The Extraordinary Power of Research Based Curriculum

The Biotechnology Programs at MassBay Community College

Bruce A. Jackson, Ph.D., Mario Raya, M.D.
Carolyn Lanzkron, Student, Forensic DNA Science
Joel Rosen, Dan Rea, Students, Marine Biotechnology
Jonas de Oliveira, Student, Biotechnology

Overview of MassBay's Biotechnology Programs

- Established in 1993. First and only completely research-based undergraduate curriculum in the United States;
- 100% Industry placement rate. Most students hired before graduation;
- 50% of students pursue Advanced Degrees;
- Curriculum emulated in 27 countries;
- Produced 19 Goldwater Scholars;
- Received national recognition.

I am the one on the left.

Biotechnology Program is comprised of 3 A.S. Degree Options, Each Driven by a "Grand Project (GP)"

1. **Biotechnology** (GP: ***Alteration of Gene Expression in Prostate/Breast Cancer)***
2. **Marine Biotechnology** (GP: *Marine* ***Ecosystems of Montserrat and Puerto Rico)***
3. **Forensic DNA Science** (No "GP"; *students involved in actual DNA case work)*

Peer Mentoring: The Program Foundation.

Students best learn when they teach what they themselves have learned!

Forensic DNA Science Program

Carolyn Lanzkron

- Students Solve Cold Murder Cases like the “Lady of the Dunes”
- Reconnect lineages of displaced people (e.g. Jewish families separated by the Holocaust);
- Are involved in DNA cases in behalf of Police Departments and Defense Attorneys (including “Innocence Project”)
- Co-Author *Amicus* Briefs (Bruce Derr v. Maryland);

DNA Forensics Captivate Students, especially when working on real cases

MassBay Students May Solve This Unsolved 1975 Murder Case

The "Lady of the Dunes"

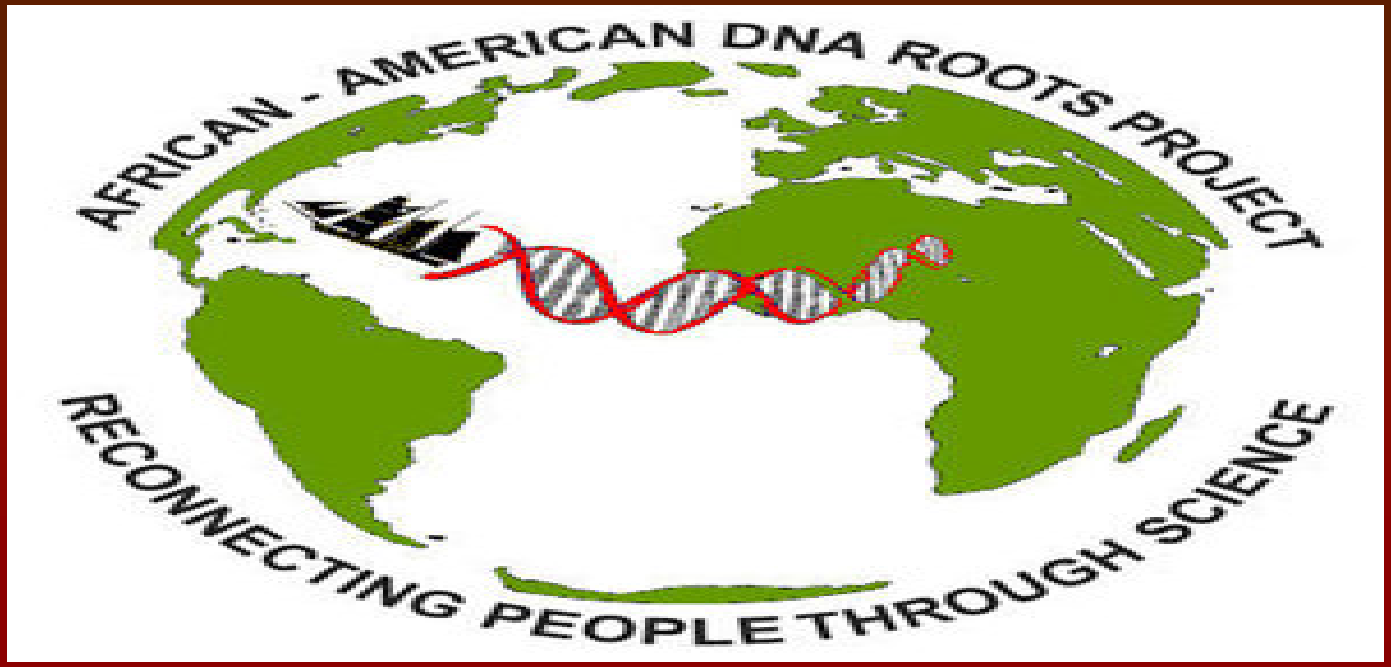
- Massachusetts's most celebrated cold murder case.

MassBay's Forensic Students Solved a New Hampshire Mystery in 2001

When the state of New Hampshire found the bodies in downtown Portsmouth, they did not call UNH or Dartmouth. They called MassBay.

MassBay Forensic students determined the precise ethnic group assignments of the remains to be:

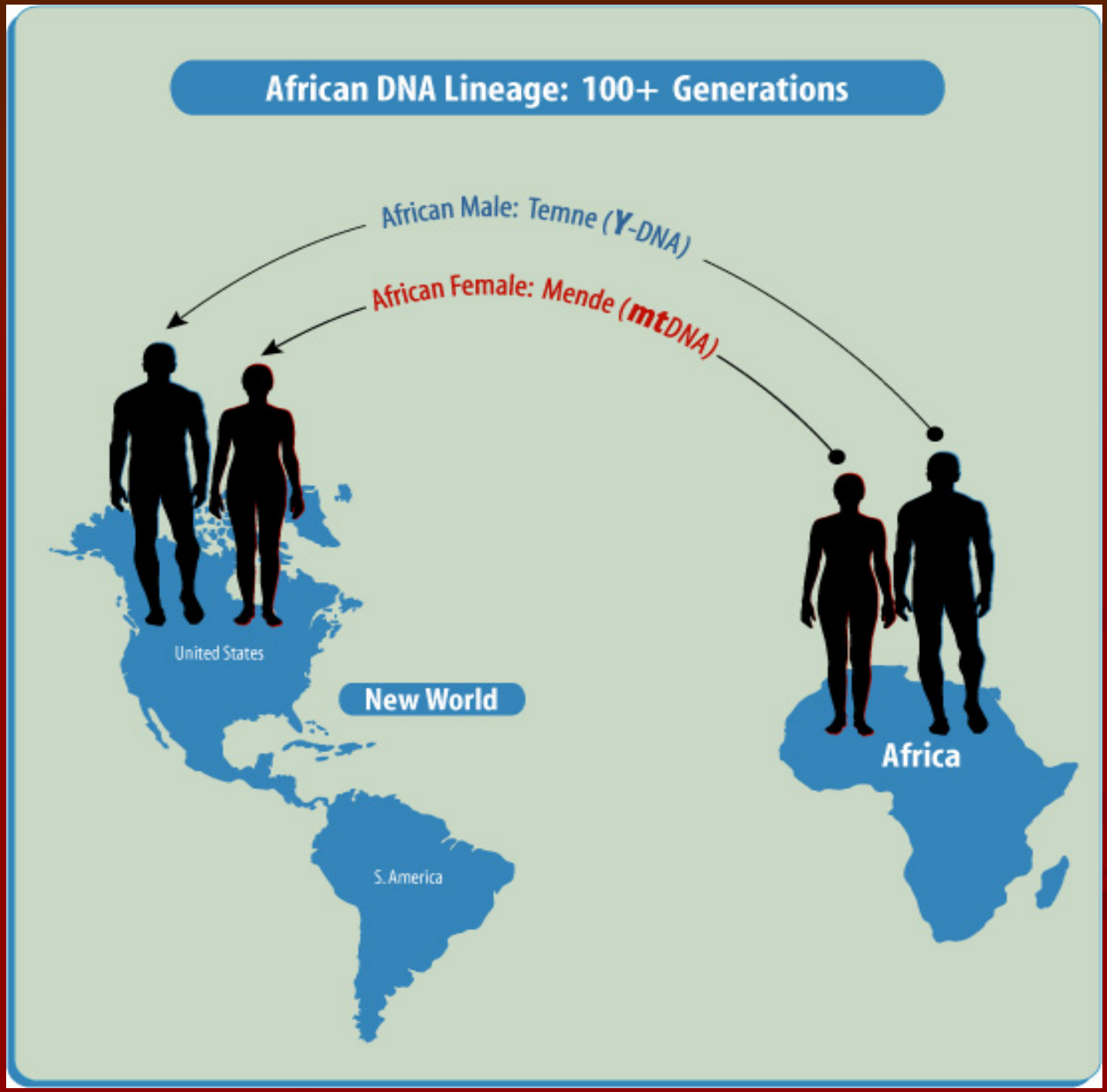
Haplogroup L3b/d (West African, common to Nigeria)

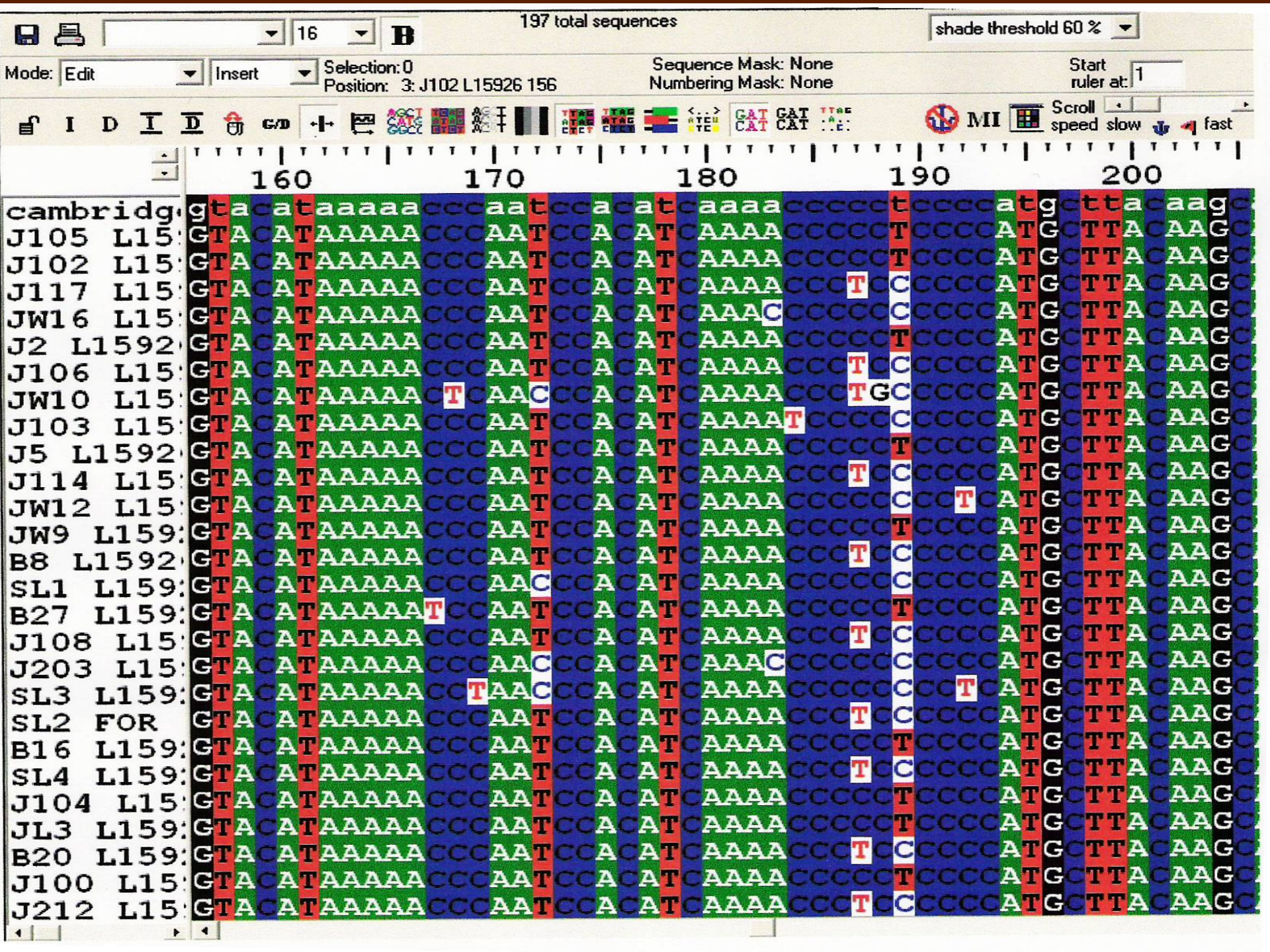


Many Forencic Students Advance

"The ROOTS PROJECT"

Traces the DNA Lineages of America and Caribbean Blacks


African DNA Lineage: 100+ Generations
African Male: Temne (Y-DNA)
African Female: Mende (mtDNA)
United States
New World
S. America
Africa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J203 L15
SL3 L159
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MassBay's Forensic Scholars have More Forensic Experiences than any Scholars in the World.

The Work of Forensic Students is International ; DNA Searches for Disconnected Lineages

K/Corenbaum Holocaust Case

“Dead Presidents”

- IURIS Study of President James Madison of Virginia, 4th President of the United States; Author of U.S. Constitution
- Had only child not with wife Dolly, but with slave Corrine?

