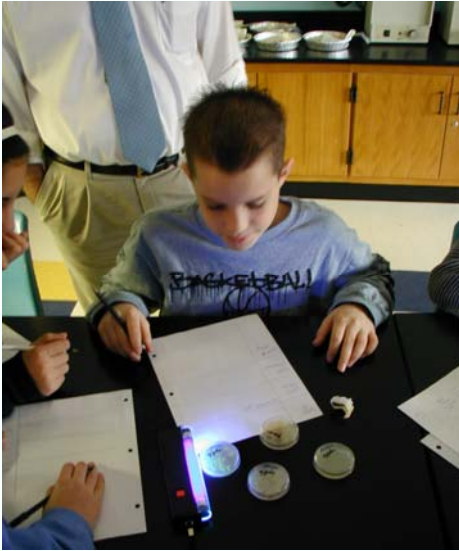


Bethpage Biotechnology Initiative





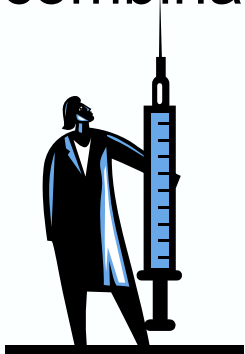
Biotechnology

bio●tech●nol'o●gy,*n.*



1. The use of microorganisms, such as bacteria or yeasts, or biological substances, such as enzymes, to perform specific industrial or manufacturing processes. Applications include the production of certain drugs, synthetic hormones, and bulk foodstuffs as well as the bioconversion of organic waste and the use of genetically altered bacteria in the cleanup of oil spills.

2. Applied biological science (as bioengineering or recombinant DNA technology)



Biotechnology Industry Facts

There are more than **300 biotech drug products and vaccines currently in clinical trials** targeting more than 200 diseases, including various cancers, Alzheimer's disease, heart disease, diabetes, multiple sclerosis, AIDS and arthritis.

Biotechnology is responsible for hundreds of **medical diagnostic tests** that keep the blood supply safe from the AIDS virus and detect other conditions early enough to be successfully treated. Home pregnancy tests are also biotechnology diagnostic products.

Consumers already are enjoying **biotechnology foods** such as papaya, soybeans and corn. Biopesticides and other agricultural products also are being used to improve our food supply and to reduce our dependence on conventional chemical pesticides.

Environmental biotechnology products make it possible to clean up hazardous waste more efficiently by harnessing pollution-eating microbes without the use of caustic chemicals.

