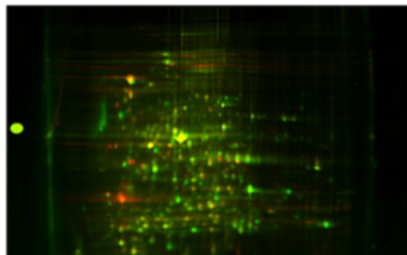
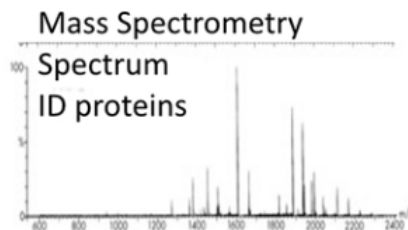


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Apoptosis - programmed cell death

Cellular Functions



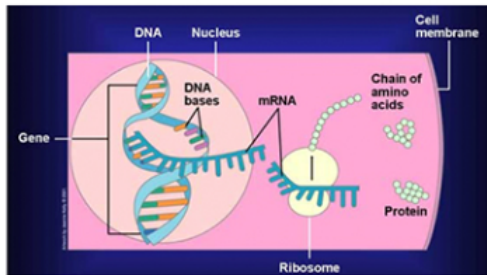
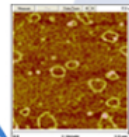
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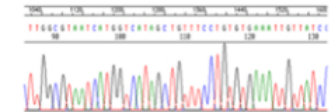
Atomic Force Microscopy

Imaging at the Ångström level

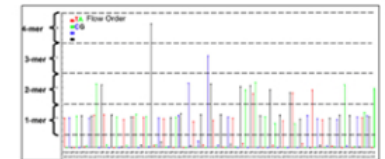
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GSU Biology Core Facility

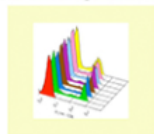
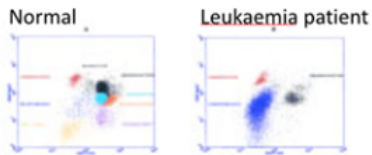
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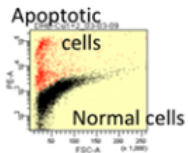


Flow Cytometry

Profiling Cells



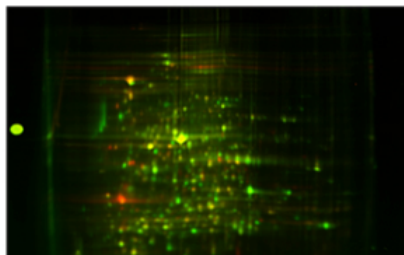
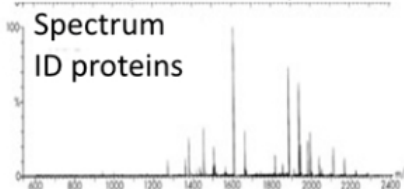
See effects of different drugs on Cell cycle



Apoptosis - programmed cell death

Cellular Functions

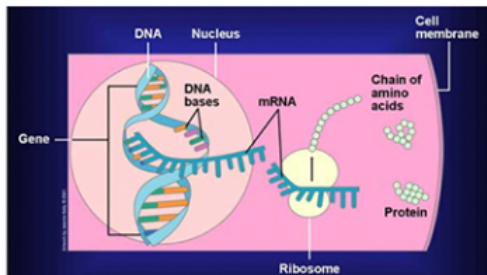
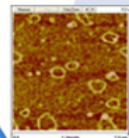
Mass Spectrometry



Atomic Force Microscopy

Imaging at the Ångström level

Protein structure analysis



Protein Expression

Proteomics

Profiling Proteins

2D Protein gel
Protein separation using
Electric charge and molecular weight

DNA

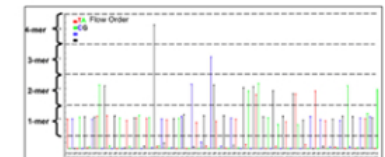
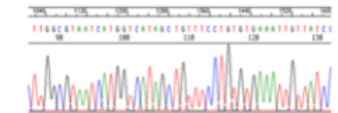
Replication

Sanger Sequencing –
>800 base pairs/run

High Throughput Genomic Sequencing –
100,000 base pairs/run

DNA Sequence Analysis:

Profiling DNA



RNA Expression

Microarray: Analysis

Profiling mRNA



Colour of pin-point dots demonstrates the presence / absence of gene sequences



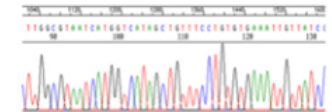
GSU Biology Core Facility

Supporting Life Sciences at GSU

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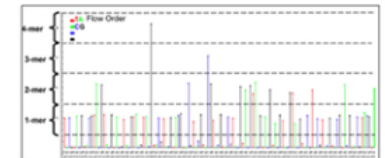


DNA Sequence Analysis: Profiling DNA

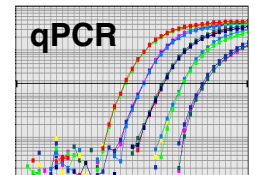


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RNA Expression

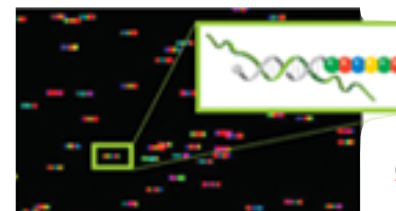


Microarray: Analysis Profiling mRNA



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Nanostring

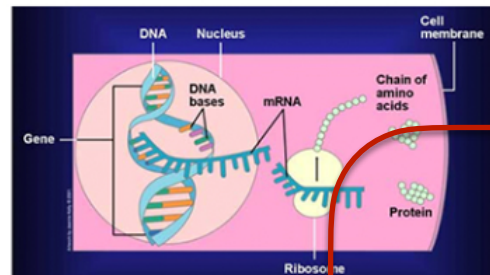


Protein Expression

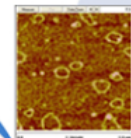
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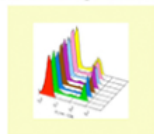
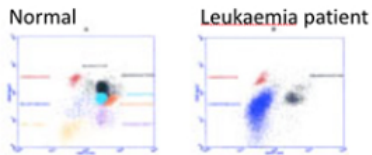


Atomic Force Microscopy Imaging at the Ångström level

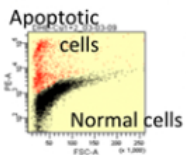


Protein structure analysis

Flow Cytometry Profiling Cells



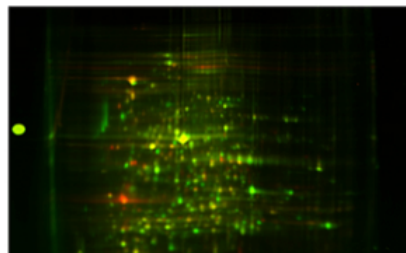
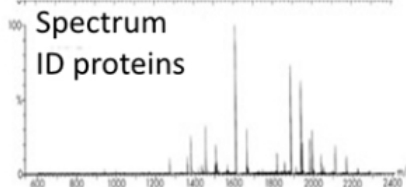
See effects of
different drugs on
Cell cycle



Apoptosis
-programmed
cell death

Cellular Functions

Mass Spectrometry





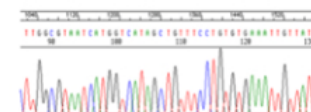
GSU Biology Core Facility

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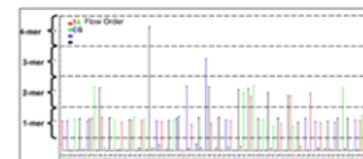


DNA Sequence Analysis: Profiling DNA

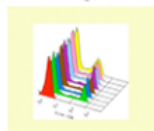
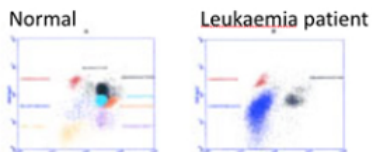


Sanger Sequencing –
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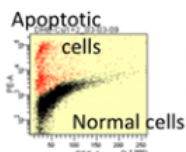
High Throughput Genomic Sequencing –
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Flow Cytometry Profiling Cells



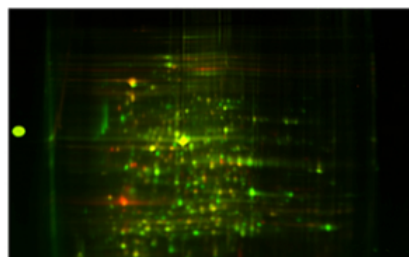
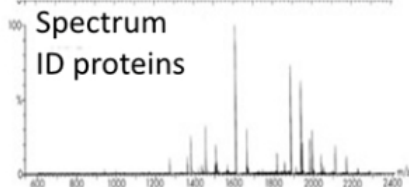
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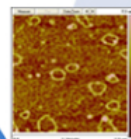
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Protein structure
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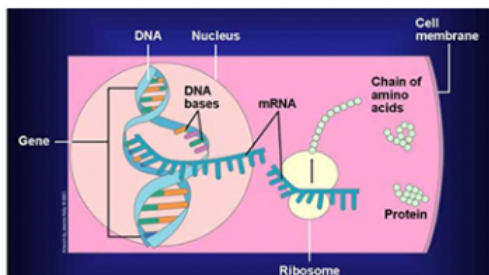
Protein Expression

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Protein separation using
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DNA

Replication

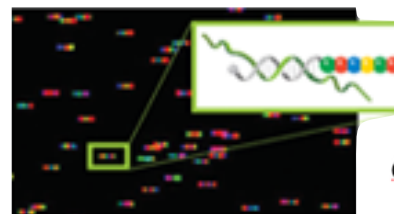


RNA Expression

Microarray:Analysis Profiling mRNA



Colour of pin-point dots demonstrates the
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Nanostring



GSU Biology Core Facility

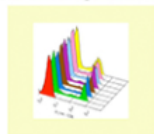
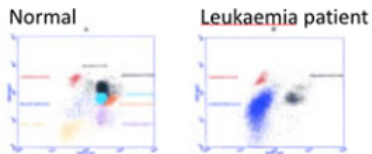
Supporting Life Sciences at GSU

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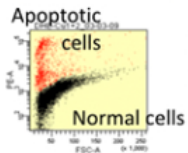


Flow Cytometry

Profiling Cells



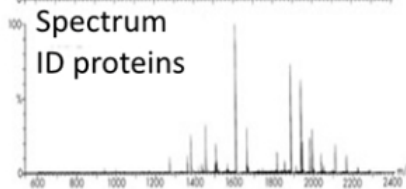
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Apoptosis - programmed cell death

Cellular Functions

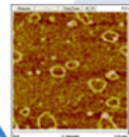
Mass Spectrometry



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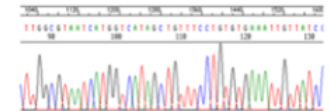
Protein structure analysis



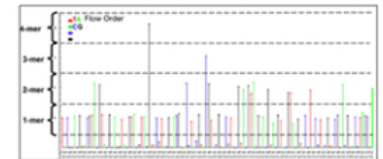
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RNA
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Microarray: Analysis

Profiling mRNA



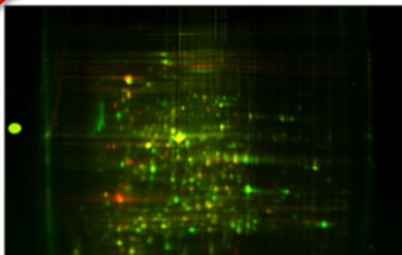
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Protein separation using
Electric charge and molecular weight





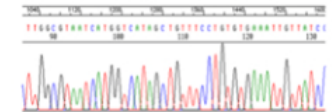
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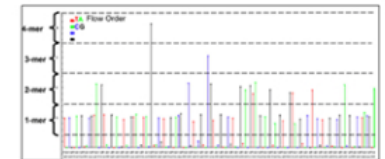


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RNA Expression

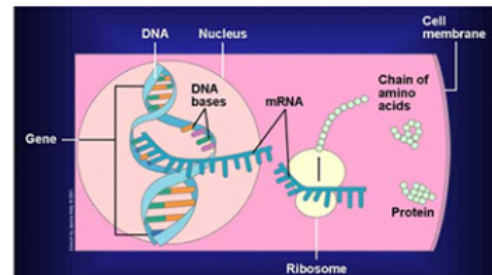
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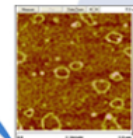
Protein Expression

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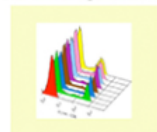
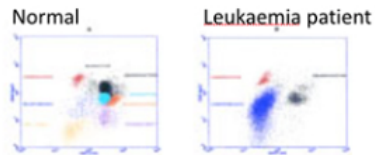
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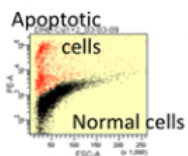


Protein structure
analysis

Flow Cytometry Profiling Cells



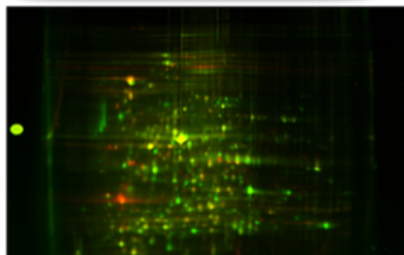
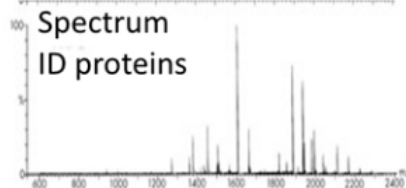
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Apoptosis
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cell death

Cellular Functions

Mass Spectrometry





GSU Biology Core Facility

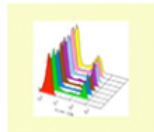
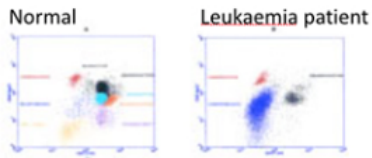
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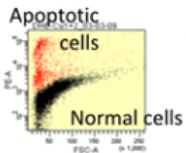


Flow Cytometry

Profiling Cells



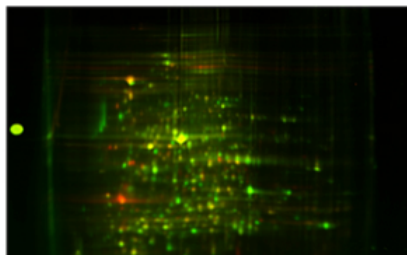
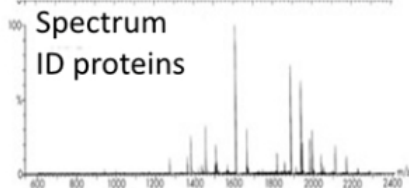
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Cellular Functions

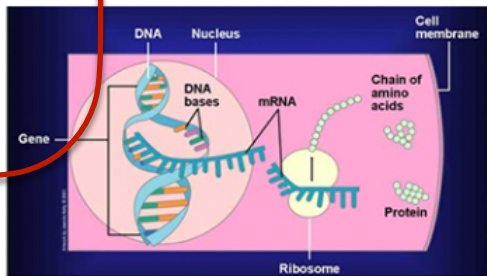
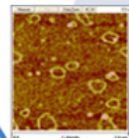
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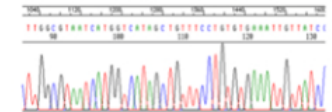
DNA

Replication

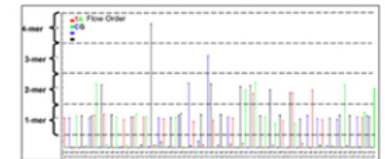
DNA Sequence Analysis:

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Sanger Sequencing –
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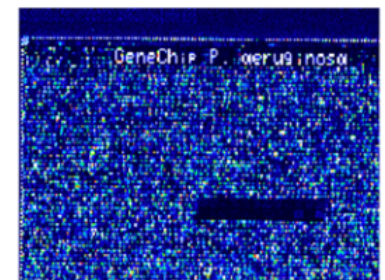
High Throughput Genomic Sequencing –
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Profiling mRNA



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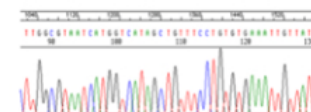
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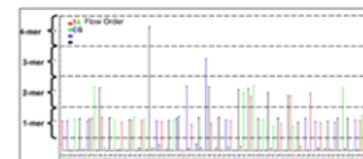


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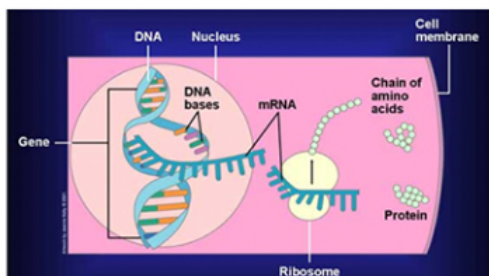
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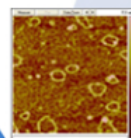
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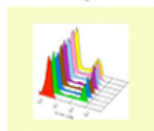
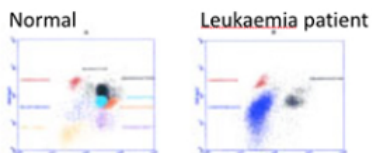
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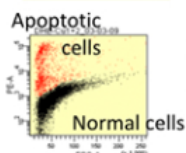


Protein structure analysis

Flow Cytometry Profiling Cells



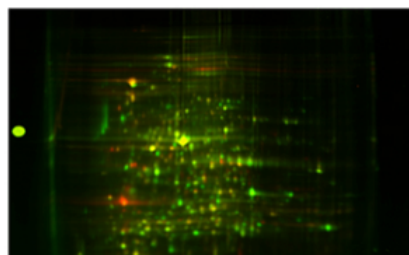
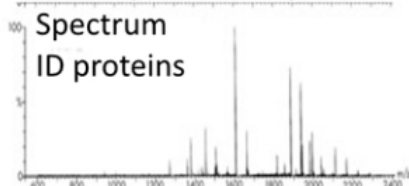
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Apoptosis
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cell death

Cellular Functions

Mass Spectrometry



SUMMER INSTITUTE CALENDAR 2022

SUN	MON	TUE	WED	THU	FRI	SAT
						July 02
						Early Arrival Airport Arrivals and Check-in
July 03	04	05	06	07	08	09
Early Arrival Airport Arrivals and Check-in	Airport Arrivals and Check-in 6:00pm: 4th of July Celebrations	9:30am-12pm: Campus tour, Panther ID & ISSS Check-in 12-2pm Lunch 2:00-6:00pm, Shuttle to local grocery store	9:30am-11:30am ISSS, OII, & Housing Orientation & Presentation 2:30-4:30pm: Welcome Reception and Buddy Meet & Greet Event	Classes begin! 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 INTRO - TRAINING	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA PREPARATION	Free Day
10	11	12	13	14	15	16
12:00-4:00pm: The World Coca-Cola and Georgia Aquarium	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS I	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS III 6:00-10:00pm: Atlantic Station Shopping & Movie (Sign-up)	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS IV ?	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 RNA PREPARATION	6:00-9:00pm: Dinner in America (Sign-up)
17	18	19	20	21	22	23
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 qPCR & AUTOMATION	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA SEQUENCING	MINI BREAK	9-11:20am: Morning course CDC TRIP 1:30-4:30pm: BIOL4905 MICROSCOPY / AFM	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30 - 4:30pm: BIOL4905 NEXT GEN SEQ. 5:30-7:30pm: Meet & Greet BBQ event @ The Commons	9:00am - 6:00pm: Outlet Mall
24	25	26	27	28	29	30
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 MICROARRAY I	9-11:20am: Morning course 12:30 - 1:30pm: Lunch and LearnGrad School Info Session 2:00 - 5:00pm: BIOL4905 MICROARRAY II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 NANOSTRING	Last day of classes 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 FLOW CYTOMETRY	FINALS	Free Day
31	August 01	02	03	04		
Free Day	Activity Day at the Recreation Center (Sign-up)	Free Day	9:30-11:00am: Georgia Capitol Tour (Sign-up) 2:00-4:00pm: Closing Reception	Departures (check-out at 12:00pm)		

Note: Students may arrive prior to the program date with an extra charge of \$35 per night. Earliest day to check-in to University Commons is July 2.