Synergy : Business from Lineage Societies.

Marine Biotechnology Program

Joel Rosen, Dan Rea

Montserrat Project

- Research Curriculums are Most Successful when the Research is Relevant to the Student.
- We investigate scientific problem(s) that students can relate to.
- Integration of Field and Molecular Research.

The San Juan Estuary:

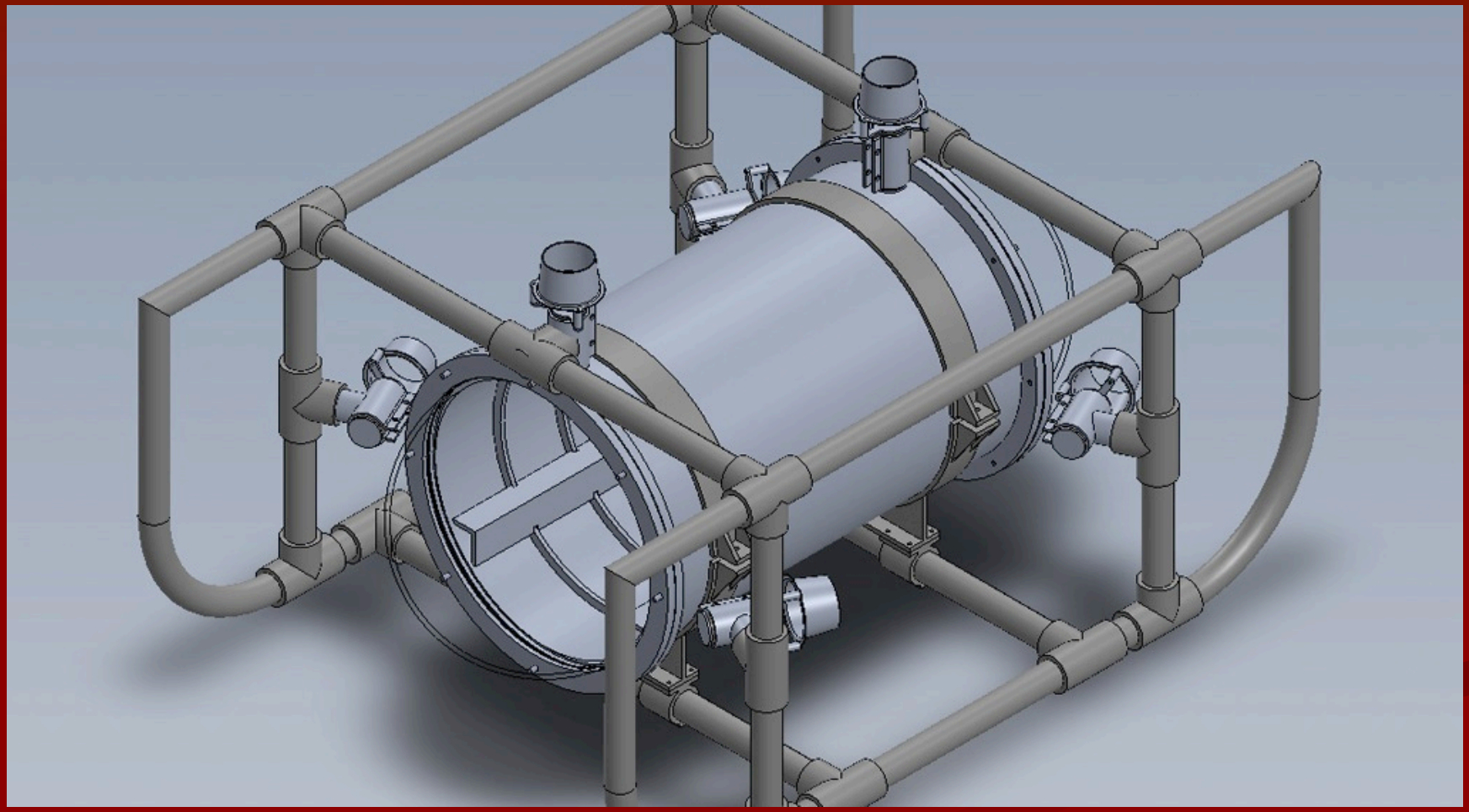
A vital economic and environmental waterway for Puerto Rico

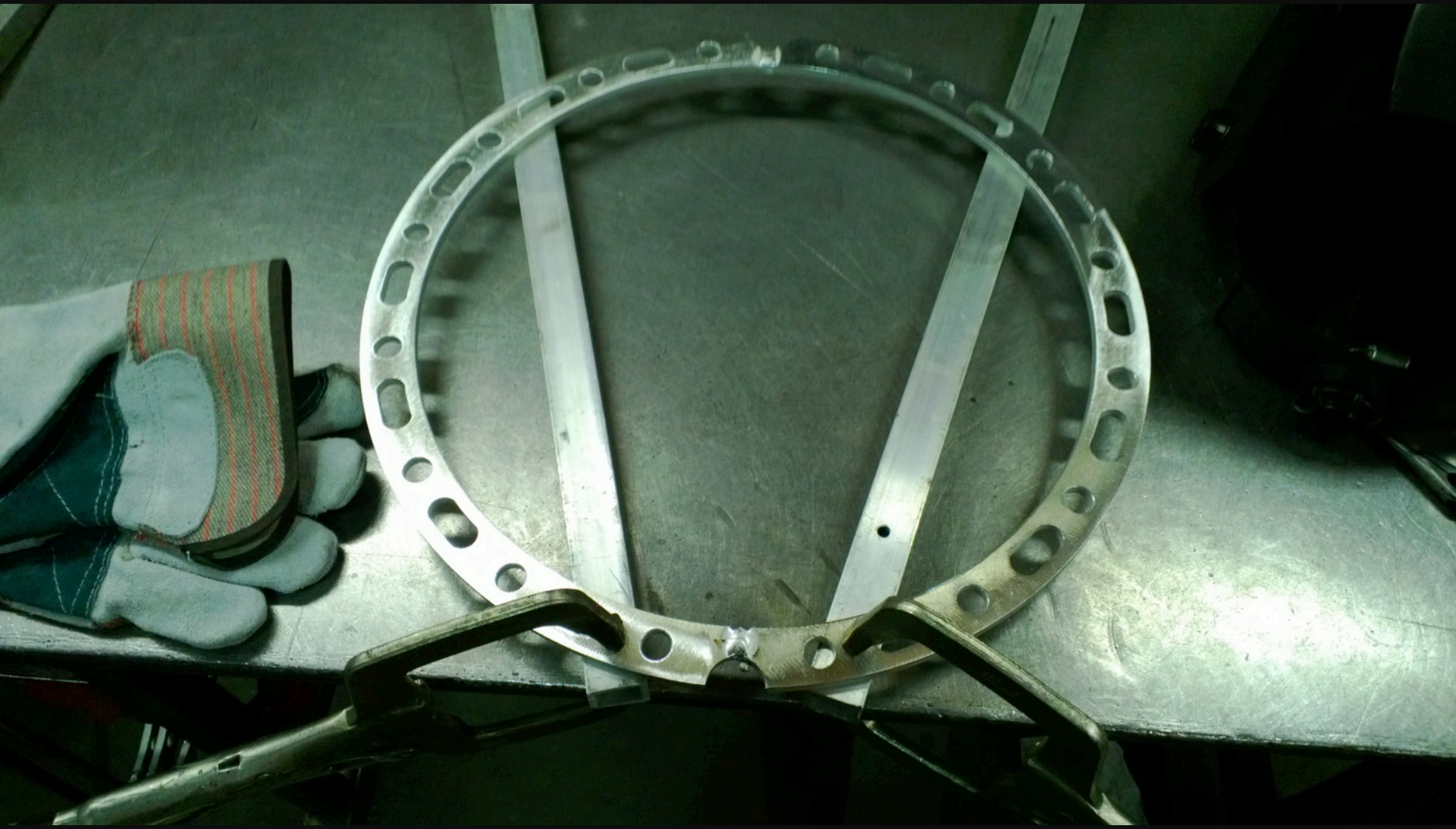
Fishermen utilize the heavily polluted Estuary