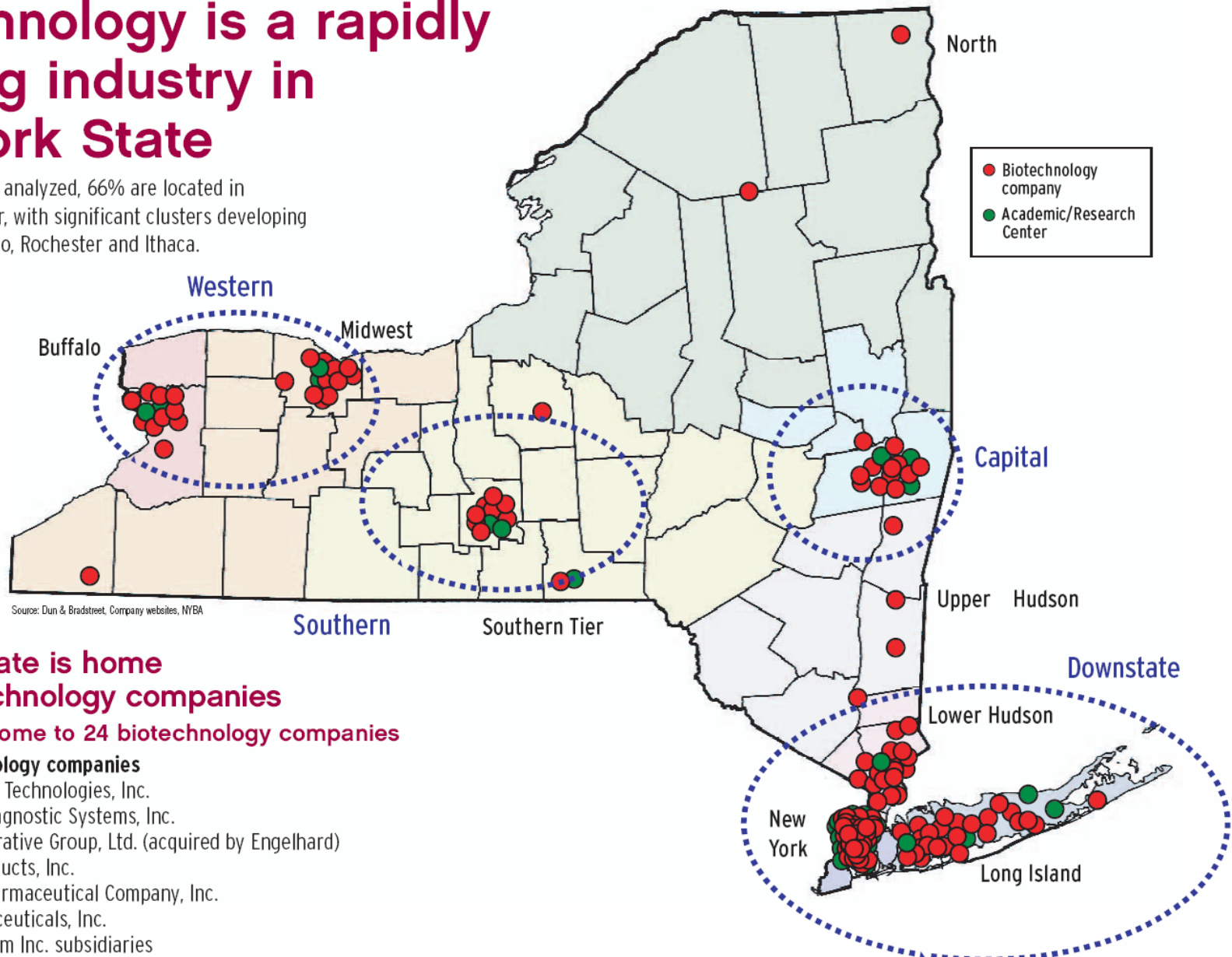
Industrial biotechnology applications have led to cleaner processes that produce less waste and use less energy and water in such industrial sectors as chemicals, pulp and paper, textiles, food, energy, and metals and minerals. For example, most laundry detergents produced in the United States contain biotechnology-based enzymes.

DNA fingerprinting, a biotech process, has dramatically improved criminal investigation and forensic medicine, as well as afforded significant advances in anthropology and wildlife management

2005 NEW YORK STATE INDUSTRY UPDATE

Biotechnology is a rapidly growing industry in New York State

Of the 123 companies analyzed, 66% are located in the Downstate cluster, with significant clusters developing around Albany, Buffalo, Rochester and Ithaca.



New York State is home to 123 biotechnology companies

Long Island is home to 24 biotechnology companies

• 7 public biotechnology companies

- BioSpecifics Technologies, Inc.
- Chembio Diagnostic Systems, Inc.
- The Collaborative Group, Ltd. (acquired by Engelhard)
- Enteric Products, Inc.
- Nastech Pharmaceutical Company, Inc.
- OSI Pharmaceuticals, Inc.
- Enzo Biochem Inc. subsidiaries

• 17 private biotechnology companies

- OSI Pharmaceuticals, Inc. has a market cap of nearly \$3 billion

Courtesy of <http://www.nyba.org/>

Business Development / Incubators & Tech Parks Long Island

Broad Hollow Bioscience Park

A collaborative effort between Cold Spring Harbor Laboratories and SUNY Farmingdale.

NYBA Sustaining member OSI Pharmaceuticals serves as the anchor tenant in this park.

A second 47,000 sq. ft. facility is currently under construction and opened for startup company tenancy in May 2006.

Current tenants include NYBA members Helicon Therapeutics and Immuno-Rx.

www.bhbp.org

Contact:

Greg Blyskal, Ph.D.

Executive Director

blyskag@farmingdale.edu

Long Island High Technology Incubator

Located in the SUNY Stony Brook Campus.

Tenants have access to select university facilities as well as professional services via Shared Service Providers.

NYBA member tenants include Evotope BioSciences and InGenius Targeting Laboratory Inc.

www.lihti.org

Contact:

Judith McEvoy

judith.mcevoy@stonybrook.edu

Calverton / SUNY Stony Brook Incubator

Located near the Brookhaven National Laboratory

Call NYBA for more information

IPark

Located in Lake Success (Nassau County), this facility is appropriate for expansion stage companies.