Legend:

Orange: Courses Blue: Lunch Break Red: Sign-up events



Jesse

Sandy

Kyu

Chip

Sonja

Personnel

Cell, Protein and DNA Core Facilities



John E. Houghton, PhD
 Director of ABCore Facilities
 Location: 520 PSC
 Tel: 404-413-5390 (O)
 Email: jhoughton@gsu.edu



"Sandy" Ying Sin Hsieh, PhD
 Research Scientist II
Rm: 519 / 535 / 659B PSC
 Tel: 404-413-5363 (O)
 Email: yhsieh3@gsu.edu
 Instrument Training, Flow Cytometry,
 Genomics, qPCR, plate readers



Sonja R. Young
 Laboratory Supervisor
Rm: 519 / 661 PSC
 Tel: 404-413-5363 (O)
 Email: sstovall@gsu.edu
 Genomics, Instrument Maintenance,
 Flow Cytometry



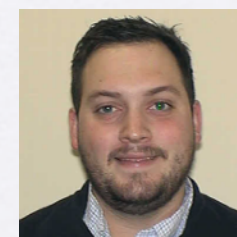
Hyuk-Kyu Seoh, PhD
 Research Scientist I
Rm: 521 / 537 PSC
 Tel: 404-413-5379 (O)
 Email: hseoh@gsu.edu
 Proteomics, Protein
 purification/separation Sequence
 Analysis



Jesse Gardner
 Research Scientist IV
Rm: 521 / 533 PSC
 Tel: 404-413-5370 (L)
 Email: jgardner26@gsu.edu
 DNA/RNA Sequence Analysis,
 DNA/RNA purification/troubleshooting
 AFM Service



"Chip" Foster
 Facilities
Rm: 519 PSC
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 Email: jfoster@gsu.edu
 Autoclaves, Instrument
 Maintenance



Alex Leach
 Teaching Asst.



Welcome

By logging into this system, you agree to comply with [University Policies](#).

CampusID Login:

[CampusID Login](#)

Non-CampusID Login:

[Non-CampusID Login](#)

Welcome to iCollege, Georgia State University's learning management system (LMS). For more information about iCollege and related tools, please visit the [Center for Excellence in Teaching and Learning \(CETL\) site](#).

Faculty: CETL provides a variety of opportunities to learn more about iCollege and its related tools. Please visit the CETL web site for additional information about [Instructional Support](#) and a [Calendar of Workshops](#).

Students: New students or those who may want a quick refresh for the iCollege environment can review the [Student Orientation](#) video.

Technical Support: Visit the [IIT Technology Service Desk](#) or call 404-413-HELP(4357) for technical assistance. For additional and after-hours support, please contact the [GeorgiaVIEW D2L Help Center](#).

Downtimes: iCollege undergoes routine maintenance which impacts access to the system. Please review the [Maintenance Schedule](#) for additional information and to help plan course activities around downtimes.

First-time users: Perform a [System Check](#) before you log in.



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INSTRUMENTATION
CELL PROTEIN and DNA

Personnel / Staff

Lab Technology /
Training & Access

FAQs

Forms

Operation
Manuals

Safety Information

"How to" GUIDES



Other, Related
ABC Core Facilities

CoreLab Technology Training & Access

Cell, Protein and DNA Core Facilities

Introduction

All researchers who would like to undertake research in the Natural Sciences at Georgia State University, and who wish to avail themselves of the research facilities and instrumentation within the **Natural Science Centre** and / or the **Petit Science Centre** must go through an initial series of training sessions to familiarize themselves with fundamental aspects of Laboratory Safety and Security, as well as what equipment is available and how to use it. These training sessions are PRIMARILY on-line, but one on training is available UPON REQUEST by a member of the **ABC Core facilities**.

Technology Training & Access **COVID-19 CHANGES for SUMMER '22**

Registration

ABCORE FACILITIES

Training Videos -some with, some without audio

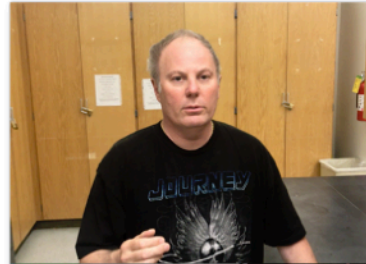
BASIC TRAINING: Videos in this section relate to Equipment that are available for "general use" in most Molecular Biology laboratories



AUTOCLAVES PSC

A brief training video on how to use the AUTOCLAVES in PSC 545/645. For further, more detailed information, please contact -[Chip Foster](#)

[View Video](#)



AUTOCLAVES NSC 3RD FLOOR

A brief training video on how to use the AUTOCLAVES in NSC 336. For further, more detailed information, please contact -[Chip Foster](#)

[View Video](#)



AUTOCLAVES NSC 4TH FLOOR

A brief training video on how to use the AUTOCLAVES in NSC 484. For further, more detailed information, please contact -[Chip Foster](#)

[View Video](#)



Kodak X-Omat 2000 Film Developer

By Sonja Young

FILM DEVELOPER

A brief guide on how to use the FILM DEVELOPER in the ABCore facilities. For further, more detailed, information please contact -[Sonja Young](#)

[View Video](#)

Centrifuges

- High Speed, floor standing Centrifuge

By Hyuk-Kyu Seoh



HIGH SPEED CENTRIFUGES

A brief guide on how to use the High Speed Centrifuges in the ABCore facilities. For further, more detailed information please contact -[Hyuk-Kyu Seoh](#)

[View Video](#)

Centrifuges

- Ultra High-speed Floor-standing Centrifuge

By Hyuk-Kyu Seoh



ULTRACENTRIFUGES (FLOOR)

A brief guide on how to use the Ultracentrifuges floor models in the ABCore facilities. For further, more detailed, information please contact -[Hyuk-Kyu Seoh](#)

[View Video](#)

Centrifuges

- Ultra High-speed Floor-standing Centrifuge
- Ultra High-speed Table-top Centrifuge

By Hyuk-Kyu Seoh



ULTRACENTRIFUGES (TABLE TOP)

A brief guide on how to use the Ultracentrifuges Table-Top models in the ABCore facilities. For further, more detailed, information please contact -[Hyuk-Kyu Seoh](#)

[View Video](#)

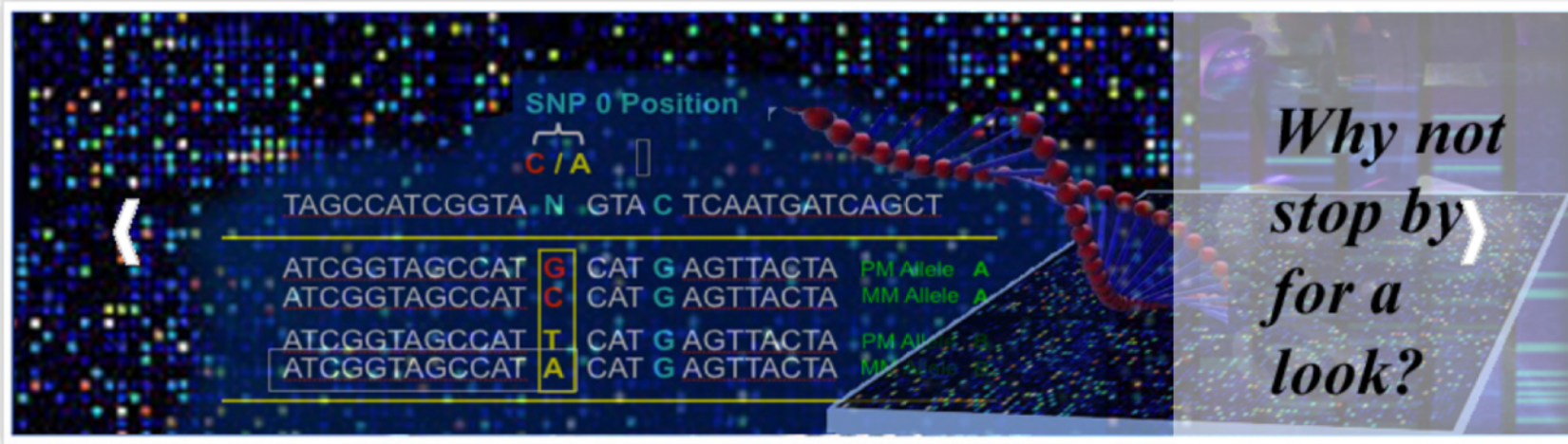
Lyophilizer (Freeze Dryer)



LYOPHILIZERS

A brief guide on how to use the Lyophilizers in the ABCore facilities. For further, more detailed, information please contact -[Hyuk-Kyu Seoh](#)

[View Video](#)

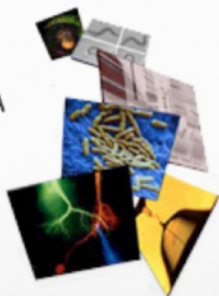


Welcome

Cell, Protein and DNA Core Facilities

About

Welcome to GSU
Cell - Protein - DNA
Core Facilities



Resources

Find answers
to your
questions
here



Contacts

John E. Houghton

Director of Core Facilities

Tel: 404-413-5390 | Email: jhoughton@gsu.edu

Debby Walthall

Research Scientist

Tel: 404-413-5363 | Email: dwalthall@gsu.edu

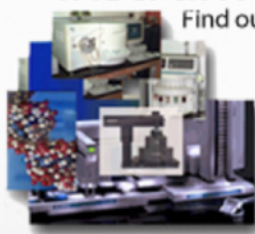
Services

Learn about
some of the
services that
the core
facility offers



Instrumentation

Find out what equipment
and facilities are
available for
your use



What's New?

Find out what's new in
the Cell - Protein -
DNA Core Facilities



SUMMER INSTITUTE CALENDAR 2022

SUN	MON	TUE	WED	THU	FRI	SAT
						July 02
						Early Arrival Airport Arrivals and Check-in
July 03	04	05	06	07	08	09
Early Arrival Airport Arrivals and Check-in	Airport Arrivals and Check-in 6:00pm: 4th of July Celebrations	9:30am-12pm: Campus tour, Panther ID & ISSS Check-in 12-2pm Lunch 2:00-6:00pm, Shuttle to local grocery store	9:30am-11:30am ISSS, OII, & Housing Orientation & Presentation 2:30-4:30pm: Welcome Reception and Buddy Meet & Greet Event	Classes begin! 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 INTRO - TRAINING	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA PREPARATION	Free Day
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Note: Students may arrive prior to the program date with an extra charge of \$35 per night. Earliest day to check-in to University Commons is July 2.

Legend:

Orange: Courses Blue: Lunch Break Red: Sign-up events

SUMMER INSTITUTE CALENDAR 2022

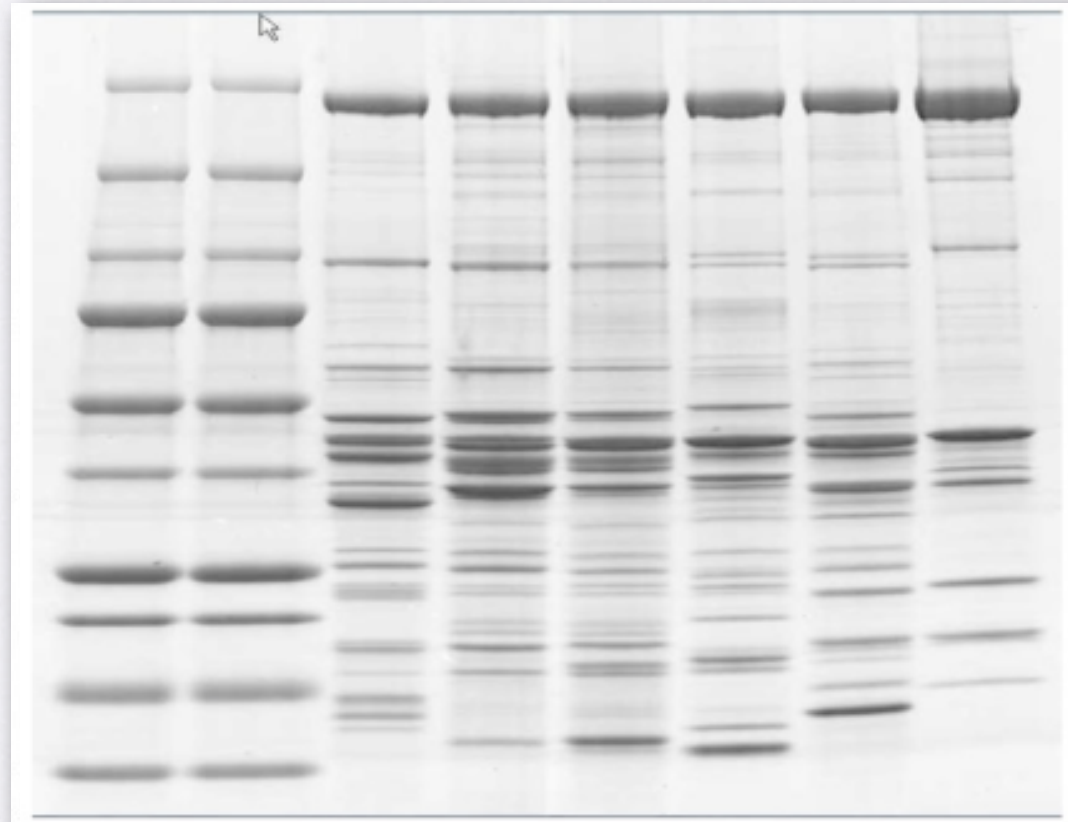
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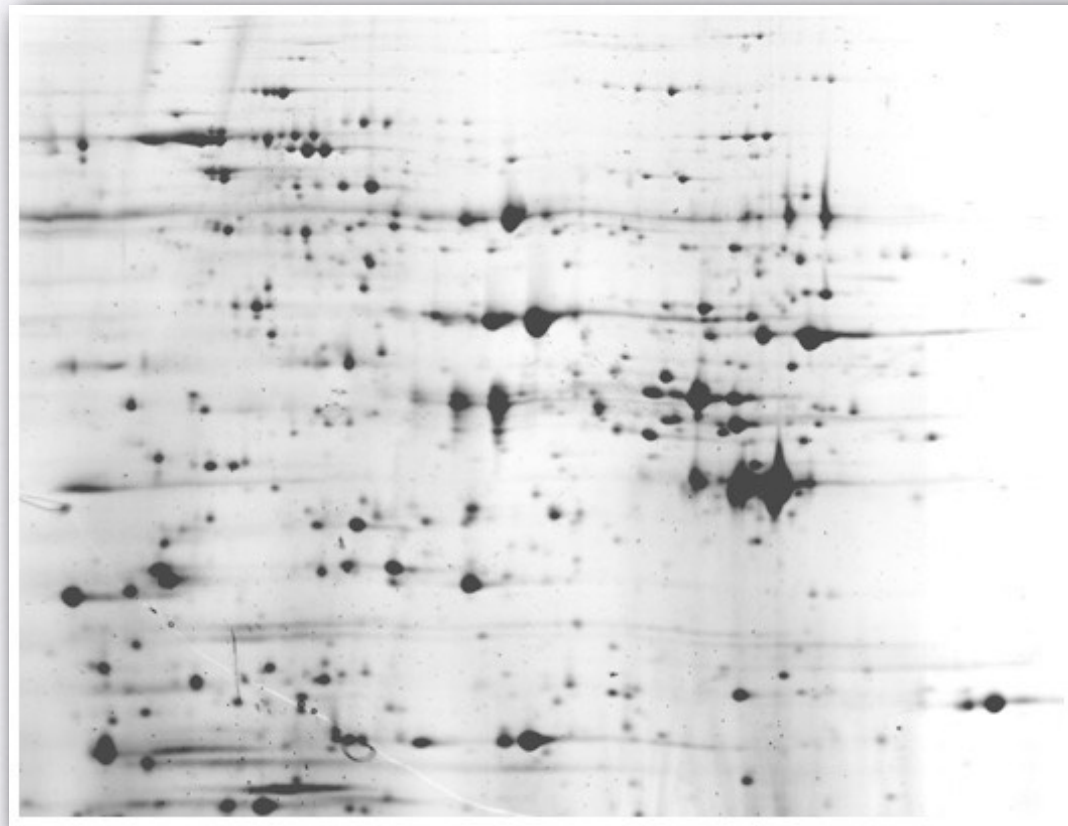
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Proteomics:



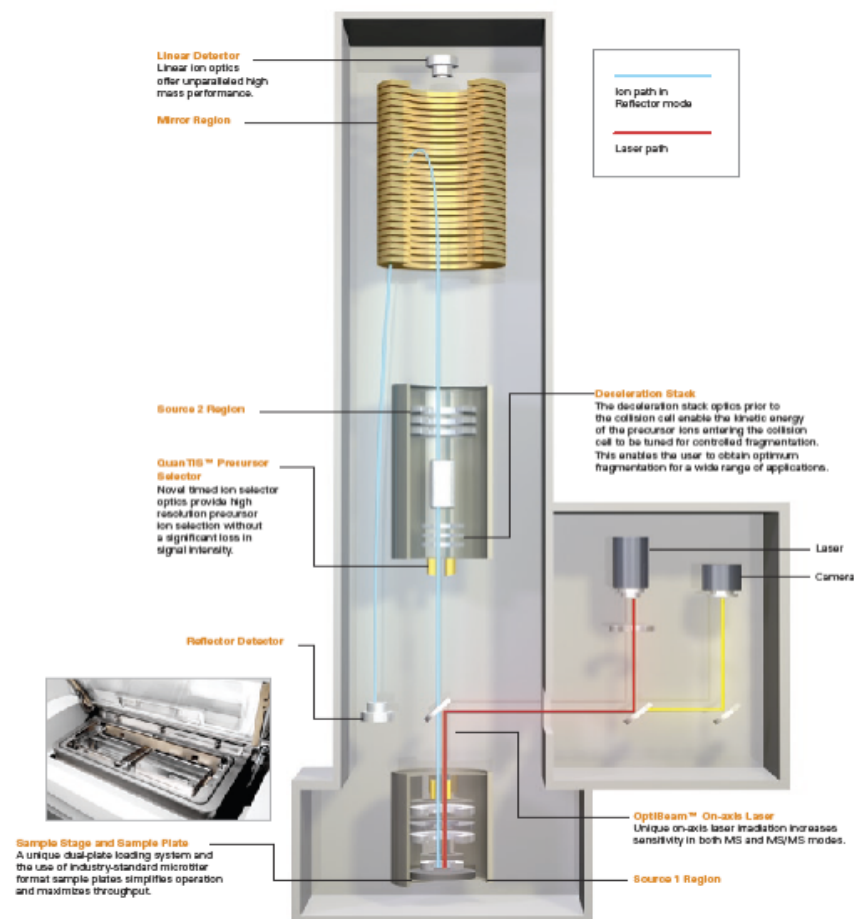
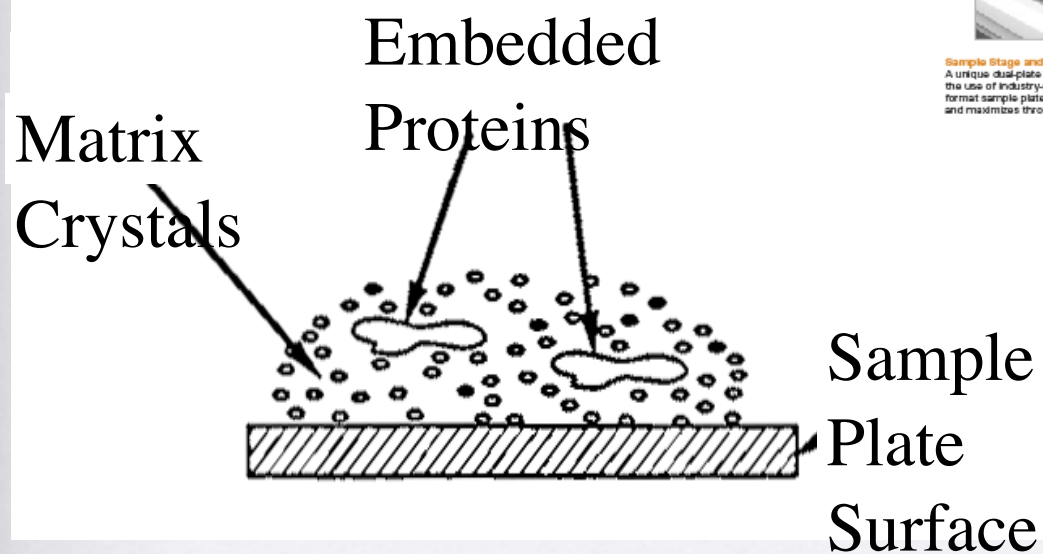
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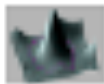


**Ettan II 2D gel Proteomics
System complemented by a
MALDI TOF/TOF(ABI) Model 4800+**



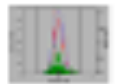


Proteomics:



Fluorescence 2-D differential in-gel electrophoresis platform

Amer sham Pharma cia Biotech UK Limited, Amer sham Place, Little Chalfont, Buckinghamshire, HP7 0NA, England



2-D differential in-gel electrophoresis (DIGE) is a powerful tool for studying protein expression changes, especially in complex samples (Figure 1).

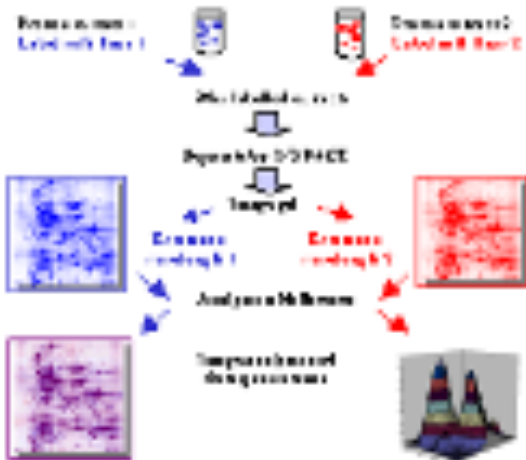


Figure 1: Overview of the 2-D DIGE workflow (fluorescence detection of the spots).

The main benefit of this method is that it allows the detection of low-abundance proteins. However, this method has some limitations: it is not suitable for studying changes in protein abundance in complex samples, and it is not suitable for studying changes in protein abundance in complex samples.

The DIGE platform consists of 2-D PAGE and DIGE.

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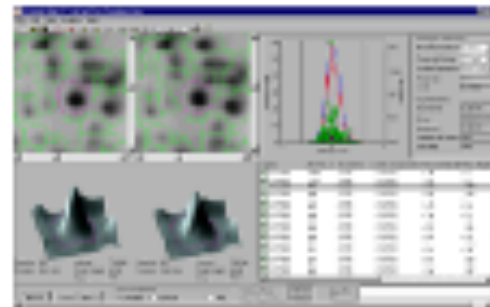


Figure 2: DIGE workflow showing protein separation, labeling, and analysis.

The DIGE platform consists of 2-D PAGE and DIGE. The DIGE platform consists of 2-D PAGE and DIGE.

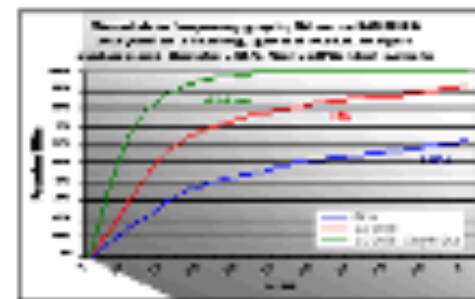


Figure 3: DIGE workflow showing protein separation, labeling, and analysis.

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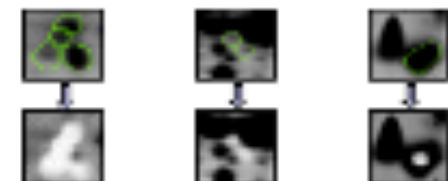


Figure 4: DIGE workflow showing protein separation, labeling, and analysis.



Figure 5: DIGE workflow showing protein separation, labeling, and analysis.

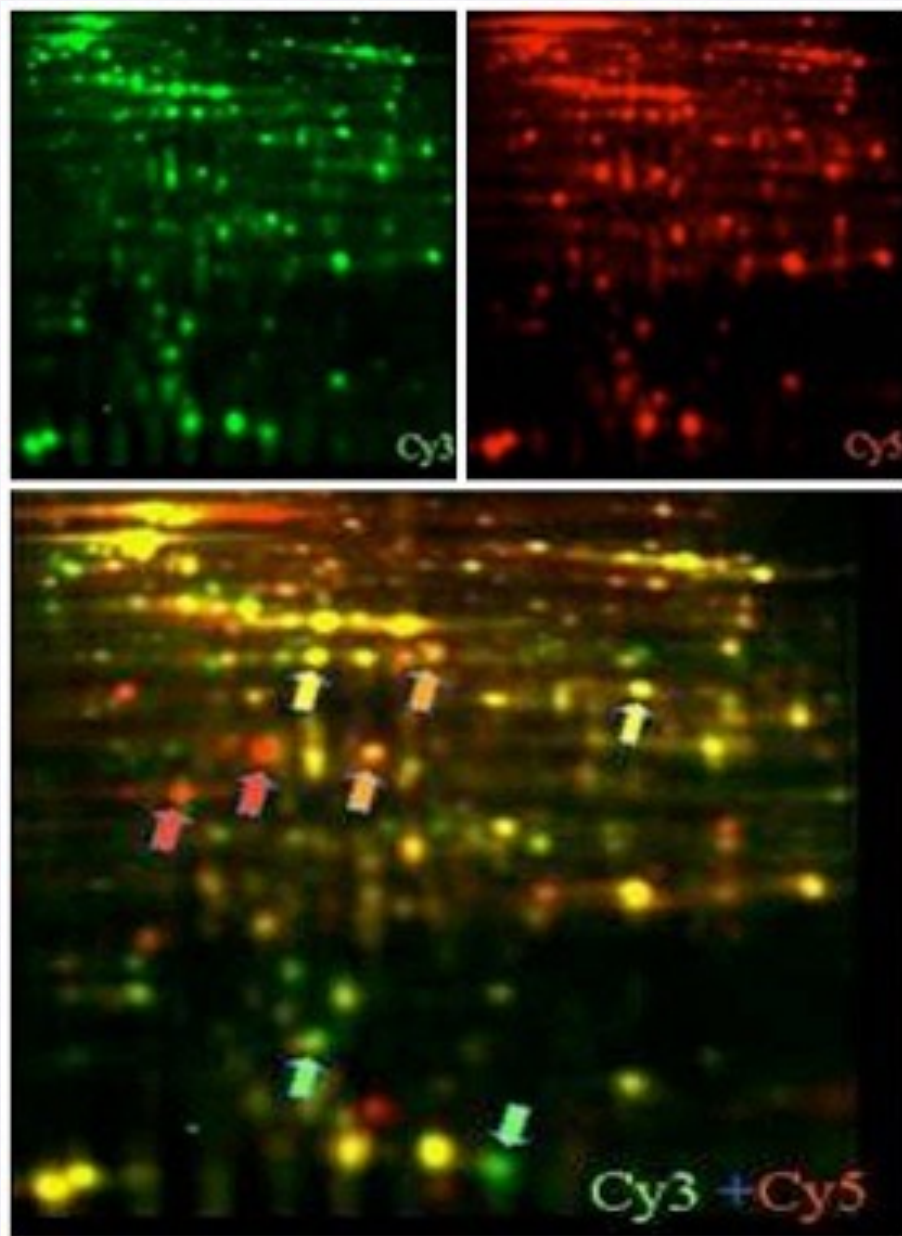
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SUMMER INSTITUTE CALENDAR 2022

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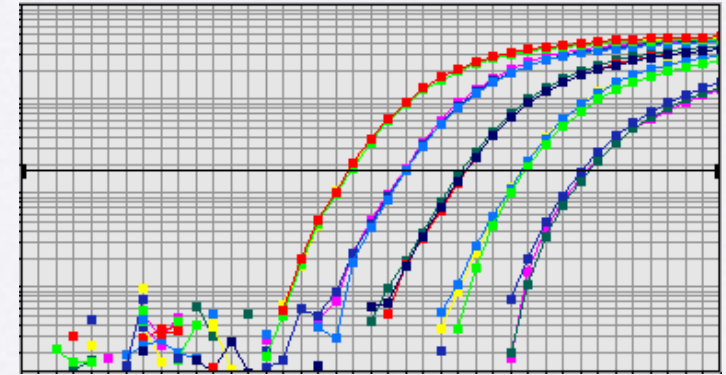
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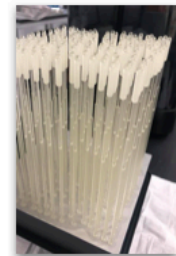


Quantitative PCR (qPCR)
Amplification of DNA/RNA
Models ABI/Life 7500 FAST,

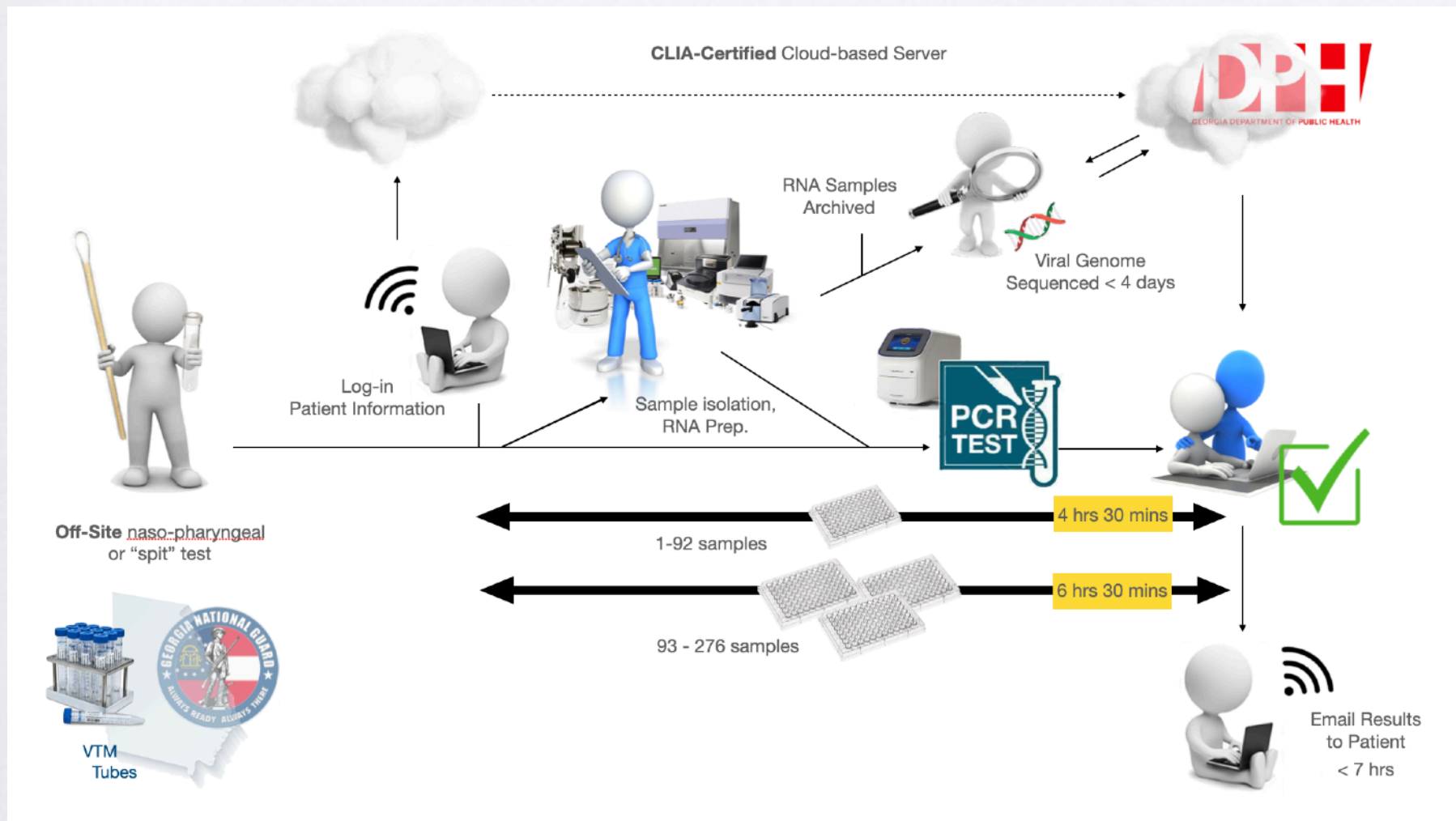
SARS-CoV-2 Pandemic

CLIA-certified COVID-19 PCR testing lab

2020-22



Facilities

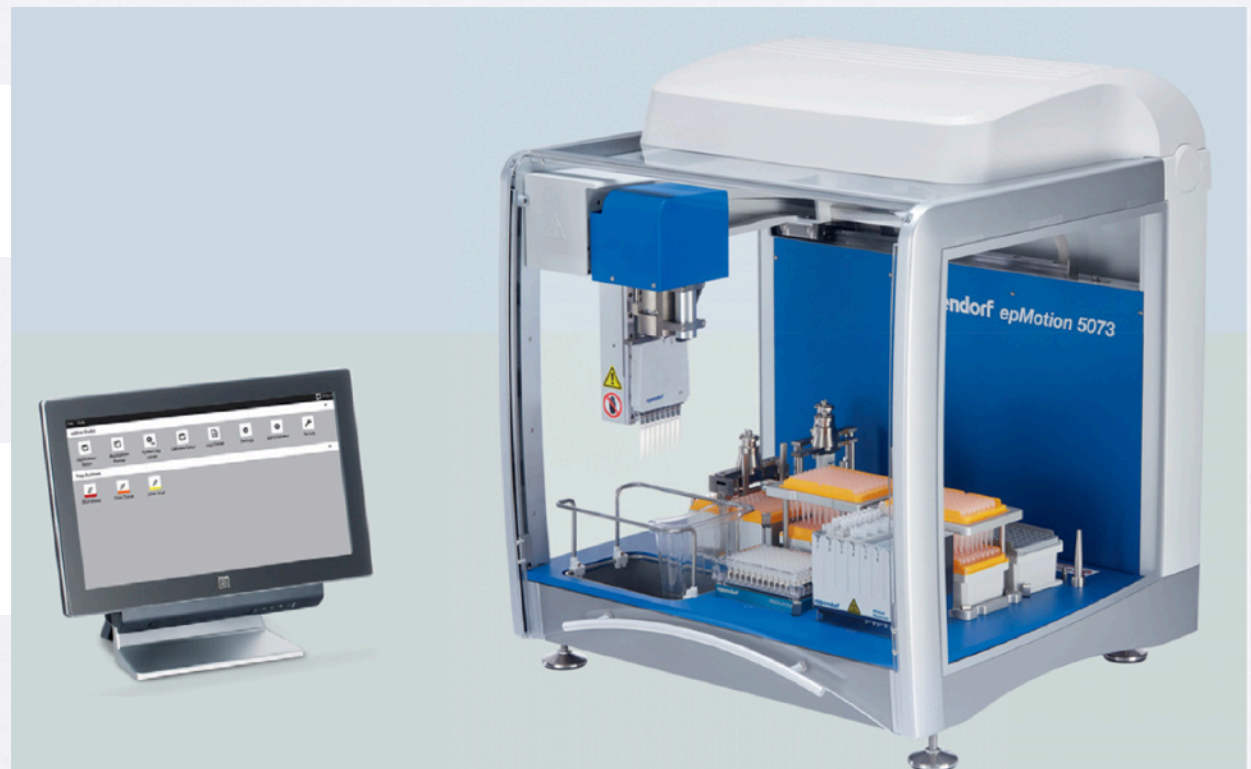




**Robotic
Workstation**
Integra Assist Plus
(Integra)



Epimotion 5073
(Eppendorf)



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31	August 01	02	03	04		
Free Day	Activity Day at the Recreation Center (Sign-up)	Free Day	9:30-11:00am: Georgia Capitol Tour (Sign-up) 2:00-4:00pm: Closing Reception	Departures (check-out at 12:00pm)		

Note: Students may arrive prior to the program date with an extra charge of \$35 per night. Earliest day to check-in to University Commons is July 2.