Our project investigates the source and nature of this pollution, and thus has relevance to Puerto Rico.

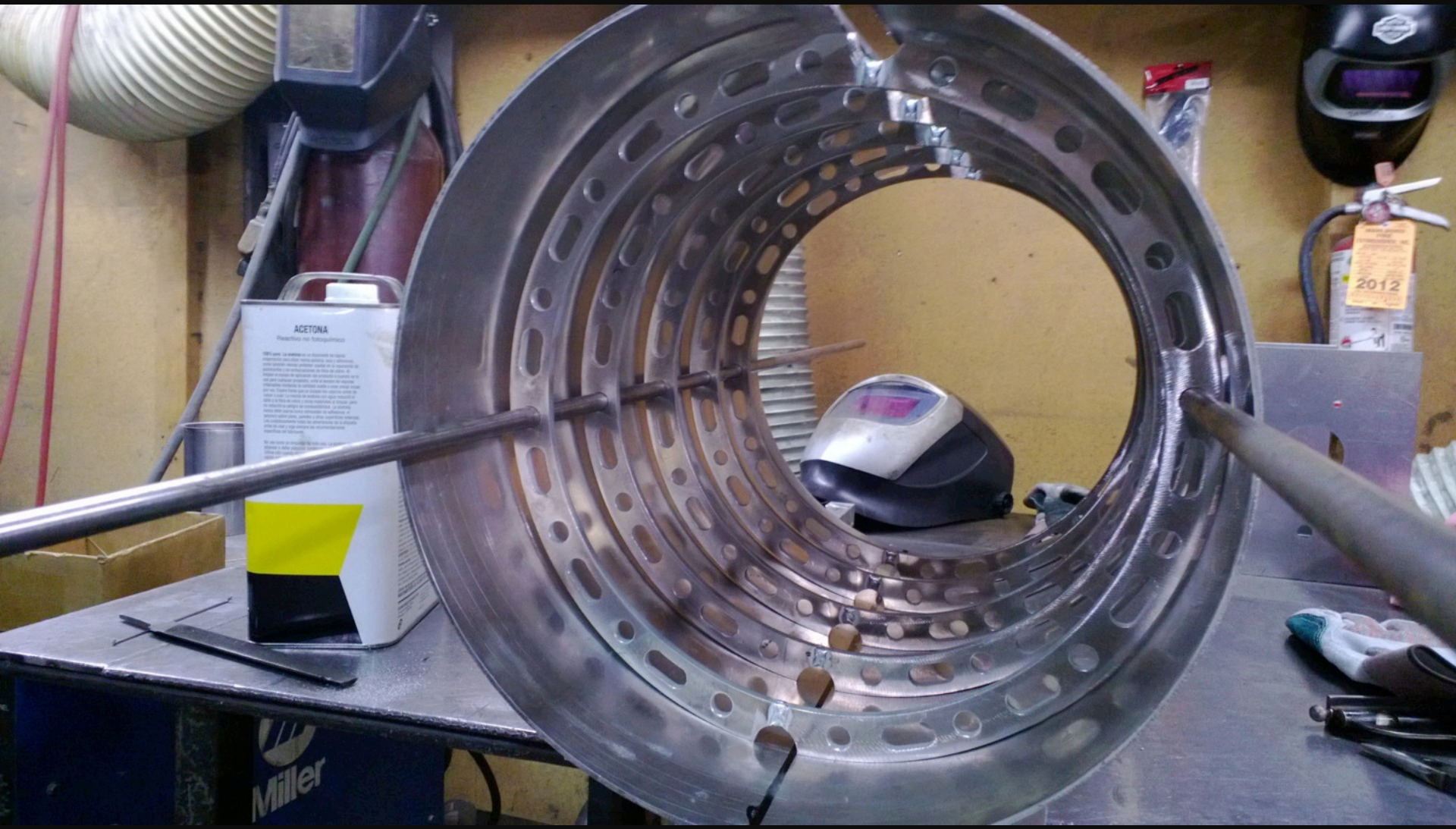
Robotic Underwater Surveying System ("RUSS")

A Submersible Designed and Built in Collaboration between the Engineering and Marine Biotechnology Students at MassBay