Call NYBA for more information

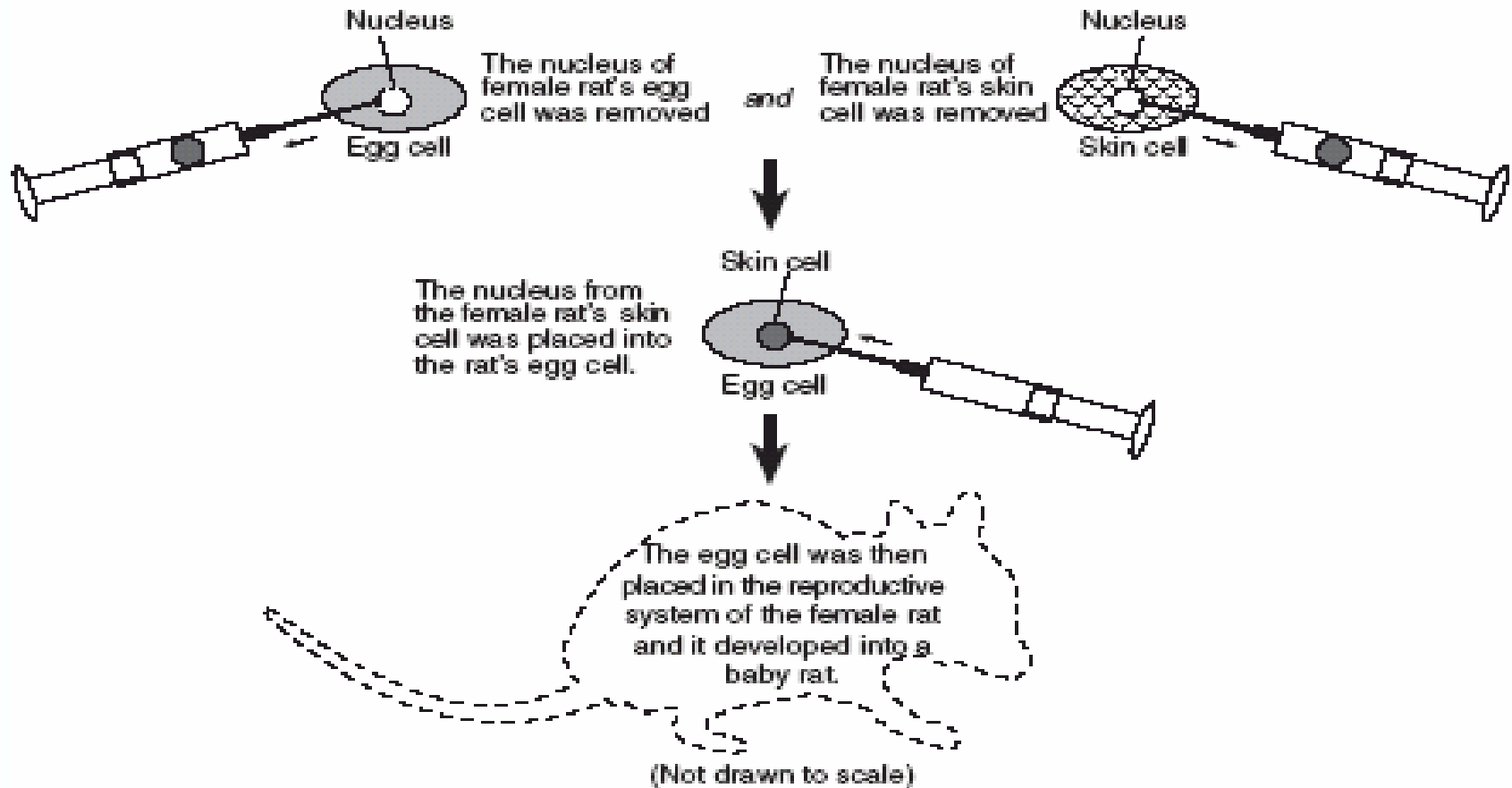
Why Study Biotech?

Studying biotechnology will afford students additional opportunities to....

-  Construct content and practice technical skills connected to the Core documents.