Legend:

Orange: Courses

Blue: Lunch Break

Red: Sign-up events



**Capillary DNA Sequencers
(ABI/Life Technologies) Model 3500xl**

SUMMER INSTITUTE CALENDAR 2022

SUN	MON	TUE	WED	THU	FRI	SAT
						July 02
						Early Arrival Airport Arrivals and Check-in
July 03	04	05	06	07	08	09
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United States Centers for Disease Control and Prevention

Government Agency

Directions

The Centers for Disease Control and Prevention is the national public health institute of the United States. [Wikipedia](#)

Address: 1600 Clifton Rd, Atlanta, GA 30333

Founded: July 1, 1946

Hours: Open today · [Open 24 hours](#)

Centers for Disease Control and Prevention (CDC)
on Google+



Centers for Disease Control and Prevention (CDC)

37,349 followers · Shared publicly



Happy Independence Day, America! To all who work to safeguard and improve the health and safety of people living in the United States, we celebrate you and ... Jul 4, 2014



SUMMER INSTITUTE CALENDAR 2022

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Automated Fluorescent Microscopes

**Axioimager II /
Observer
(inverted)**
(Zeiss)

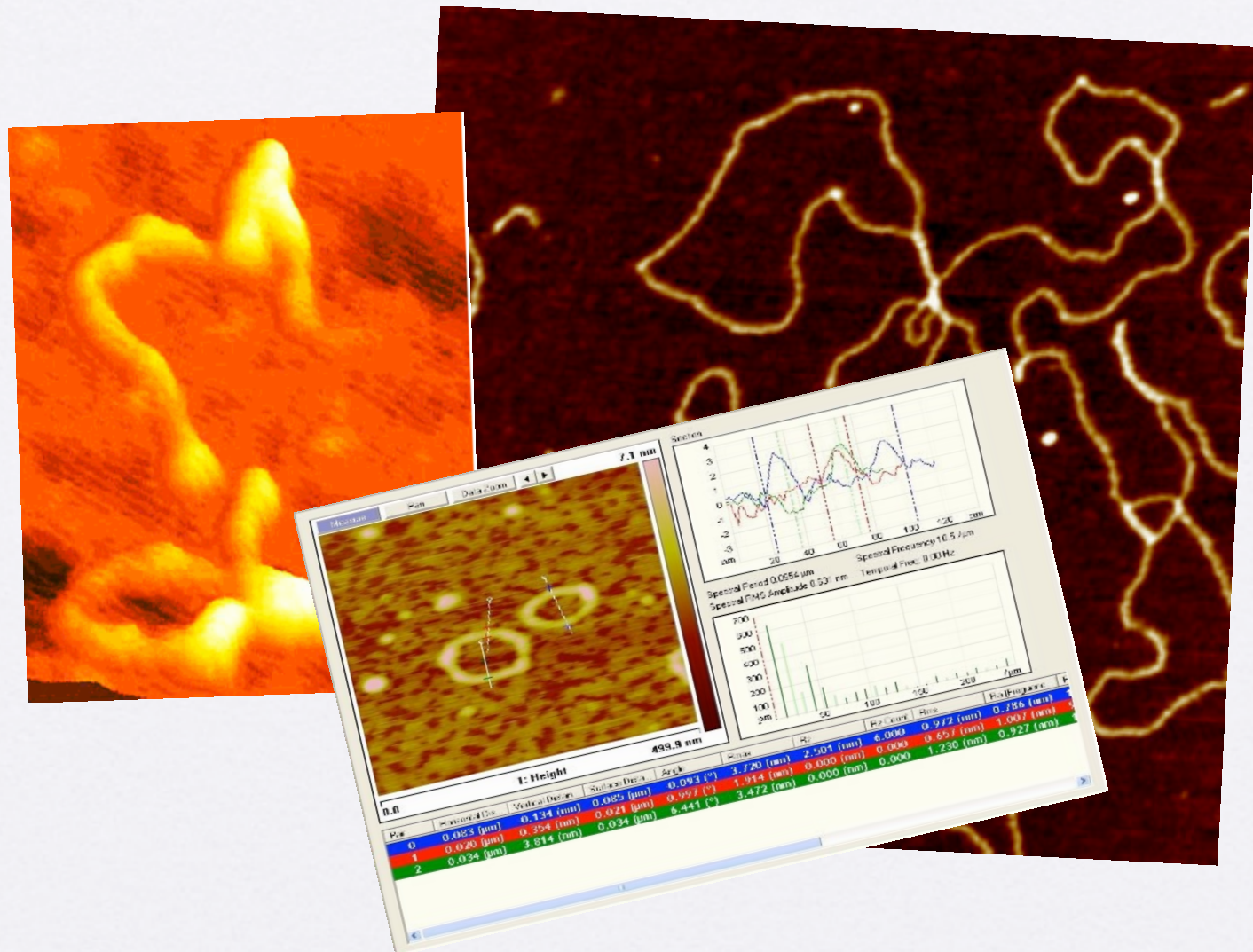


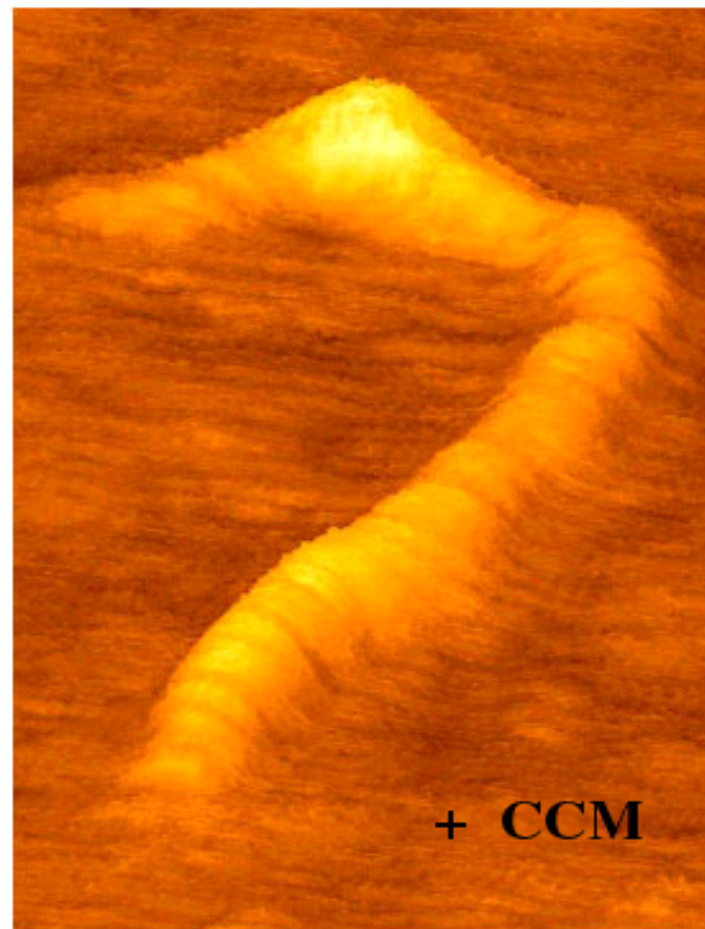
Automated Fluorescent Digital Microscope

(Keyence) **BZ-X700**



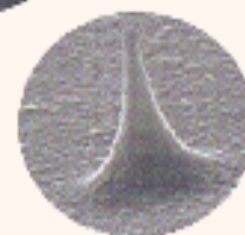
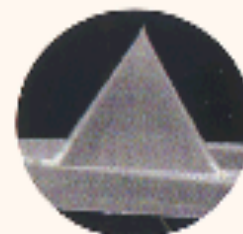
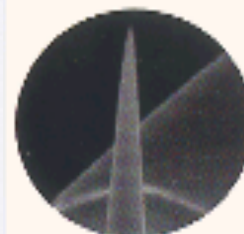
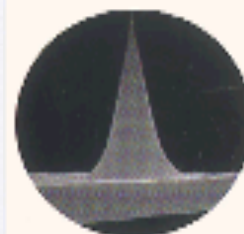
Atomic Force Microscopy:

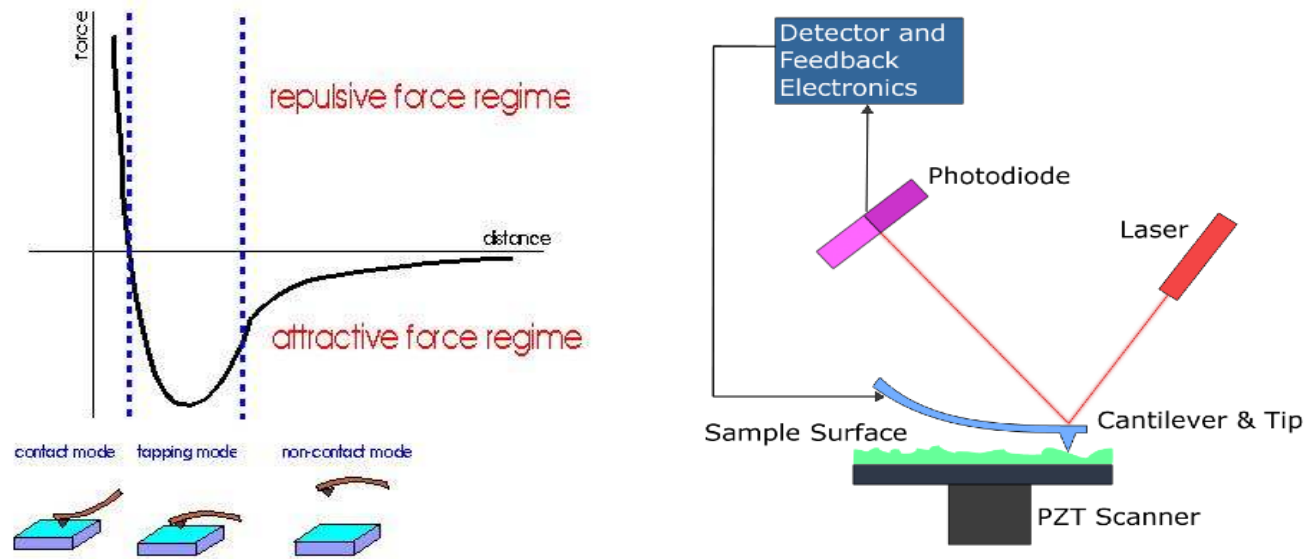




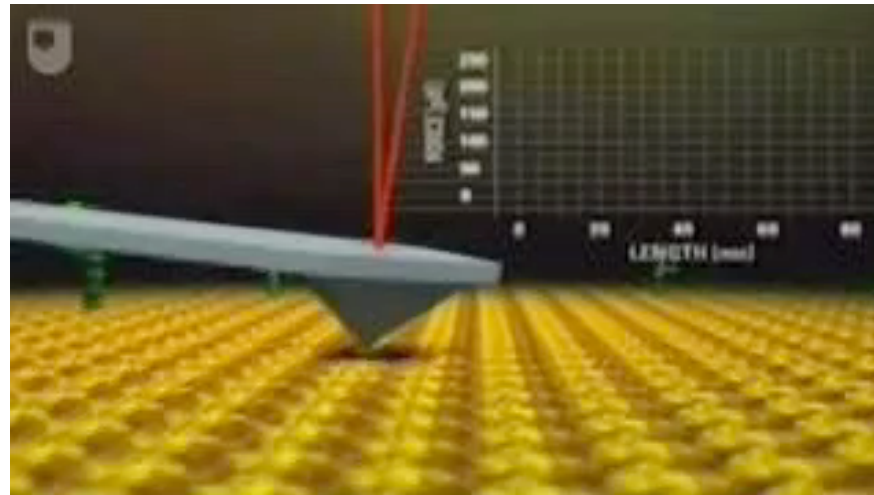


Cantilevers





Atomic Force Microscope (AFM) operates by measuring attractive or repulsive forces between a probe or "tip" and the sample. The tip is located at the end of a leaf spring or "cantilever". A laser beam is reflected off the cantilever. Any angular deflection of the cantilever caused by the change of the force between tip and sample is represented by the angular deflection of the laser beam. Images are taken by scanning the sample relative to the tip and measuring the deflection of the cantilever as a function of lateral position. Different from traditional microscope, image from AFM is three dimensional.



SUMMER INSTITUTE CALENDAR 2022

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Legend:

Orange: Courses Blue: Lunch Break Red: Sign-up events



SUMMER INSTITUTE CALENDAR 2022

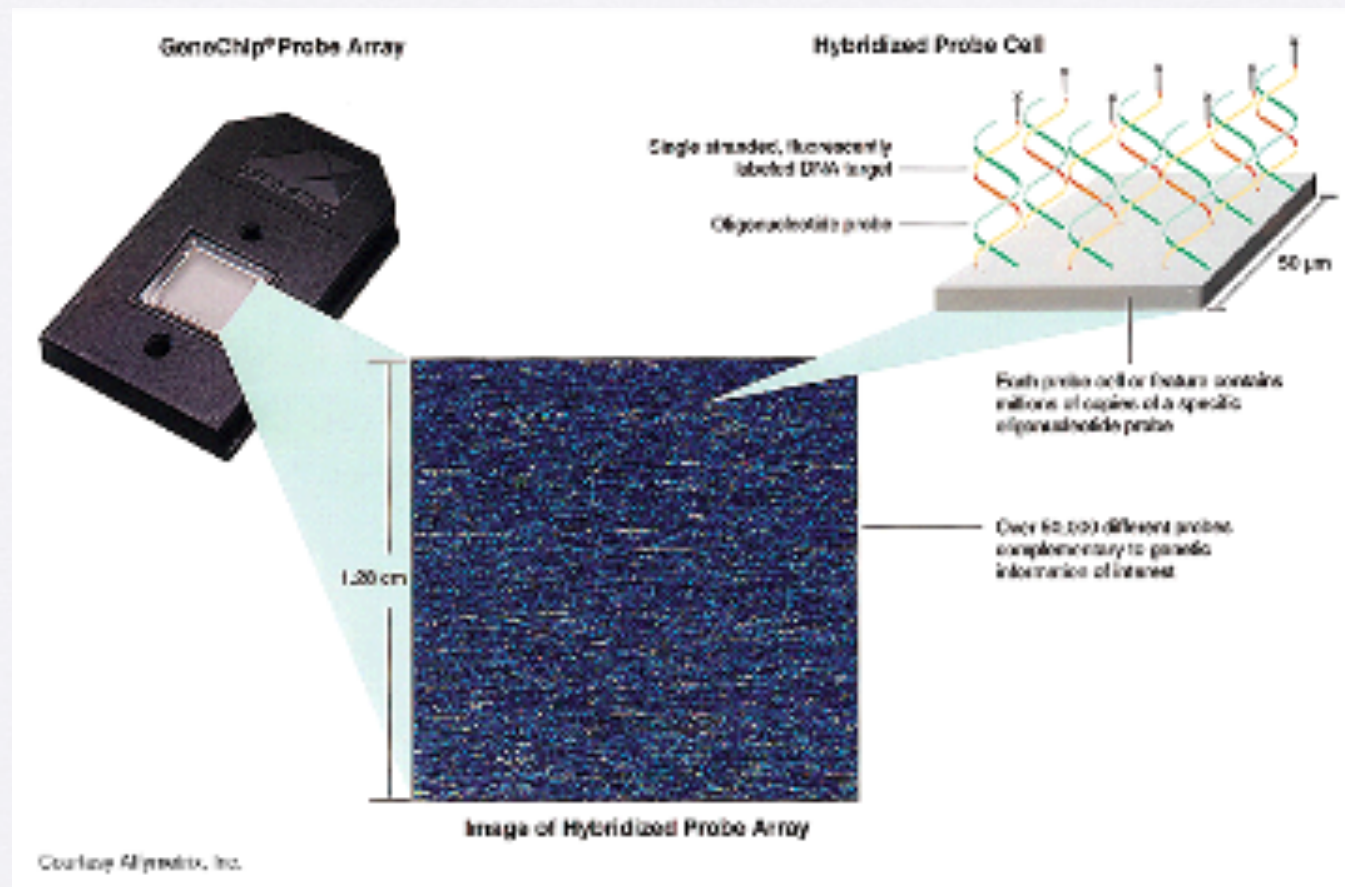
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Genomics:



Microarray Technology: enables us to monitor variable mRNA expression -at the level of the genomic mRNA expression.