2012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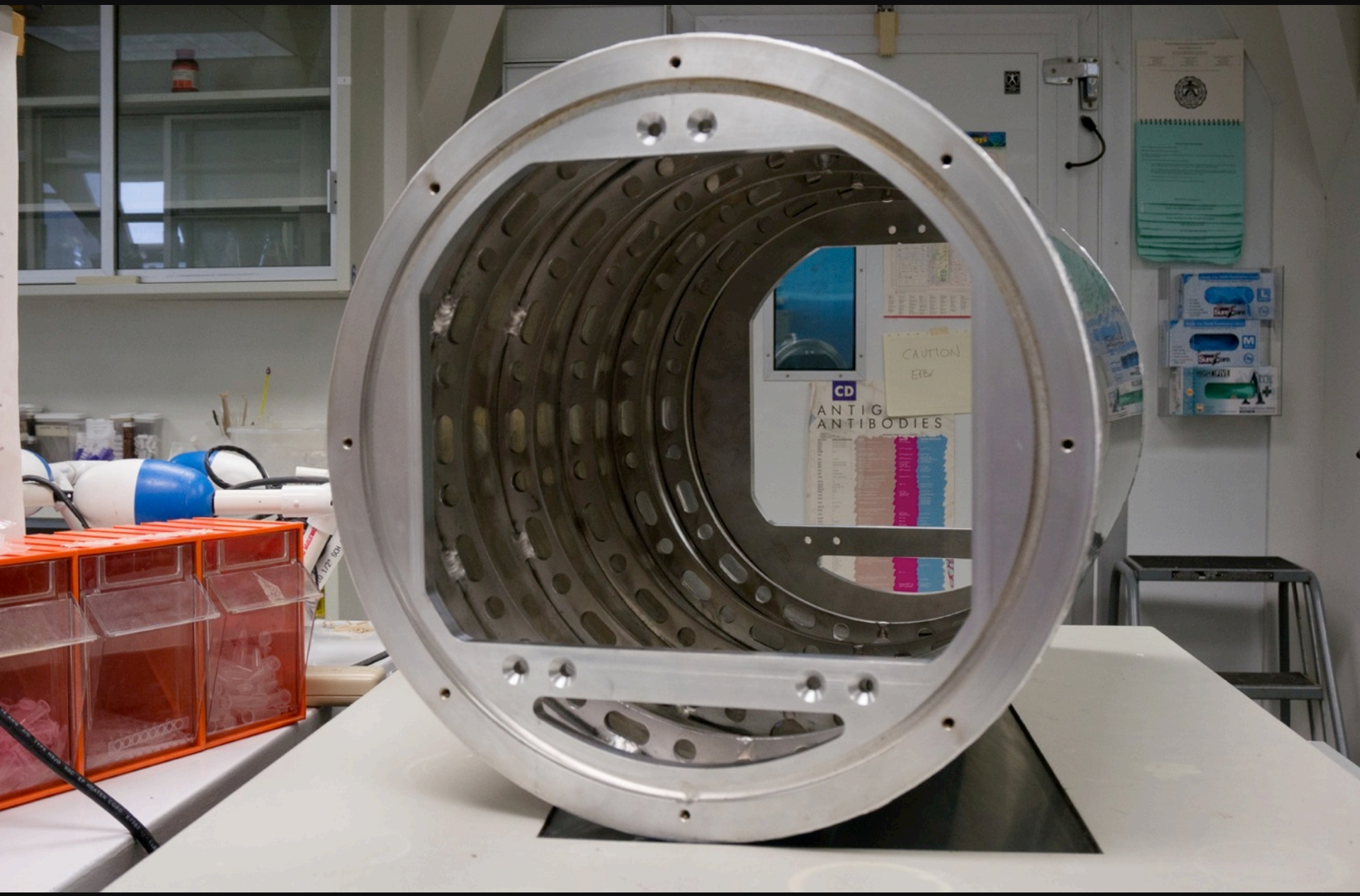
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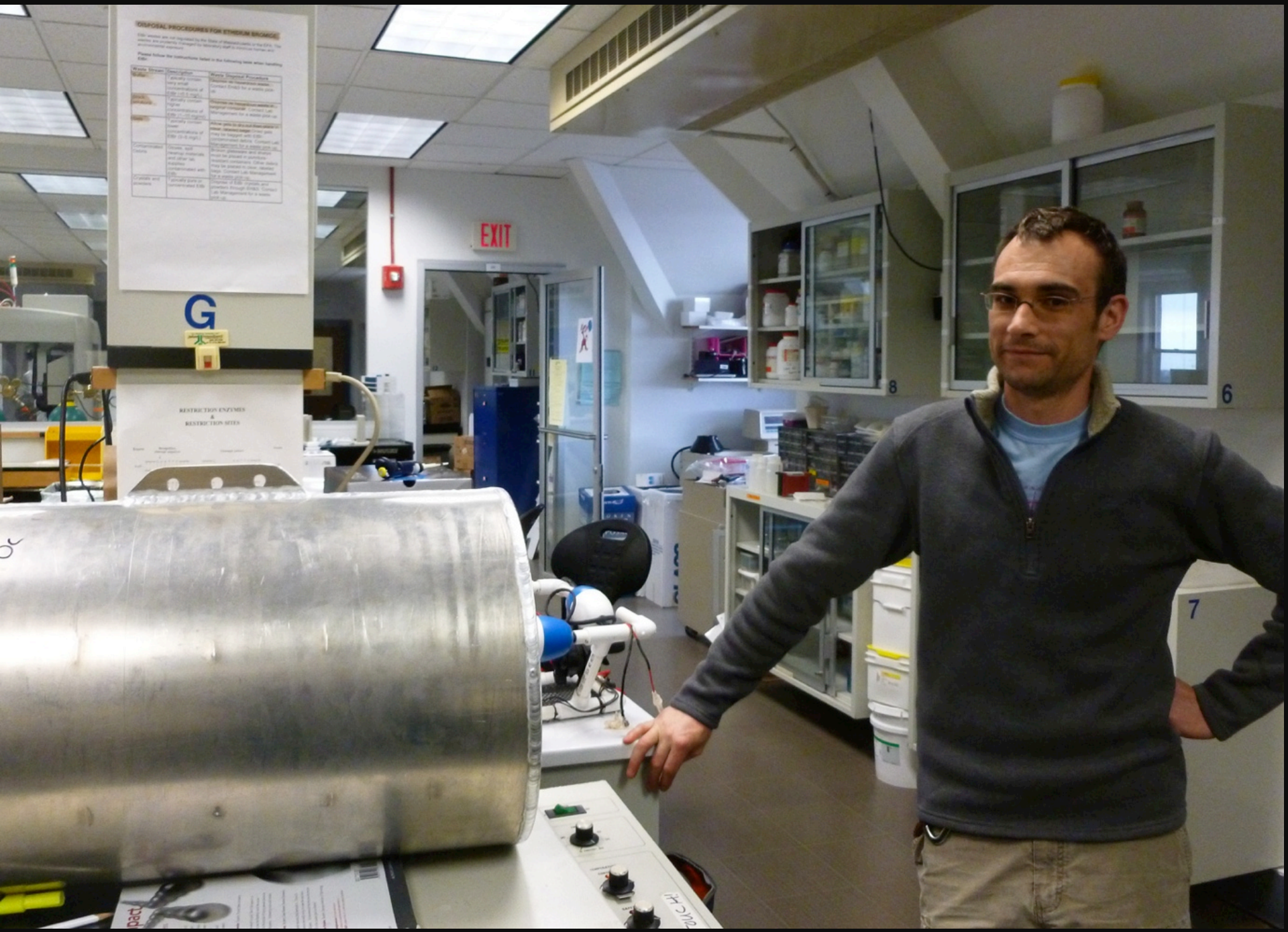