Intermediate Level Science Test

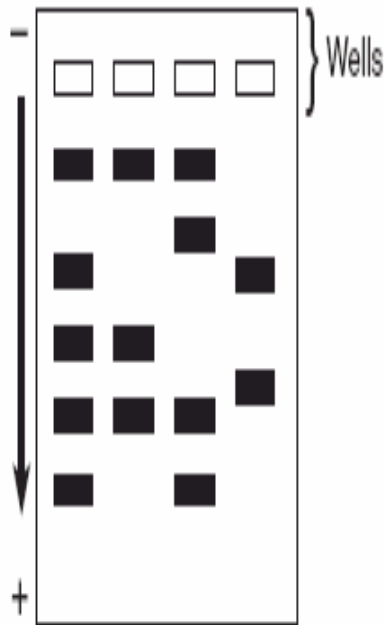
Sample Question



LER June '05

Sample Question

The four wells represented in the diagram were each injected with fragments that were prepared from DNA samples using identical techniques.



69 This laboratory procedure is known as
(1) cloning
(2) gel electrophoresis
(3) chromatography
(4) use of a dichotomous key

70 The arrow represents the direction of the movement of the DNA fragments. What is responsible for the movement of the DNA in this process?

71 The four samples of DNA were taken from four different individuals. Explain how this is evident from the results shown in the diagram. [1]

72 Identify the substance that was used to treat the DNA to produce the fragments that were put into the wells. [1]

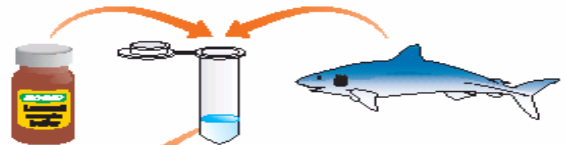
Why Study Biotech?

Studying biotechnology will afford students additional opportunities to....

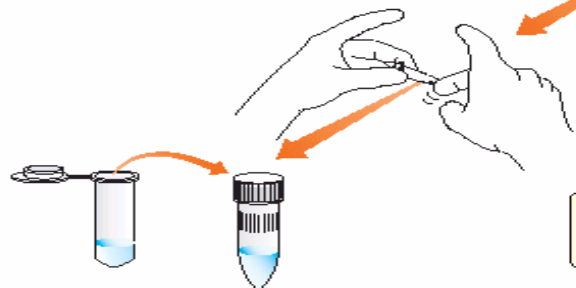
- Experience scientific inquiry by applying the scientific method using equipment and protocols employed by professionals in the field.

Extract fish muscle proteins

Add fish muscle and Laemmli sample buffer to micro test tube



Gently flick tube to agitate sample

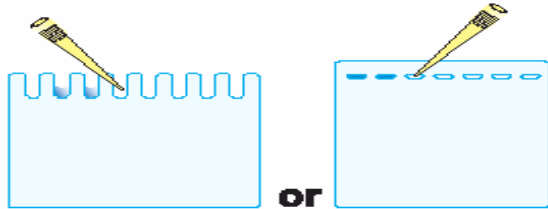


Pour extracted protein samples into screwcap tubes

Heat protein samples at 95°C for 5 minutes. Run gels or store samples overnight

LAB 1

Load and electrophorese samples on precast polyacrylamide gels at 200 V for 30 minutes

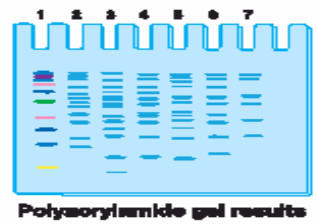


Load and electrophorese samples in 4% low melt agarose at 100 V for 45 minutes

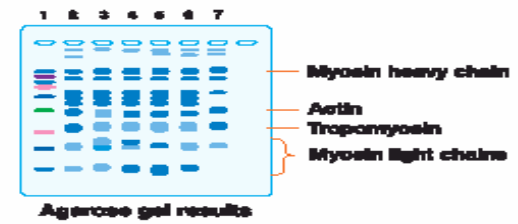
Stain with Bio-Safe™ Coomassie stain and destain with water

LAB 2

- Lanes:
 1 Size standards
 2 Shark
 3 Salmon
 4 Trout
 5 Catfish
 6 Sturgeon
 7 Actin and myosin standards



OR



Analyze results and create cladograms from gel data



LAB 3

Why Study Biotech?

Studying biotechnology will afford students additional opportunities to....