Transcriptomic / Genomic Analysis

Design
Experiment

Prepare
Sample

Hybridize

Wash
&
Stain

Scan

Analysis



Probe
Array



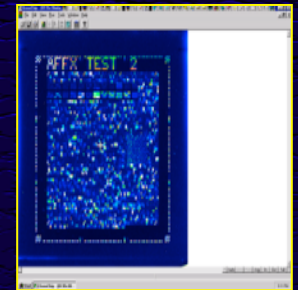
Hybridization
Oven



Fluidics Station



Scanner



Software

SUMMER INSTITUTE CALENDAR 2022

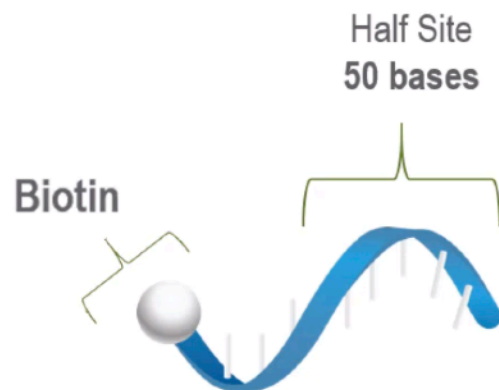
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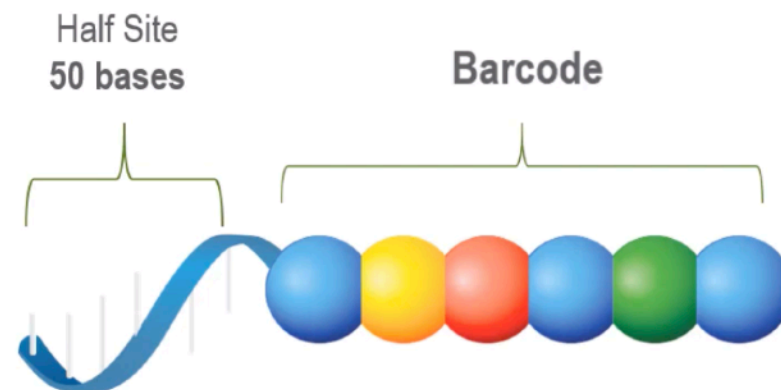
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Digital Counting Using Barcoded Probes



Target-specific **Capture** Probe



Target-specific **Reporter** Probe

Barcode	Identity
	XLSA
	FOX5
	PDCD1

FOR RESEARCH USE ONLY. Not for use in diagnostic procedures.

nanoString

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12:00-4:00pm: The World Coca-Cola and Georgia Aquarium	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS I	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS III 6:00-10:00pm: Atlantic Station Shopping & Movie (Sign-up)	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 PROTEOMICS IV ?	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 RNA PREPARATION	6:00-9:00pm: Dinner in America (Sign-up)
17	18	19	20	21	22	23
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 qPCR & AUTOMATION	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 DNA SEQUENCING	MINI BREAK	9-11:20am: Morning course CDC TRIP 1:30-4:30pm: BIOL4905 MICROSCOPY / AFM	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30 - 4:30pm: BIOL4905 NEXT GEN SEQ. 5:30-7:30pm: Meet & Greet BBQ event @ The Commons	9:00am - 6:00pm: Outlet Mall
24	25	26	27	28	29	30
Free Day	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 MICROARRAY I	9-11:20am: Morning course 12:30 - 1:30pm: Lunch and LearnGrad School Info Session 2:00 - 5:00pm: BIOL4905 MICROARRAY II	9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 NANOSTRING	Last day of classes 9-11:20am: Morning course 11:20am-2:00pm: Lunch break 1:30-4:30pm: BIOL4905 FLOW CYTOMETRY	FINALS	Free Day
31	August 01	02	03	04		
Free Day	Activity Day at the Recreation Center (Sign-up)	Free Day	9:30-11:00am: Georgia Capitol Tour (Sign-up) 2:00-4:00pm: Closing Reception	Departures (check-out at 12:00pm)		

Note: Students may arrive prior to the program date with an extra charge of \$35 per night. Earliest day to check-in to University Commons is July 2.

Legend:

Orange: Courses

Blue: Lunch Break

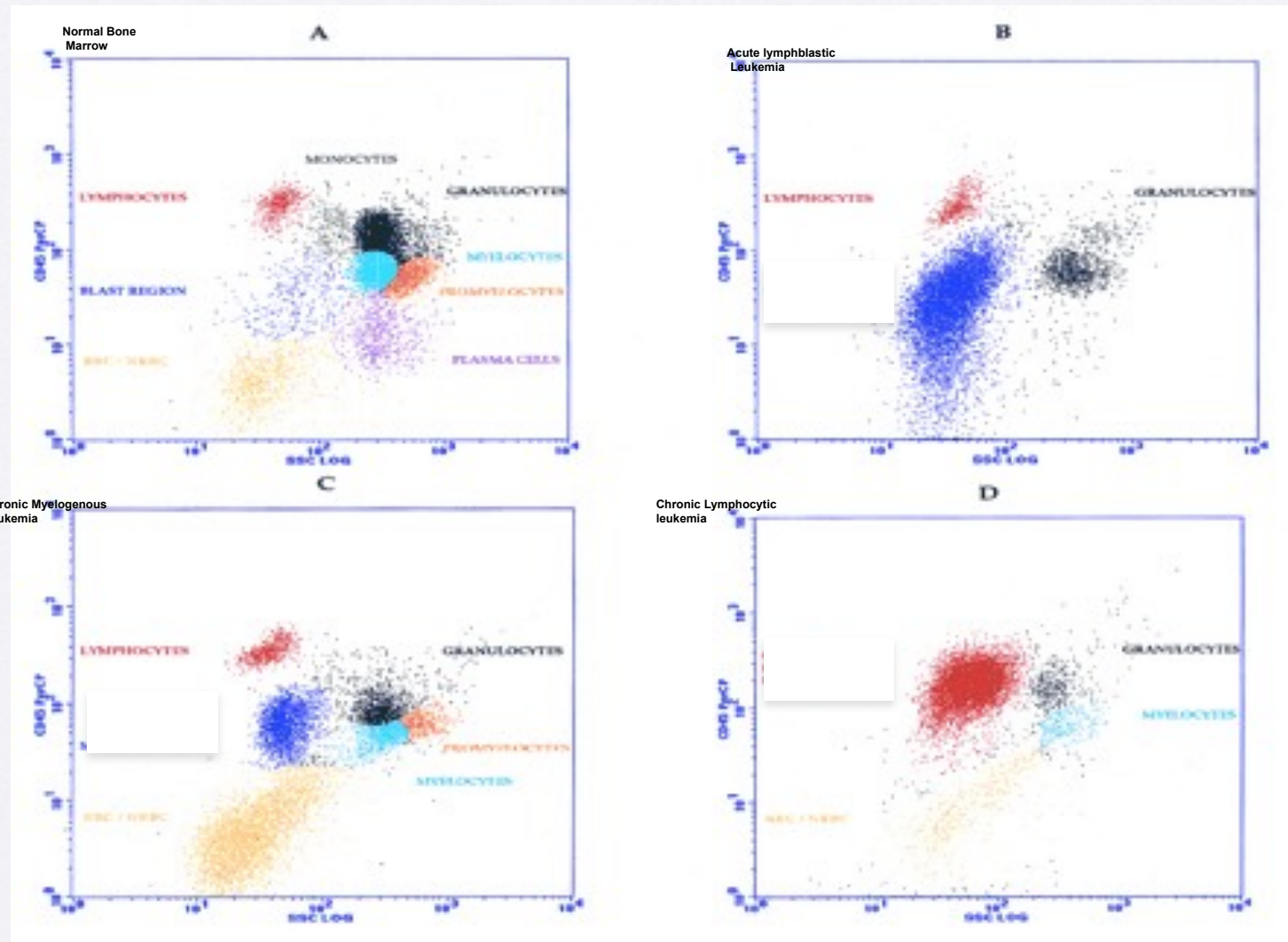
Red: Sign-up events



Automated Flow Cytometry
LSR Fortessa (Becton Dickinson)

Automated Flow Cytometry
LSR Fortessa (Becton Dickinson)





Use of up to six fluorescent markers to various specific types of cancer enables precise diagnosis.

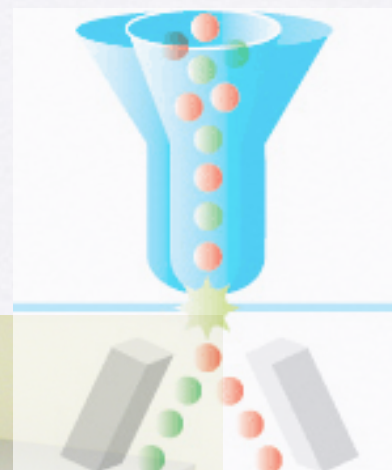
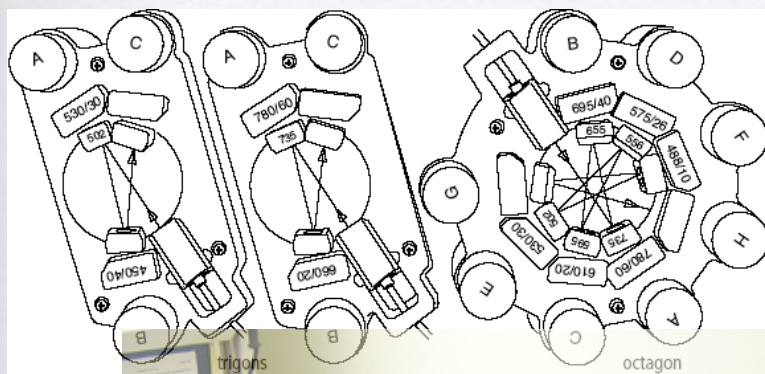
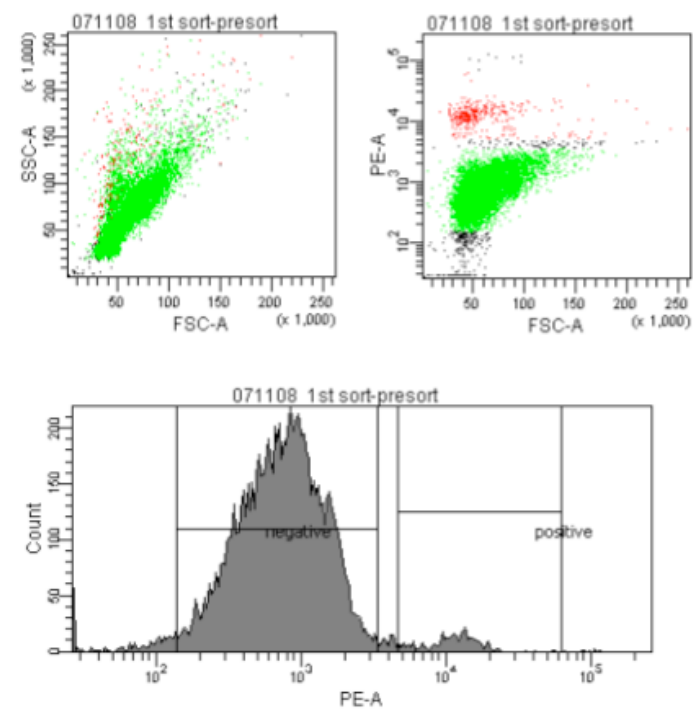


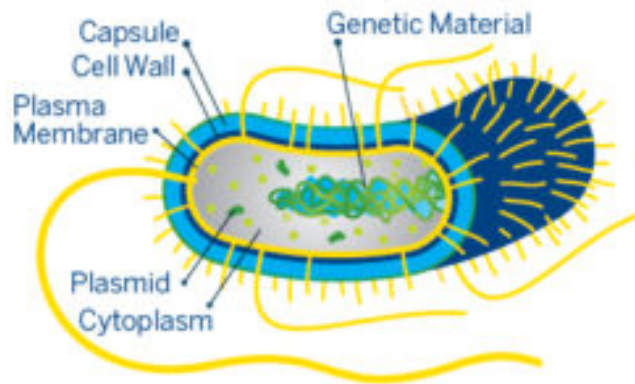
Figure 1-16 Fully-loaded detector arrays



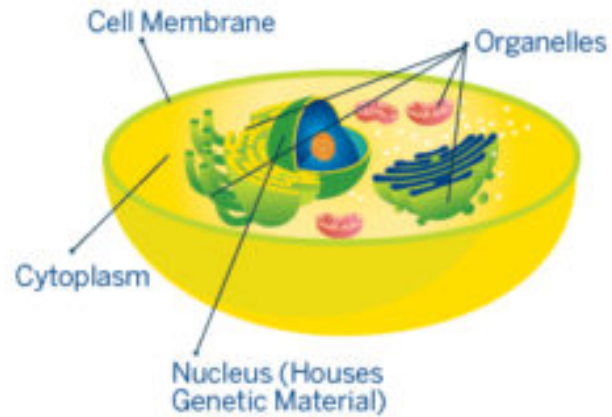
FACSDiva Version 6.1



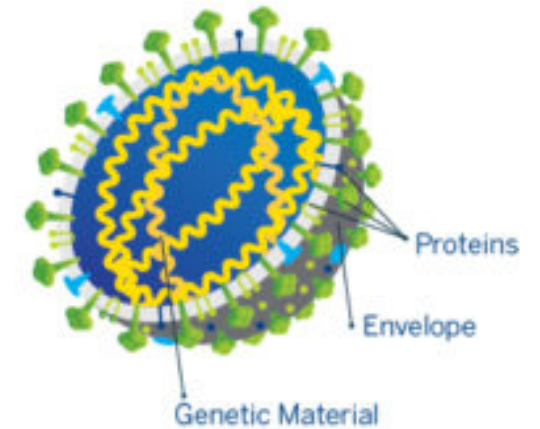
PROKARYOTE



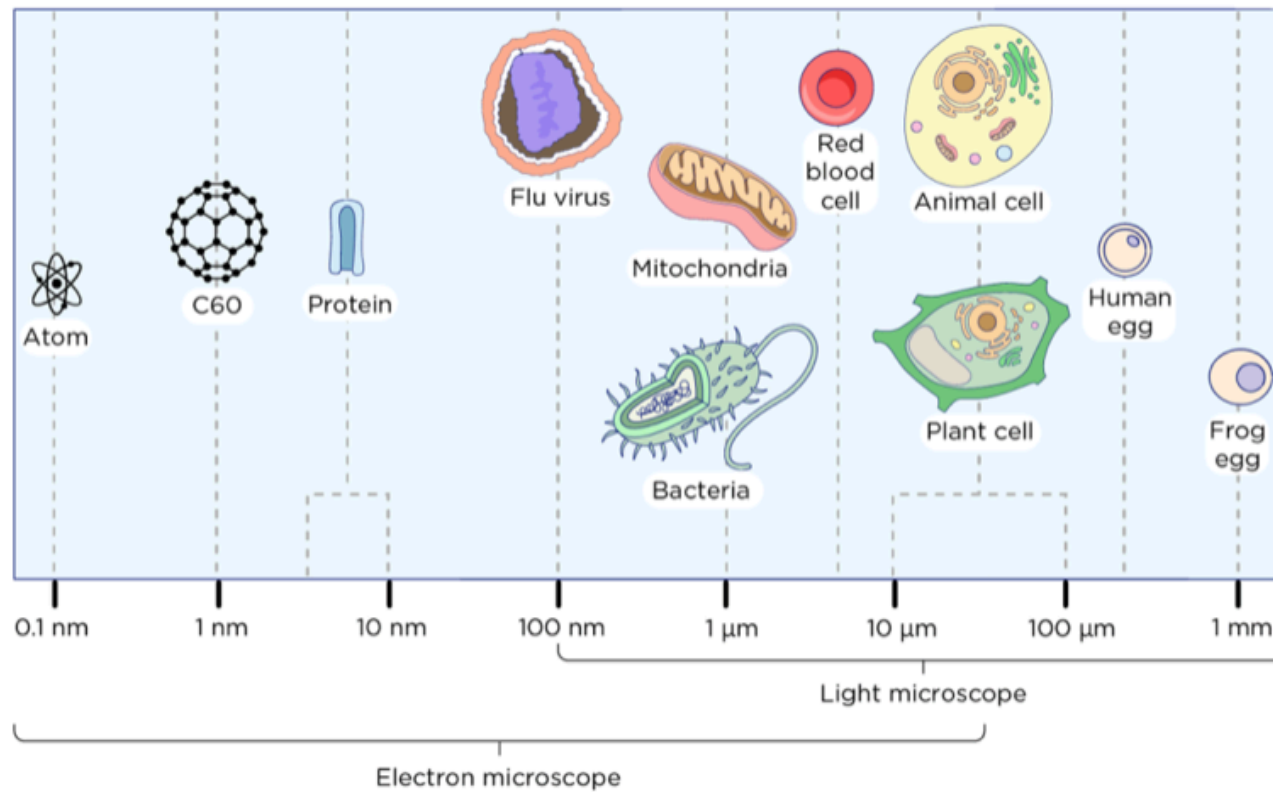
EUKARYOTE

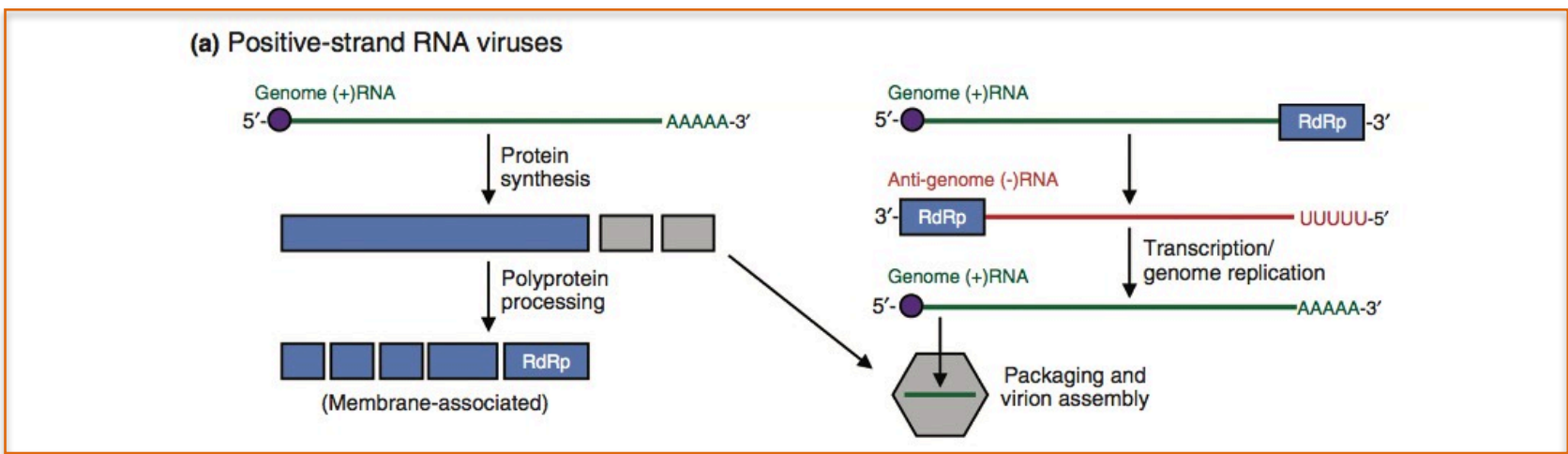


VIRUS



Relative size of prokaryotes and viruses





Overview of transcription and replication strategies for various types of (a) **Positive-strand RNA [(+)RNA] viruses.**

The genomes of (+)RNA viruses are message-sense (green), and they often contain a 5' m⁷G cap (purple circle) and 3' poly-A tail (AAAAA).