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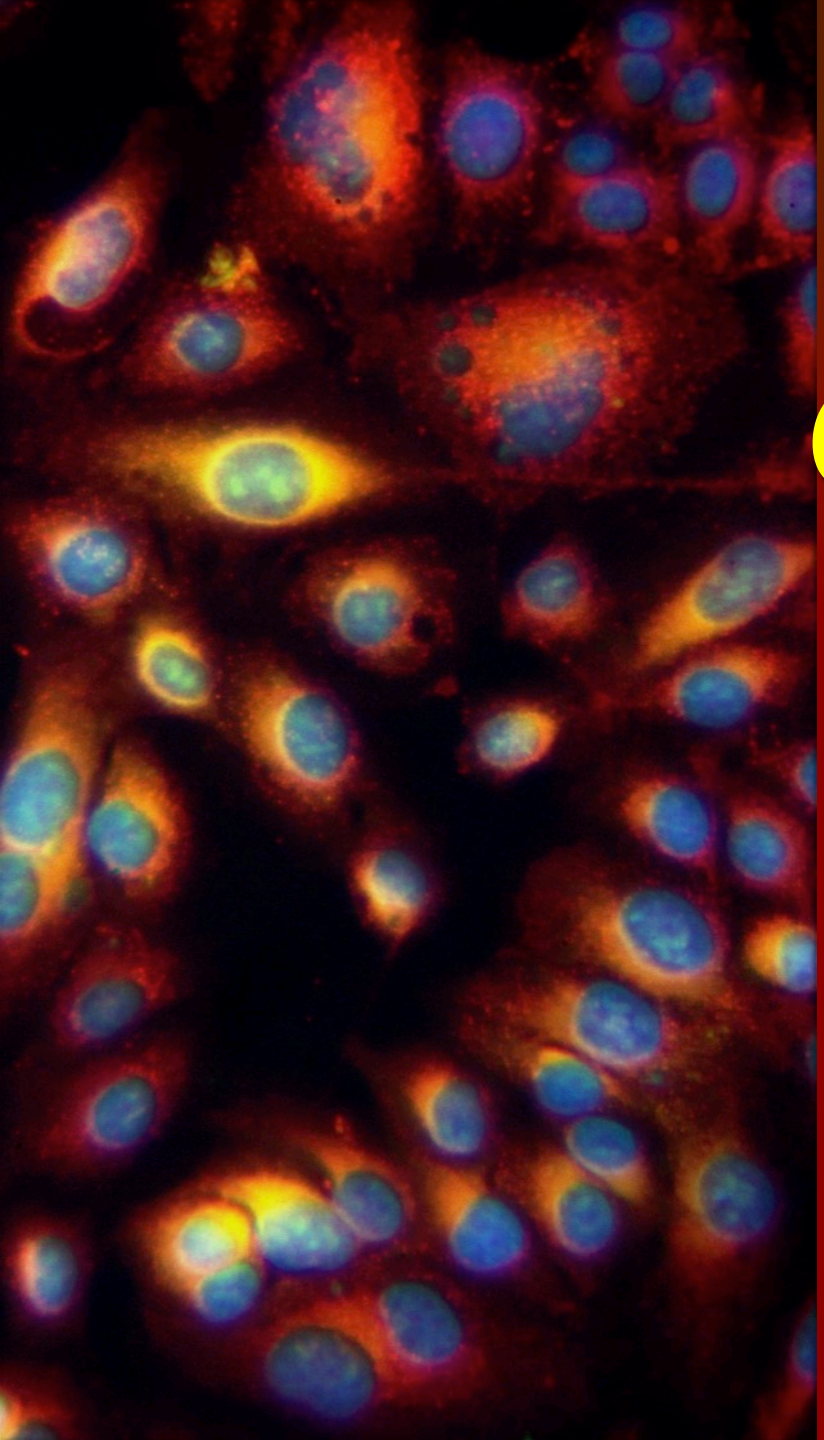
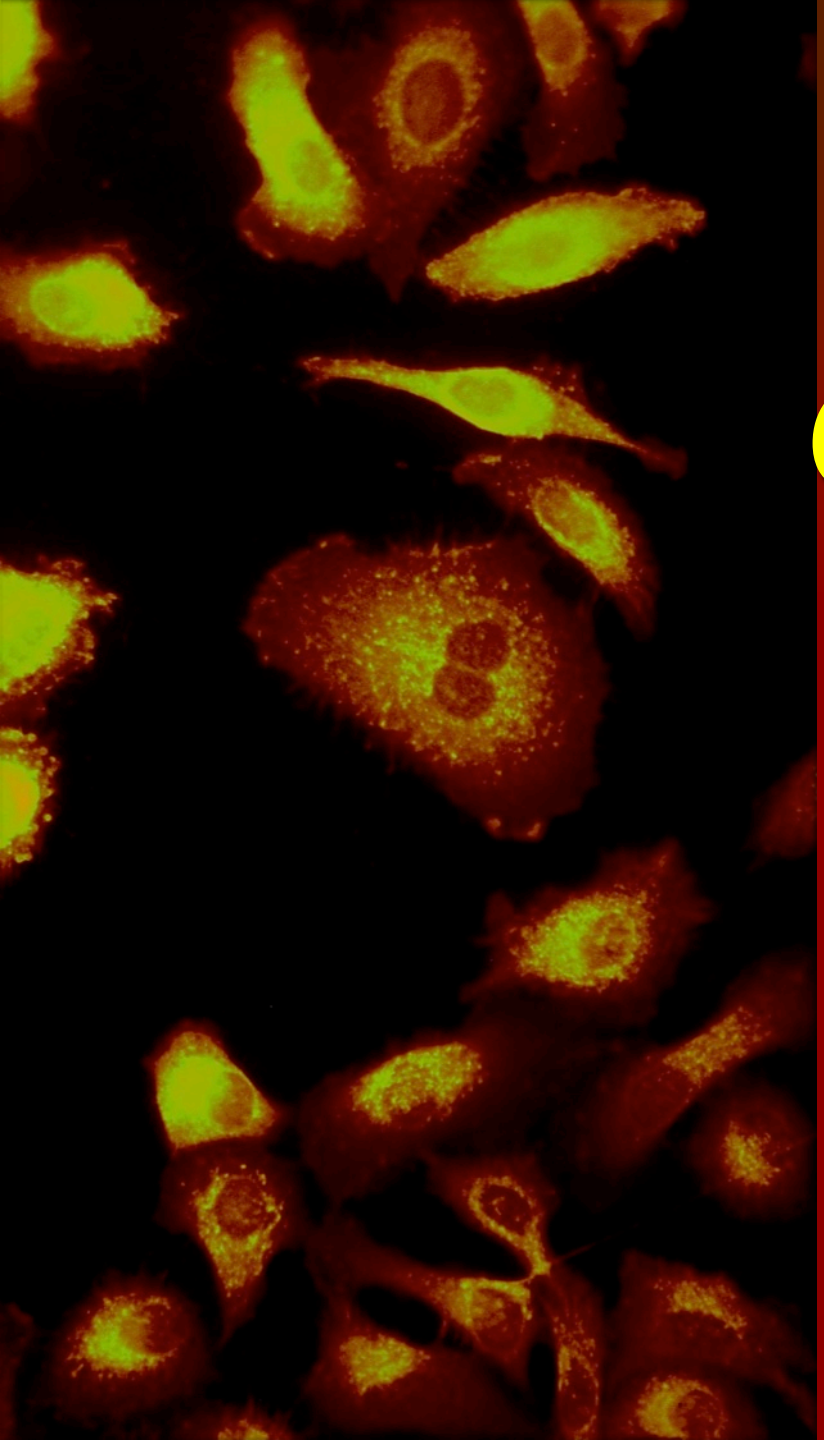
Biotechnology Program