Host cell ribosomes translate the genome into one or more polyproteins, which are co-translationally and post-translationally processed by virally encoded proteases.

Some of the mature polyprotein processing precursors and products include the **RNA-dependent RNA polymerase (RdRp; light blue rectangle)** and cofactors (**light blue squares**) that mediate viral RNA synthesis in association with cellular membranes.

Other proteins made by the virus include those that will assemble into viral particles (gray squares). The **RdRp** mediates the synthesis of negative-strand RNA [(-)RNA] antigenome (red) using the genome as template.

The antigenome is then converted into new (+)RNA genome by the **RdRp** and then packaged into nascent virion particles (gray hexagon).

PMC full text: [Coronaviruses. 2015; 1282: 1–23.](#)

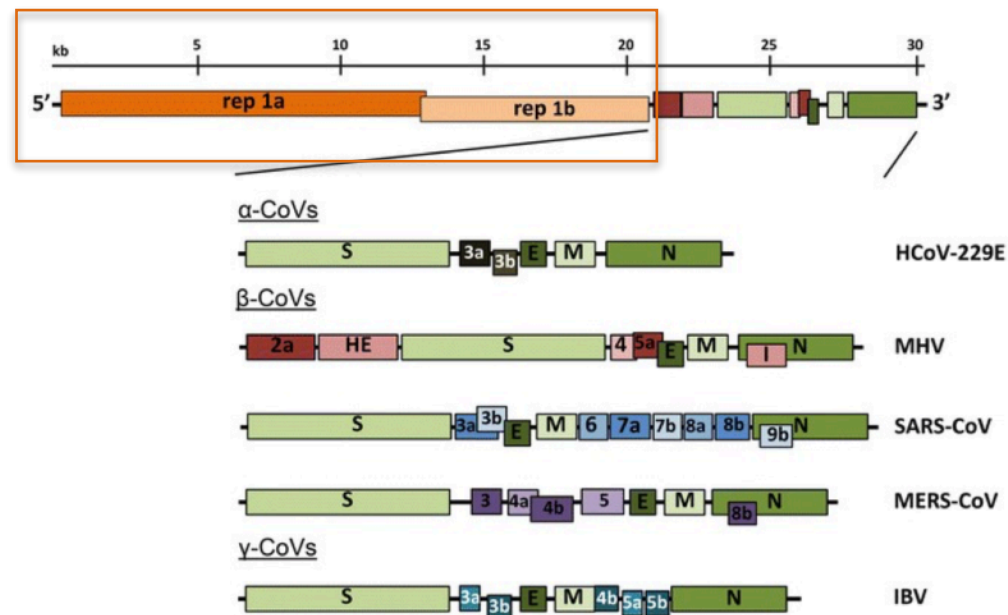
Published online 2015 Feb 12. doi: [10.1007/978-1-4939-2438-7_1](#)

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<< Prev Fig. 1 Next >>

Fig. 1



Genomic organization of representative α , β , and γ CoVs. An illustration of the MHV genome is depicted at the *top*. The expanded regions below show the structural and accessory proteins in the 3' regions of the HCoV-229E, MHV, SARS-CoV, MERS-CoV and IBV. Size of the genome and individual genes are approximated using the legend at the *top* of the diagram but are not drawn to scale. *HCoV-229E* human coronavirus 229E, *MHV* mouse hepatitis virus, *SARS-CoV* severe acute respiratory syndrome coronavirus, *MERS-CoV* Middle East respiratory syndrome coronavirus, *IBV* infectious bronchitis virus

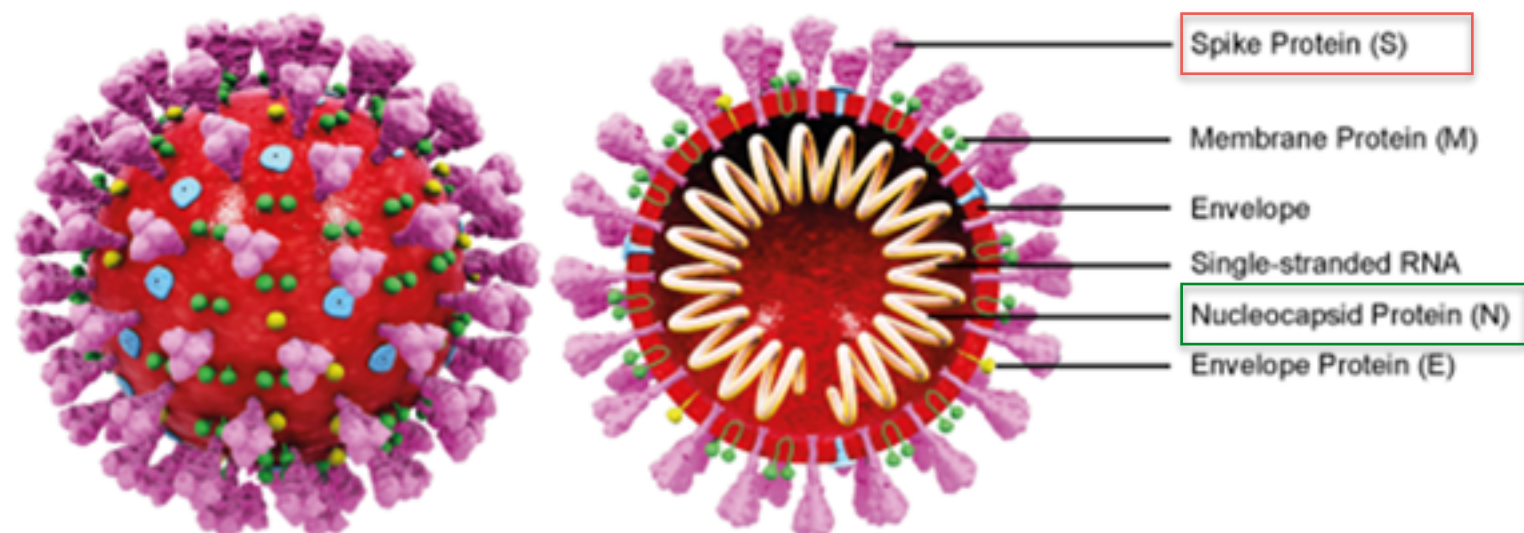


FIGURE 1: Schematic diagram of SARS-CoV-2.

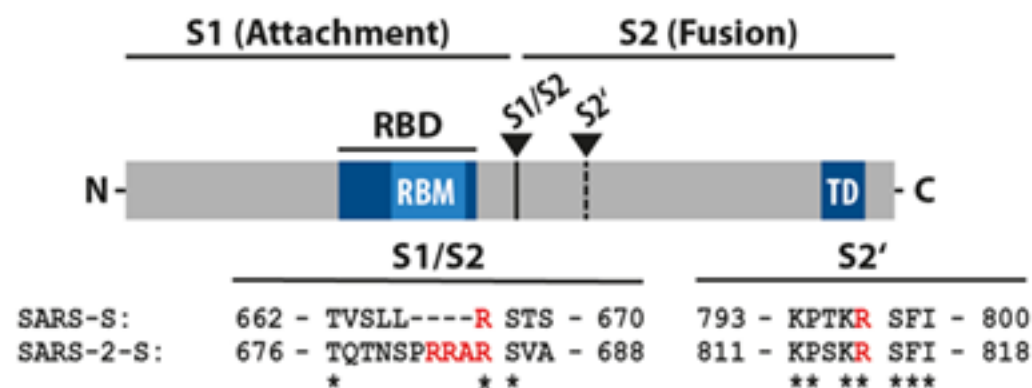
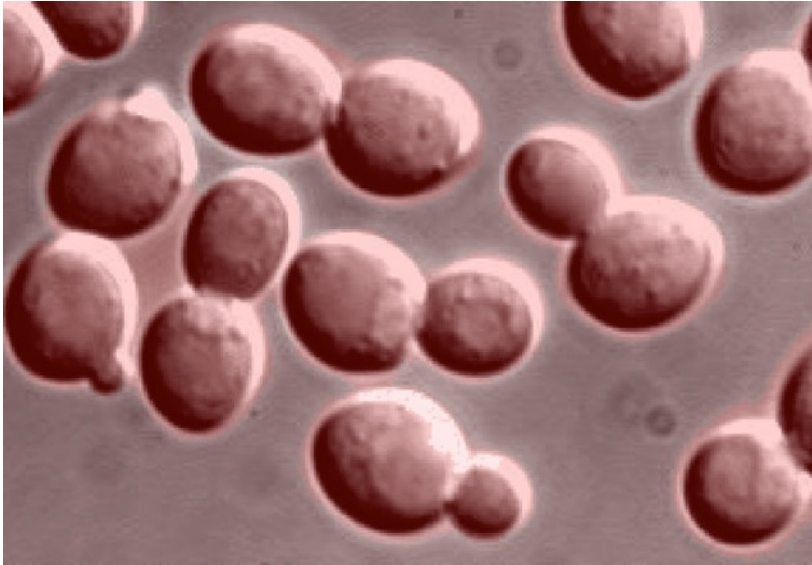


FIGURE 2: Domain comparison overview of Spike Protein S of SARS and SARS-CoV-2.

Schematic illustration of SARS-S including functional domains (RBD, receptor binding domain; RBM, receptor binding motif; TD, transmembrane domain) and proteolytic cleavage sites (S1/S2, S2', see arrows). Amino acid sequences around the two protease recognition sites (red) are shown for SARS-S and SARS-2-S (conserved residues are indicated as asterisks).



Baker's Yeast: *Saccharomyces cerevisiae*

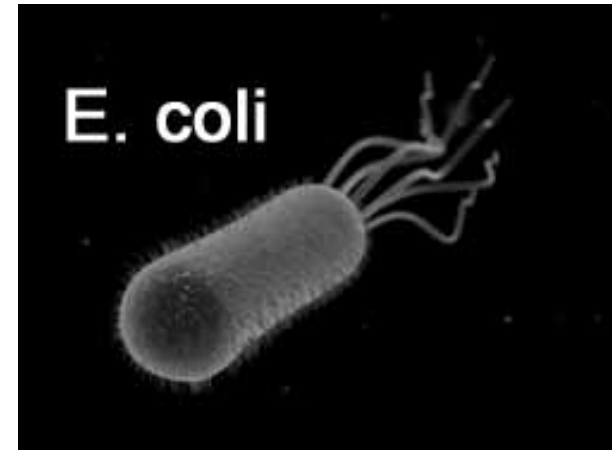
Yeasts are small, *single-celled plants*. They are members of the family *fungi* (singular, *fungus*), which also includes mushrooms. Fungi differ from other plants in that they have no chlorophyll.

~50 μm

Eukaryote

DNA is linear

Cell wall



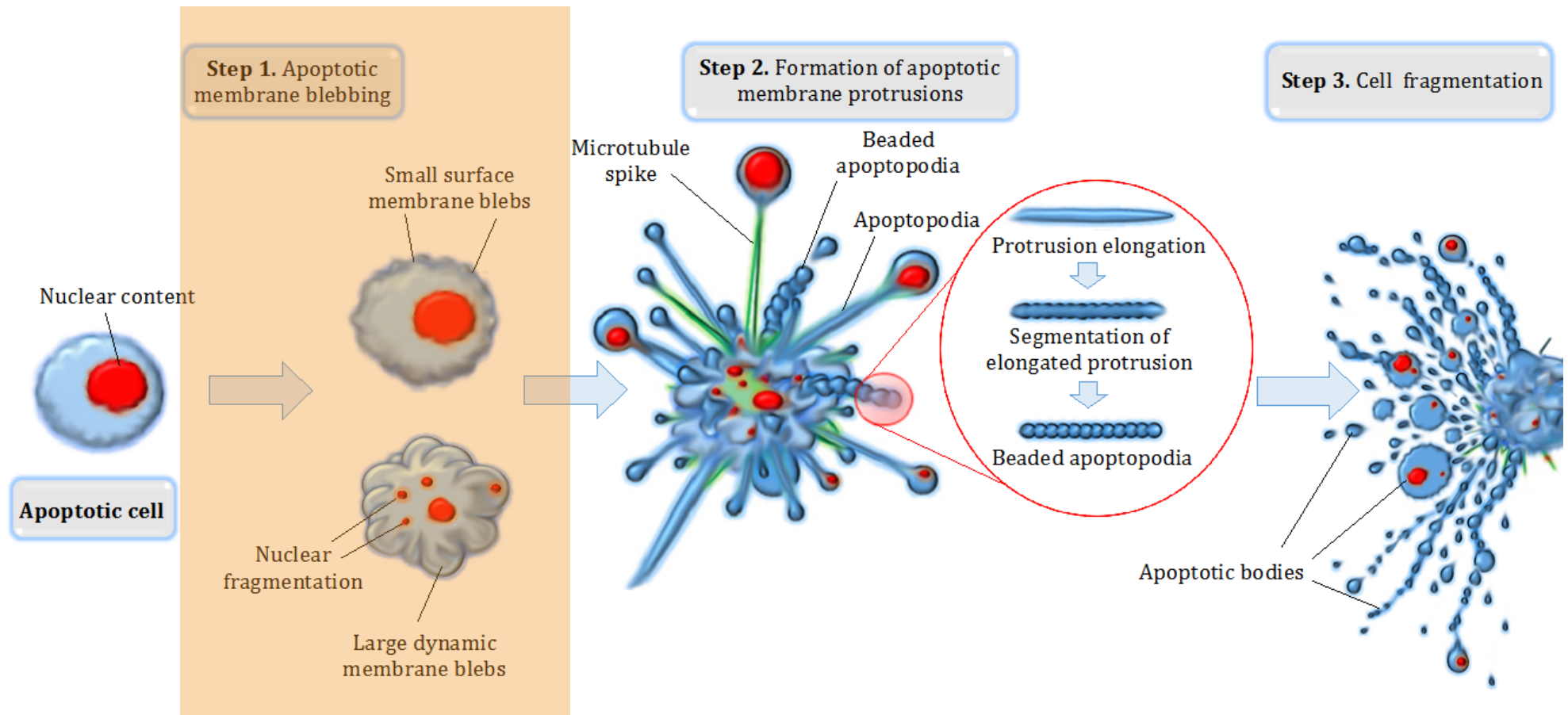
Bacteria thrive on many different types of food. But most yeasts can live only on sugars and starches. From these, they produce carbon dioxide gas and alcohol. Thus, they have been useful to man for centuries in the production of certain foods and beverages. They are responsible for the rising of bread dough and the fermentation of wines, whiskey, brandy and beer. They also play the initial role in the production of vinegar.

~1.5 -3 μm

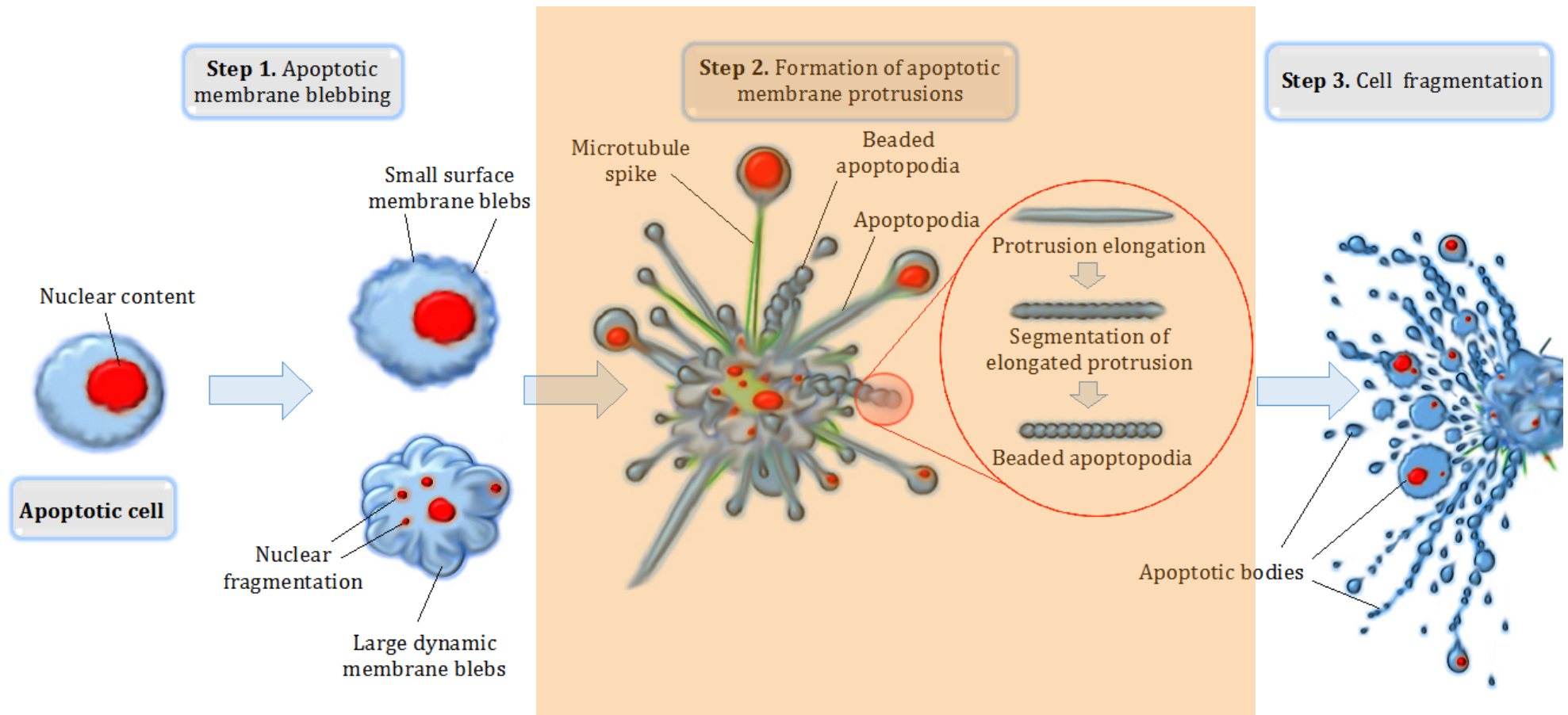
Prokaryote

DNA is Circular

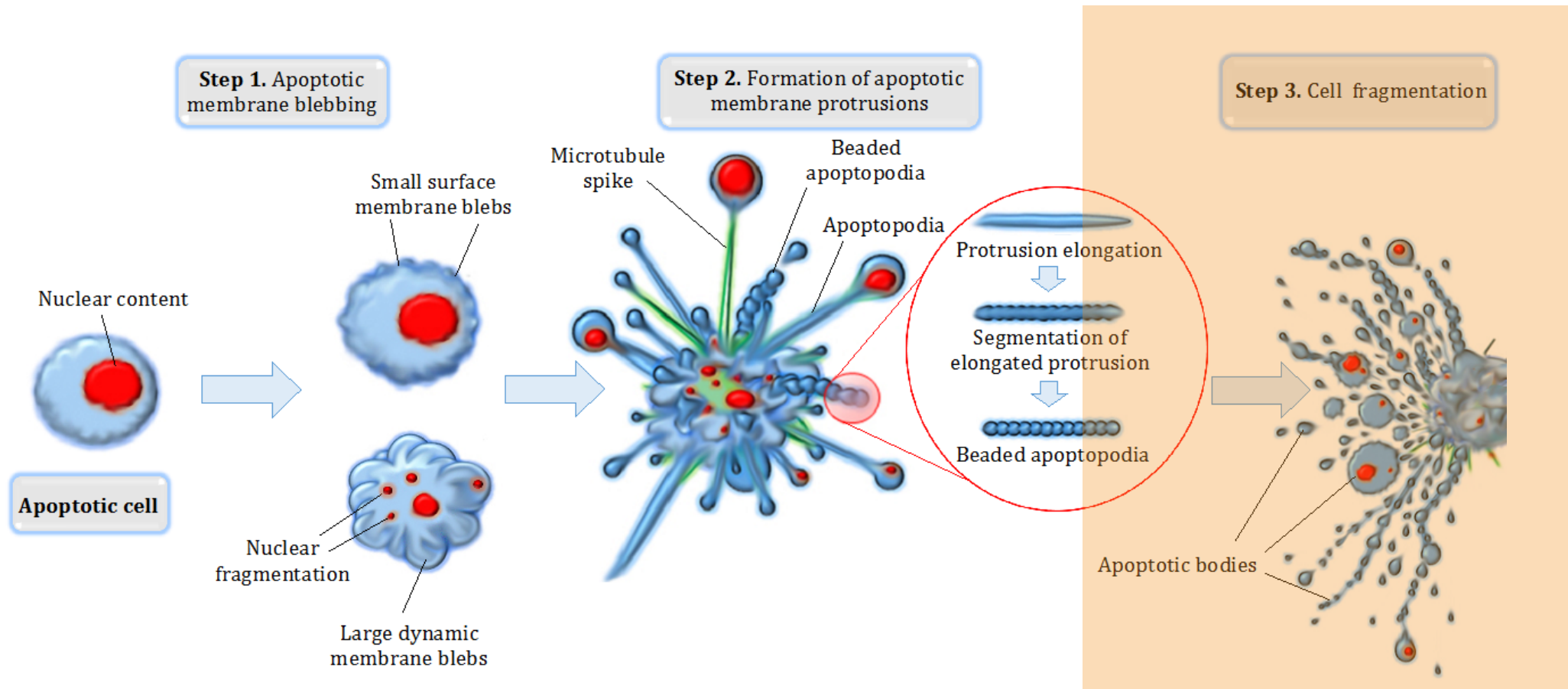
cell membrane



Different steps in apoptotic cell disassembly.



Different steps in apoptotic cell disassembly.



Different steps in apoptotic cell disassembly.

Caspases (cysteine-aspartic proteases, cysteine aspartases or cysteine-dependent aspartate-directed proteases) are a family of protease enzymes playing essential roles in programmed cell death. ... These are signalling molecules that allow recruitment of immune cells to an infected cell or tissue.

Apoptosis in yeast

Frank Madeo¹, Eva Herker, Silke Wissing, Helmut Jungwirth, Tobias Eisenberg, Kai-Uwe Fröhlich

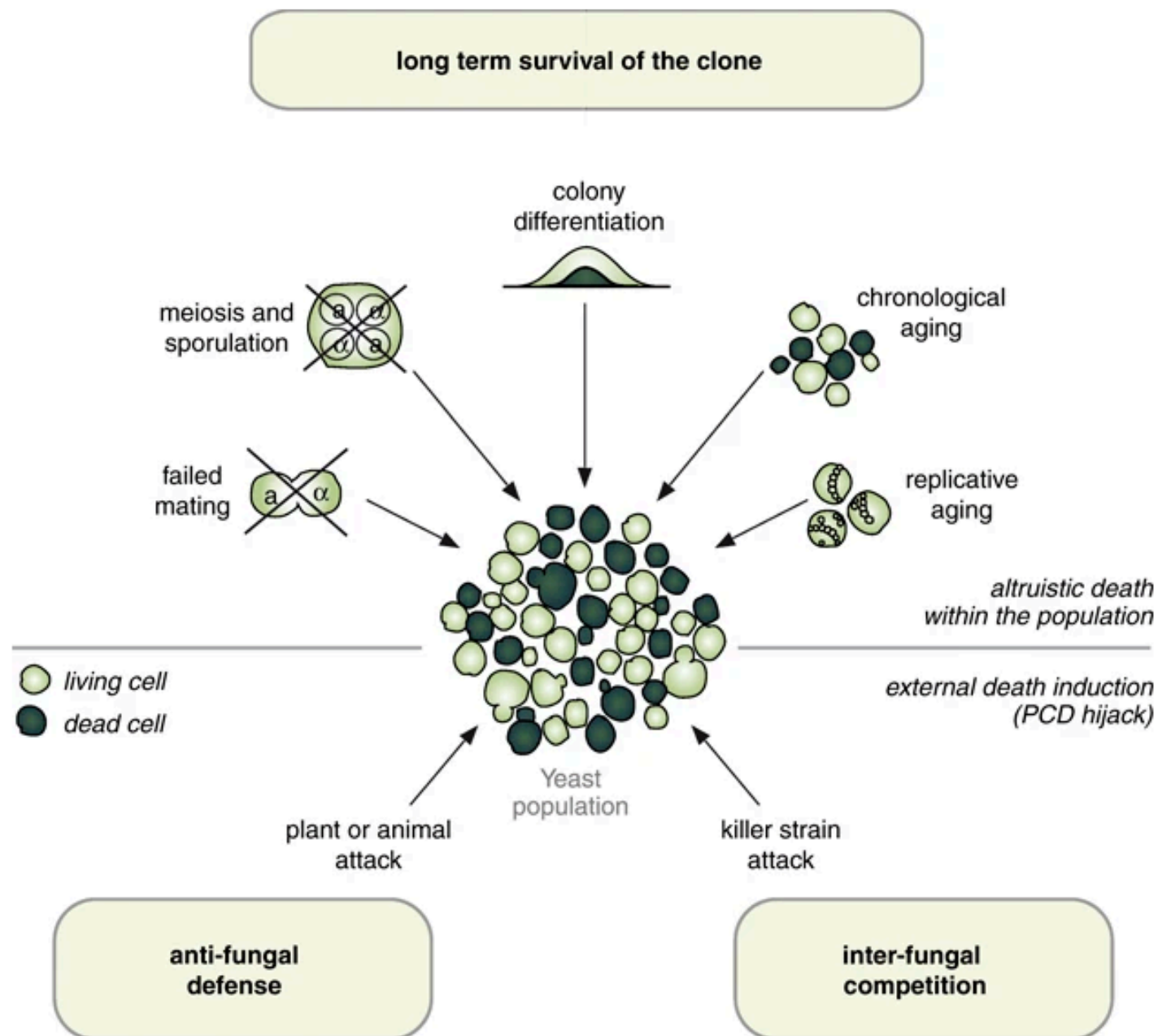
Affiliations + expand

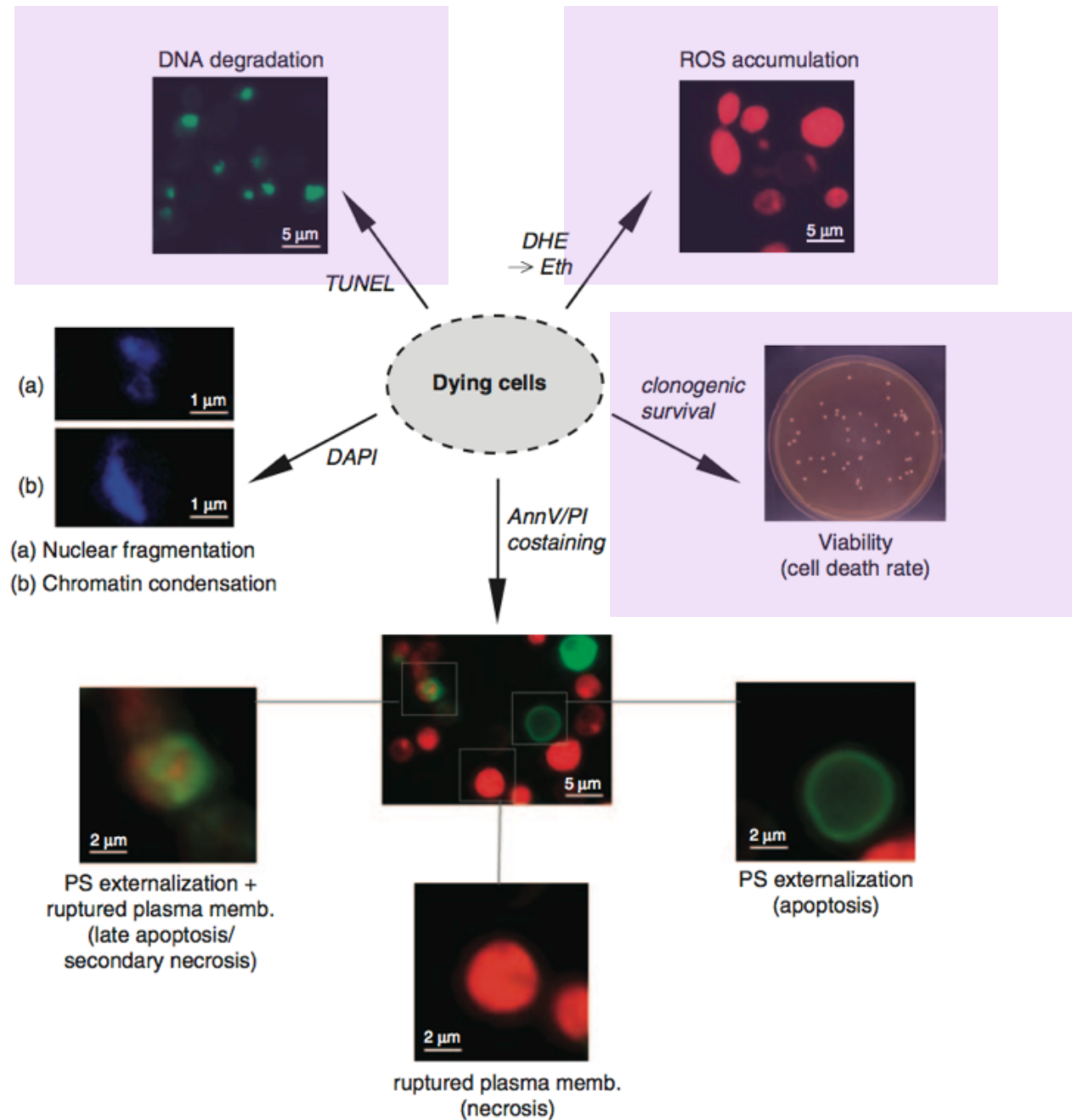
PMID: 15556039 DOI: [10.1016/j.mib.2004.10.012](#)

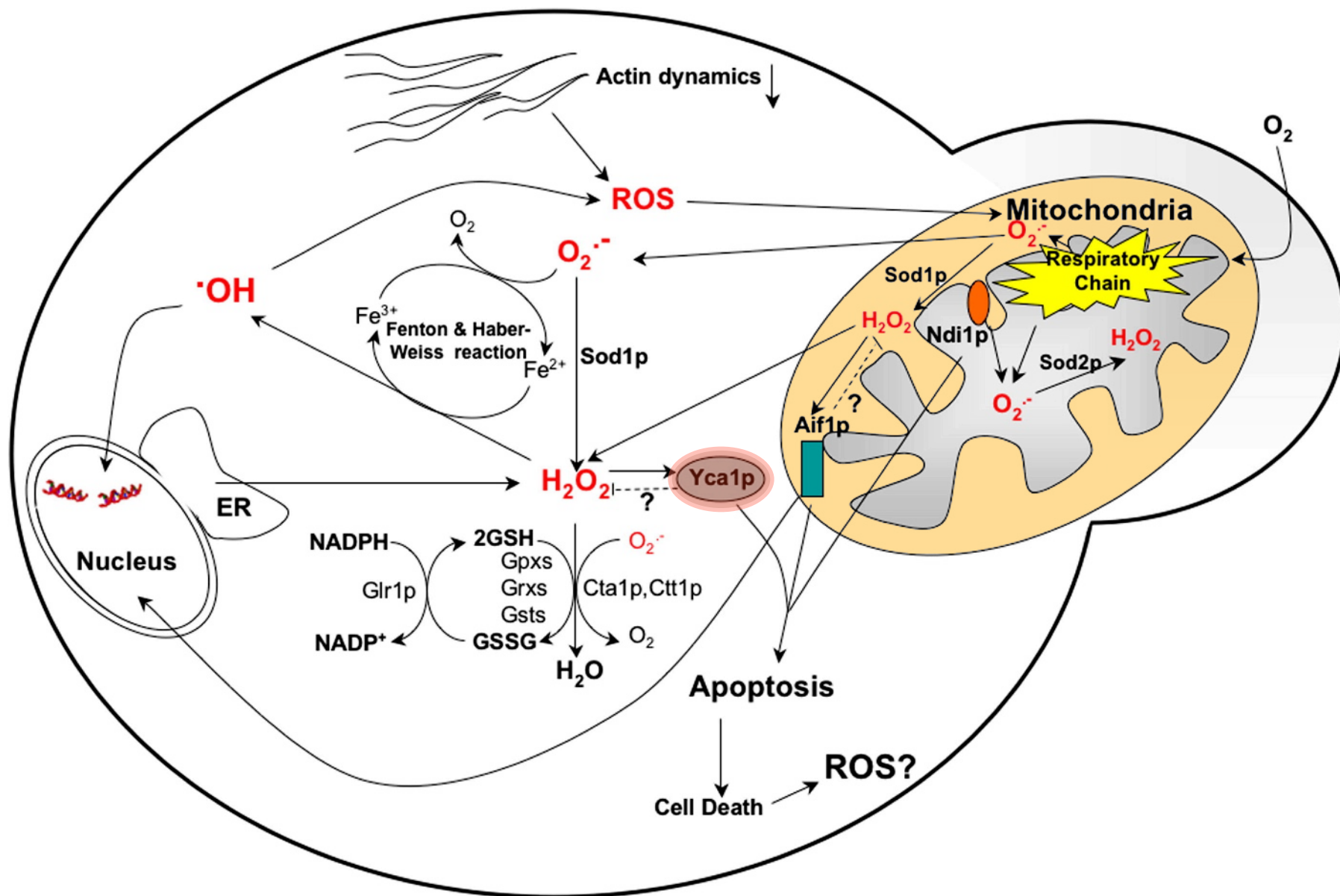
Abstract

Apoptosis is a highly regulated cellular suicide program crucial for metazoan development. However, dysfunction of apoptosis also leads to several diseases. Yeast undergoes apoptosis after application of acetic acid, sugar- or salt-stress, plant antifungal peptides, or hydrogen peroxide. Oxygen radicals seem to be key elements of apoptotic execution, conserved during evolution. Furthermore, several yeast orthologues of central metazoan apoptotic regulators have been identified, such as a caspase and a caspase-regulating serine protease. In addition, physiological occurrence of cell death has been detected during aging and mating in yeast. The finding of apoptosis in yeast, other fungi and parasites is not only of great medical relevance but will also help to understand some of the still unknown molecular mechanisms at the core of apoptotic execution.