The core of the Program focuses different techniques related to cell culture and analysis of gene expression.



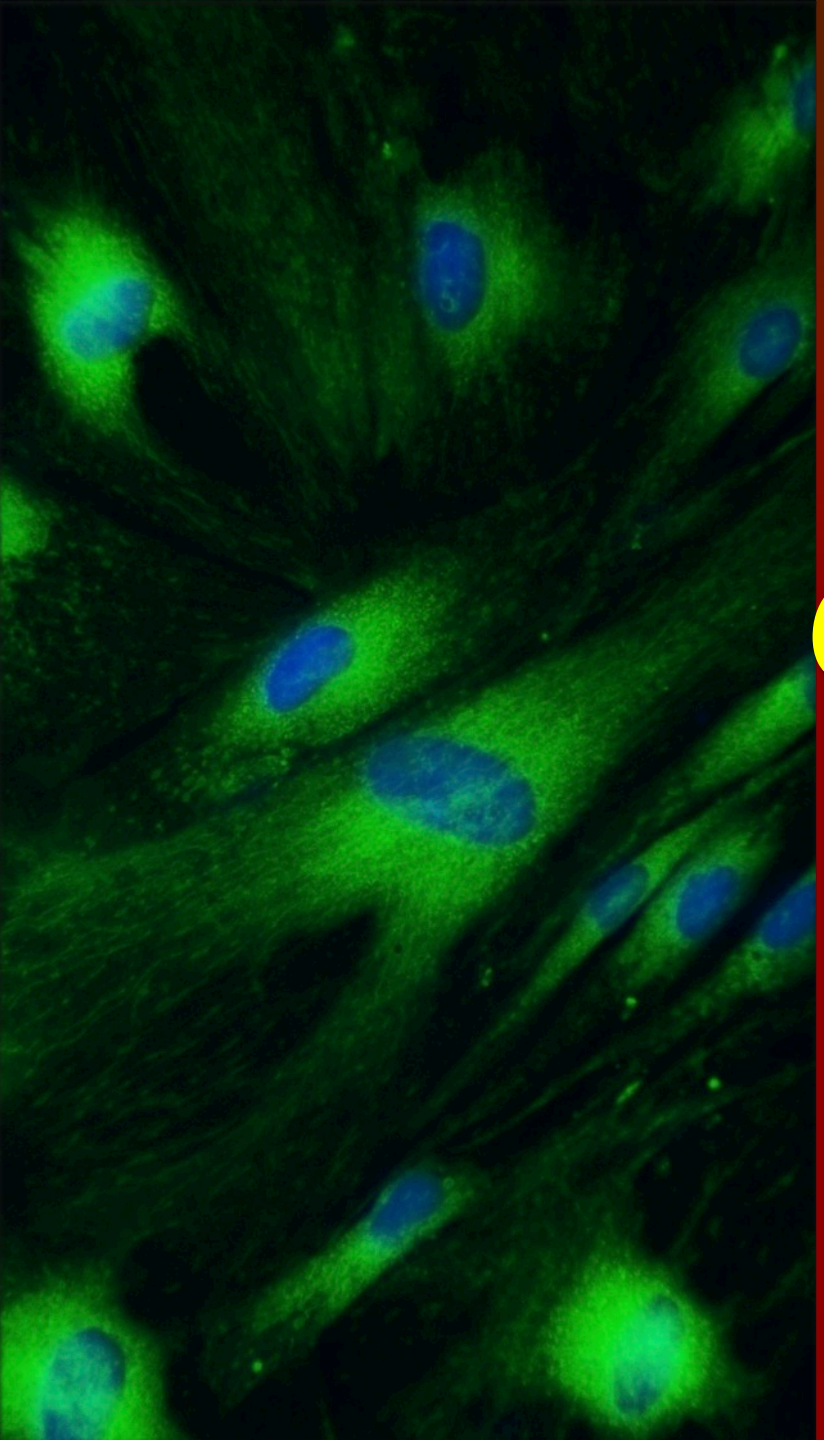
Cancer and Inflammation

To increase our understanding of how inflammation can promote the development of cancer and the dissemination of tumors.