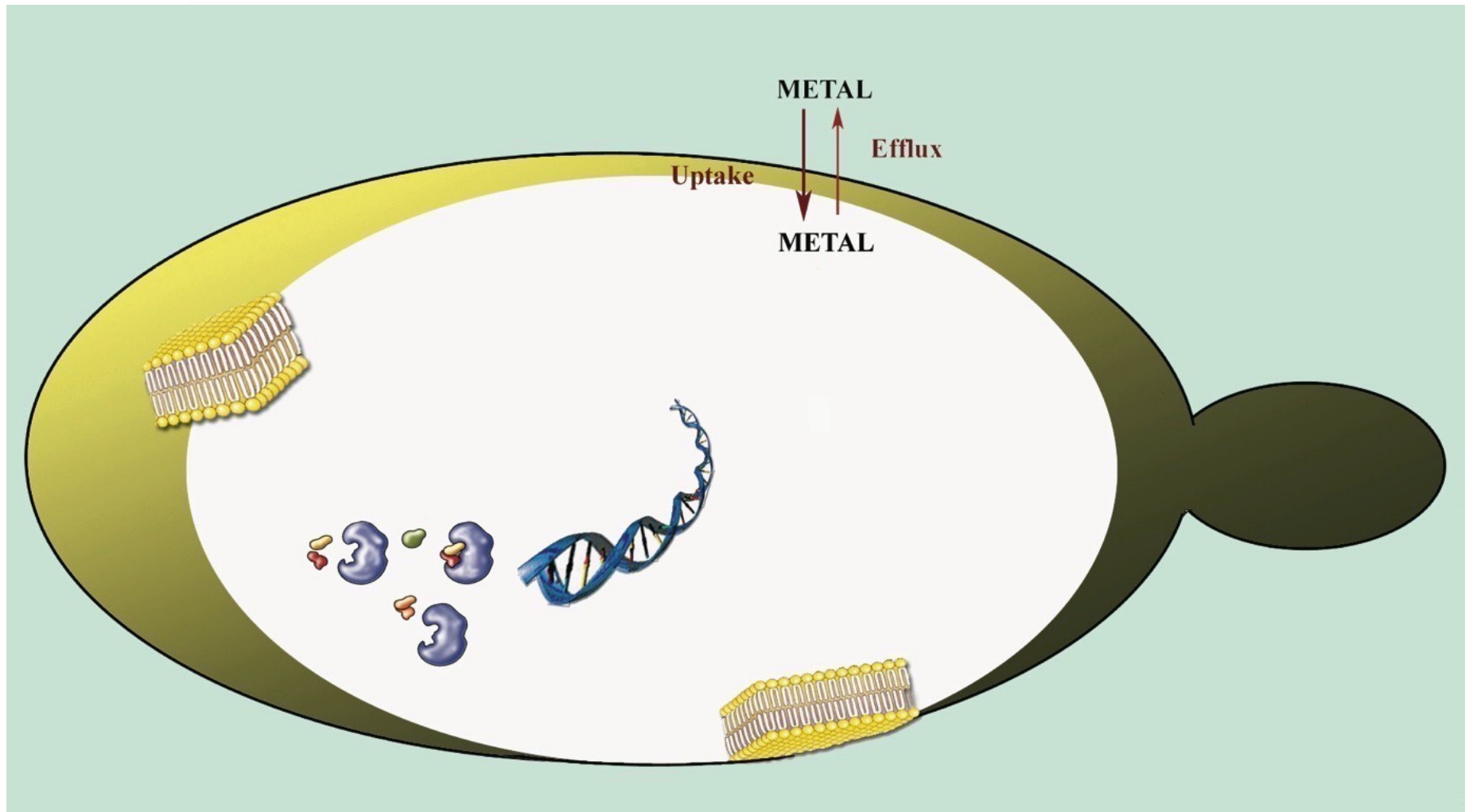
Figure 2



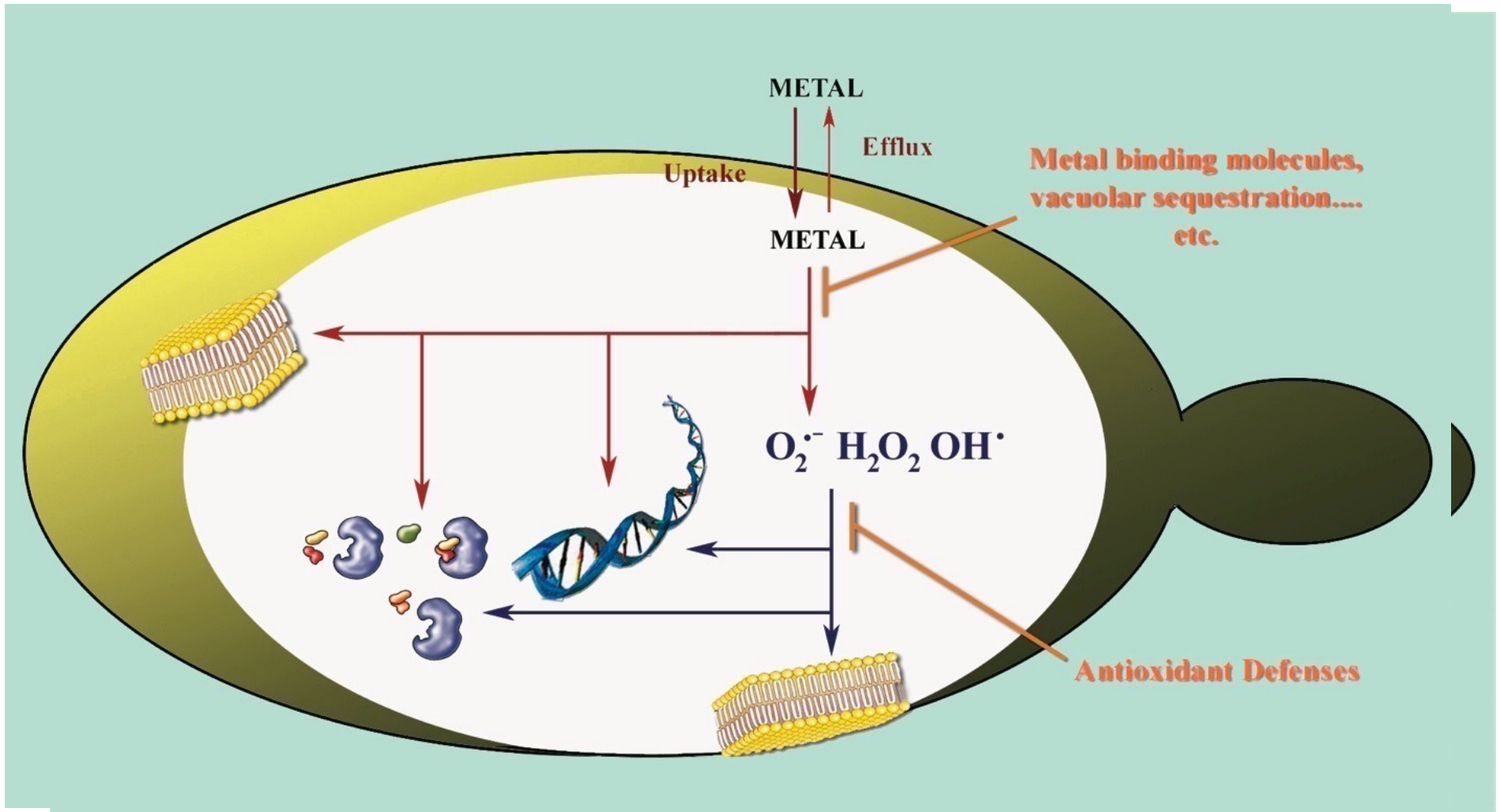




Metals generate ROS and cause oxidative stress



Metals generate ROS and cause oxidative stress



COMPLIANCE AND SAFETY

Responsible Conduct in Research

Conflicts of Interest

Export Control Regulations

Institutional Animal Care and Use Committee (IACUC)

Research and Environmental Safety (RES)

Research and Environmental Safety Committees

Institutional Biosafety Committee (IBC)


Laboratory Safety Committee (LSC) >

Radiation Protection Committee (RPC)

Animal Resources Program (DAR)

Human Subjects (IRB)

Laboratory Safety Committee

Georgia State University supports the pursuit of research and academic excellence while promoting safety awareness in the labs. The **Laboratory Safety Committee (LSC)** at GSU provides guidance and administrative oversight of environmental health and safety procedures in the academic research and teaching laboratories. The LSC develops policies and guidelines to assist in addressing hazard identification, accident prevention, and security in the laboratory to ensure the safety and welfare of all lab personnel. These policies and procedures can be found in the [Laboratory Safety Manual- Revised February 13 2015](#) . The committee meets the second Friday of each month.

Committee Members

Name	Department
Markus Germann <i>Chair</i>	Dept. of Chemistry, Arts & Sciences
Laura Carruth	Neuroscience Institute, Arts & Sciences
Nikolaus Dietz	Dept. of Physics and Astronomy, Arts & Sciences
Crawford Elliott	Dept. of Geosciences, Arts & Sciences
Dereck Faust*	School of Art & Design, Arts & Sciences
Teri Morris Florman	School of Nursing
John Houghton	Dept. of Biology, Arts & Sciences
Jennifer McWhorter	Fire Safety
Abdul Momen	Facilities
Stephen Rosner	Athletic Dept.
Kyla Ross	Dept. of Biology, Arts & Sciences
Pedro Vasquez	Dept. of Chemistry, Arts & Sciences
Richard Muller <i>Ex officio member with vote</i>	Assistant Director, Compliance & Safety

* new member

Compliance & Safety

Human Subjects (IRB)

Animal Subjects
(IACUC)Laboratory &
Environmental Safety

Biosafety

Chemical Safety

Radiation Safety



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Laboratory & Environmental Safety

Georgia State University recognizes the importance of and encourages laboratory research and teaching activities conducted at the university. In our mission to become a leading public research institution, GSU is committed to keeping those who work in our facilities safe. Thus, the Office of Research and Environmental Safety (RES) and the Laboratory Safety Committee (LSC) have established safety measures to protect the welfare of all laboratory personnel.

Definition of a Laboratory

A laboratory is defined as an area where hazardous materials may be used as part of teaching or research including but not limited to: science laboratories, art studios for painting, sculpture, ceramics, wood/metal working, jewelry, textiles, etc., among other areas of operations at the university. Such laboratories are characterized by controlled uniformity of conditions (e.g. constant temperature, water or utility services, humidity, cleanliness, fume hoods and/or cabinets, proper waste disposal protocols, and fire safety measures) and are subject to federal, state, and university regulations.

If you have any questions, please contact:

Betsy Butler

Senior Biosafety Officer

Phone: (404) 413-3510

Email: bbutler12@gsu.edu**Jamar Simmons**

Chemical Safety Officer

Phone: (404) 413-3535

Email: jamar@gsu.edu

[https://
ursa.research.gsu.edu/
biosafety/](https://ursa.research.gsu.edu/biosafety/)

(404) 413-3333



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Senior Biosafety Officer: **Betsy Butler**

Office: (404) 413-3568 Email: bbutler12@gsu.edu

Chemical Safety Officer: **Jamar Simmons**

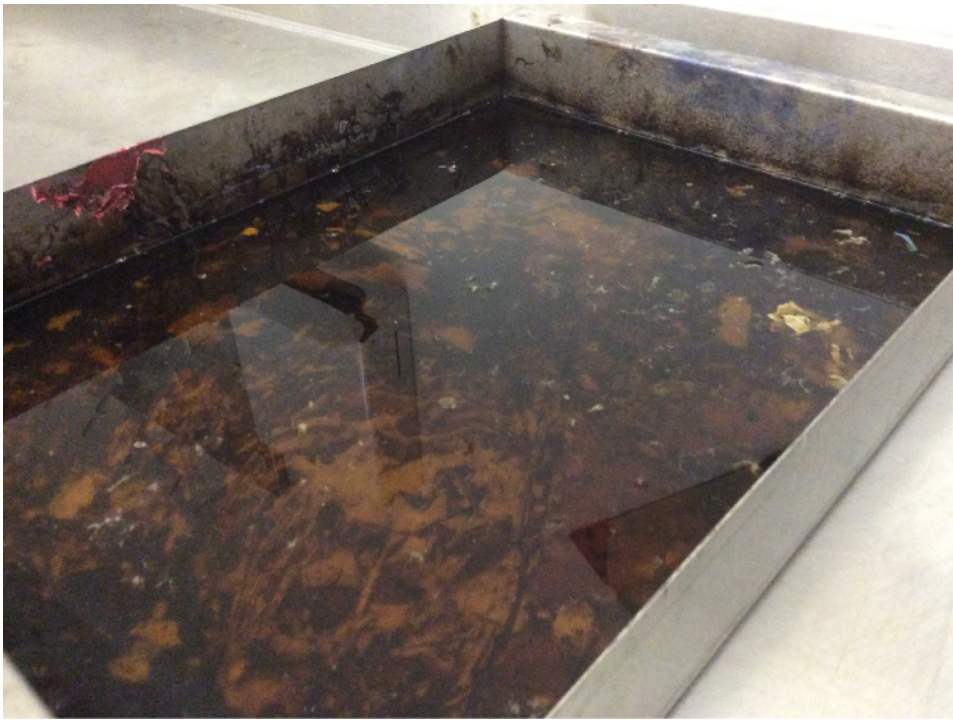
(404) 413-3535 Email: jamar@gsu.edu



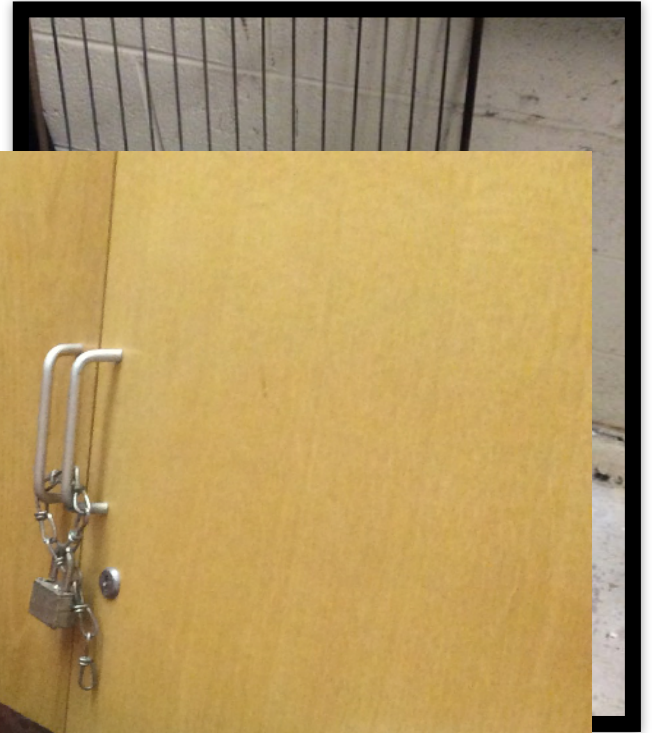
from permeablizing cell membranes -
 Gene Pulse Electroporation System (BioRad).....

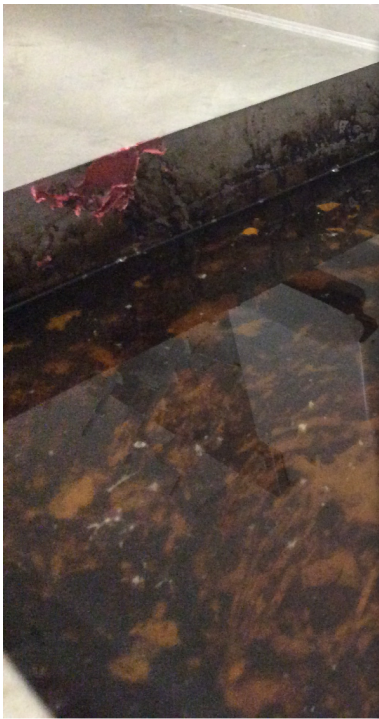
..to Cell breaking -**Sonifier 450**
 (Branson -top right)
 and
 French Press (Aminco)

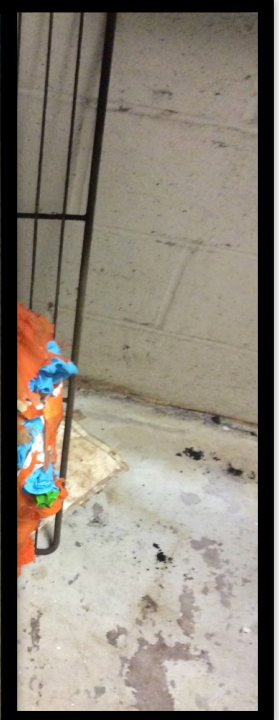


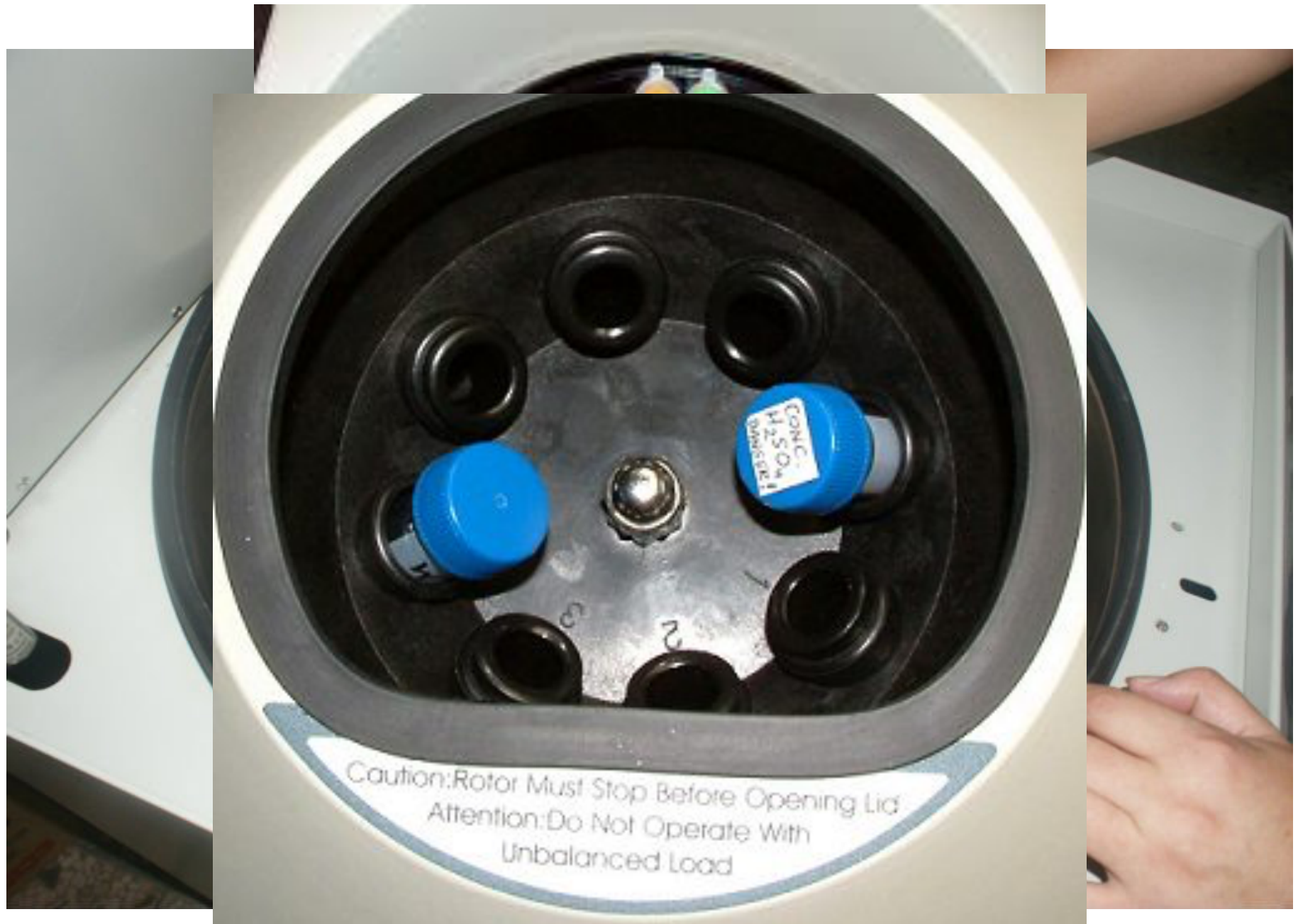












Use of ALL TYPES of centrifuges..



Check O'Rings on centrifuge lids!!!!











**ALWAYS CONTAIN HAZARDOUS MATERIAL
IN APPROPRIATE CONTAINERS
IN THE CORRIDOR !!!!!**



NO GLOVES IN THE CORRIDOR !!!!!