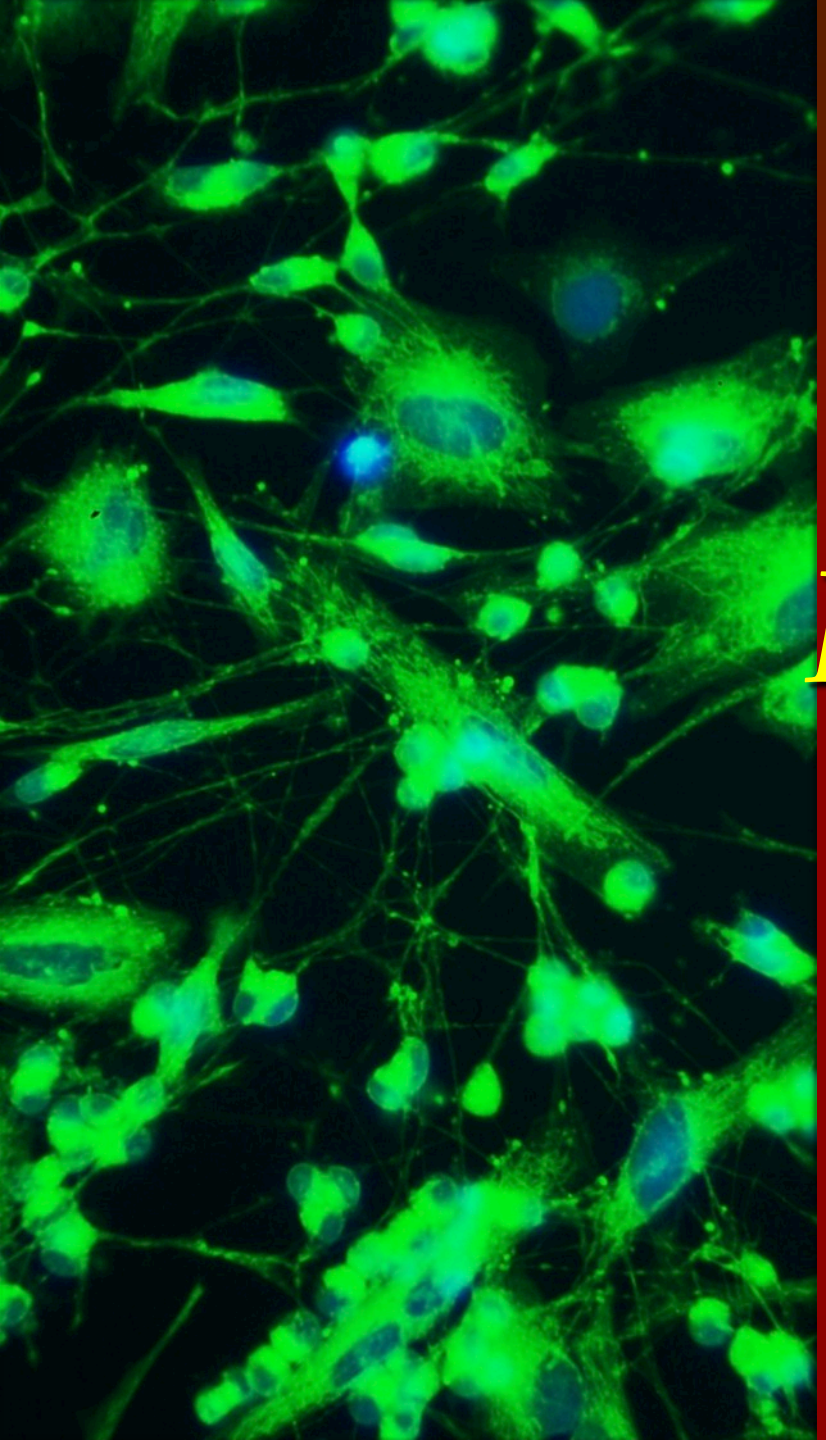
Cancer and Inflammation

Understanding the effects cyclooxygenase-2 inhibition in the production of nitric oxide in breast cancer cells.



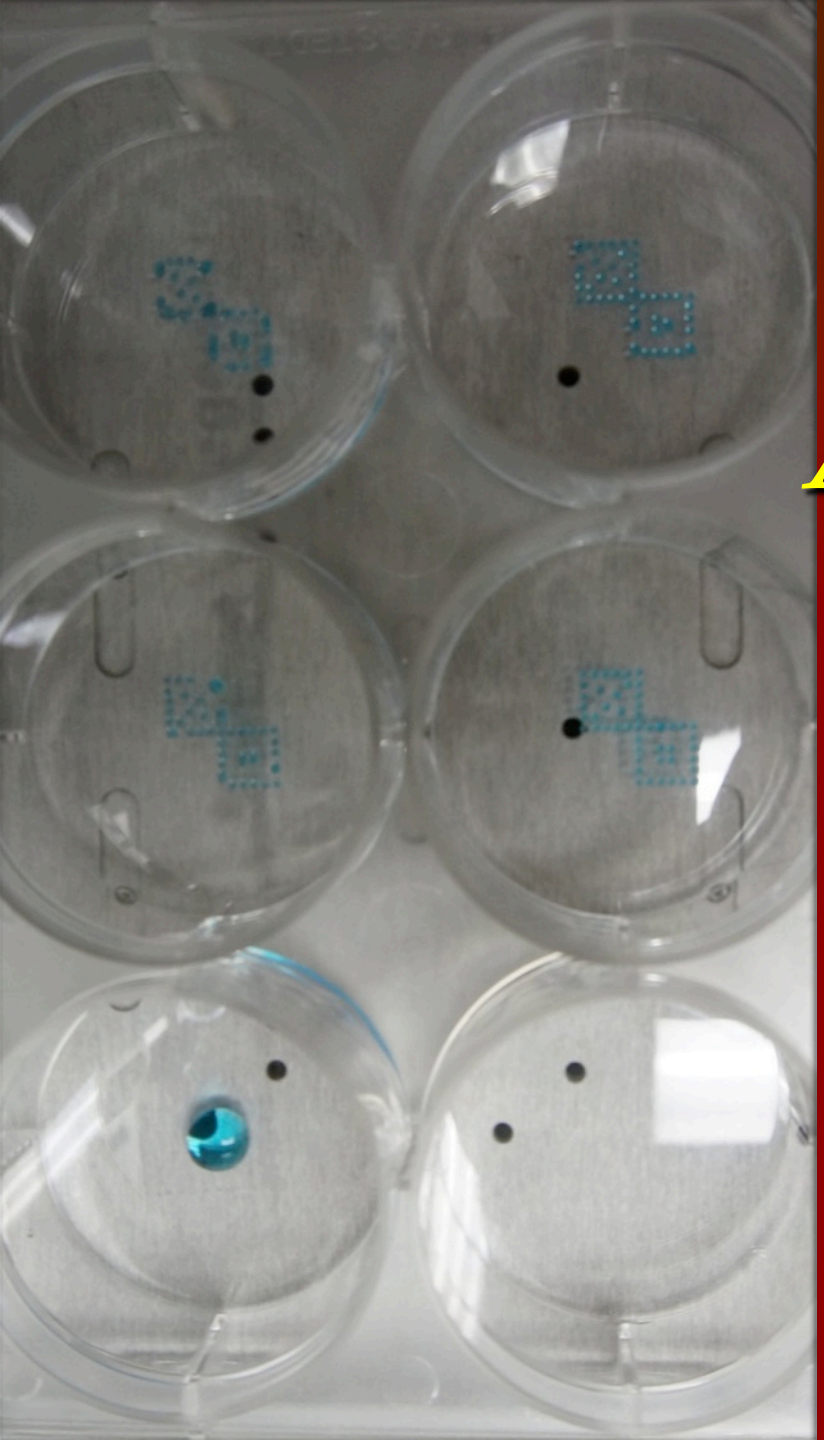
Cancer

Analysis of the expression of mitochondrial transcription factors that regulate the elements of the electron transport chain



Inflammation

Using SH-SY5Y cells treated with retinoic acid and brain-derived neurotrophic factor as a model for inflammatory and neurodegenerative disease



Advanced Techniques

Integrating tissue engineering and laboratory automation as part of our curriculum

- Design of 3-dimensional scaffolds for tissue culture and engineering using a filament 3d printer

- Analysis of the effects of chronic inflammation in DNA methylation patterns in human cell line

- Analysis of telomerase activity in cancer cell lines

- Effects COX-2 inhibition in the expression of tumor suppressor proteins p16 and p53 in prostate cancer cells

- Collagen-based tissue regeneration (in partnership with Olaf Pharmaceuticals, Inc.)