- 👉 Gain insight and prepare for undergraduate lab experiences and/or a career in an emerging field

According to TIME magazine's

What Will Be the Top 4 Hottest Jobs?

1. Tissue Engineers With man-made skin already on the market and artificial cartilage not far behind, 25 years from now scientists expect to be pulling a pancreas out of a Petri dish. Or trying, anyway. Researchers have successfully grown new intestines and bladders inside animals' abdominal cavities, and work has begun on building liver, heart and kidney tissue.

2. Gene Programmers Digital genome maps will allow lab technicians to create customized prescriptions, altering individual genes by rewriting lines of computer code. After scanning your DNA for defects, doctors will use gene therapy and "smart" molecules to prevent a variety of diseases, including certain cancers.

3. Pharmsers New-age Old MacDonalds will raise crops and livestock that have been genetically engineered to produce therapeutic proteins. Works in progress include a vaccine-carrying tomato and drug-laden milk from cows, sheep and goats.

4. Frankenfood Monitors Not sure what's for dinner? With a little genetic tinkering, fast-growing fish and freeze-resistant fruits will help feed an overpopulated planet, but such hybrids could unwittingly wipe out the food chain. Eco-scouts will be on the lookout for so-called Trojan gene effects, and bounty hunters will help the USDA eliminate transgenic species that get out of hand.

Why Study Biotech?

Studying biotechnology will afford students additional opportunities to....

 **Develop scientific literacy**

RECENT HEADLINES

Medical Milestone: Organs Engineered in a Lab

New Vaccine May Lower Cholesterol

Grains Of Hope:

Genetically engineered crops could revolutionize farming. Protesters fear they could also destroy the ecosystem. You decide!

Study: Fat or thin—one gene does it?

Is there a human right to be superhuman?

Beyond Biology: Making Factories and Computers with DNA

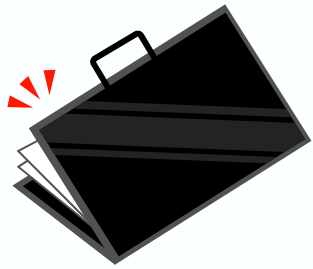
‘Liquid Drano’ for the arteries



*The Bethpage Biotechnology
Initiative*

The Bethpage Biotechnology Initiative – An Overview

- As part of the Bethpage Academy of Technology, students will have an opportunity to earn a special biotechnology designation on their diploma.
- To qualify for this special designation, students must complete a portfolio consisting of classroom and independent research experiences.
- A grant from Senator Carl Marcellino will defray costs to acquire the same laboratory equipment used by professionals throughout the world.



Student Portfolio

Beginning in grade 7, students will have an opportunity to earn biotechnology credits in the following areas:

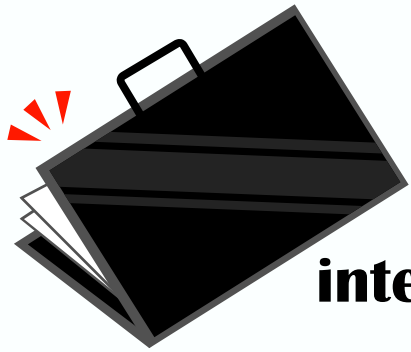
 **Classroom Experiences**

 **Historical Perspectives**

 **Scholarly Review**

 **Bioethics**












 **Independent Activities**

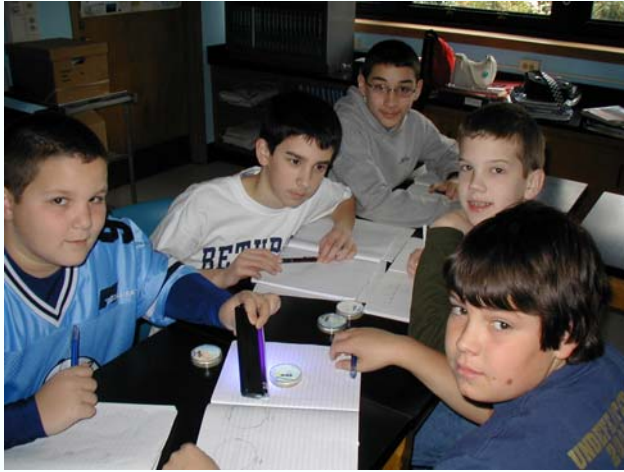


Classroom Experiences

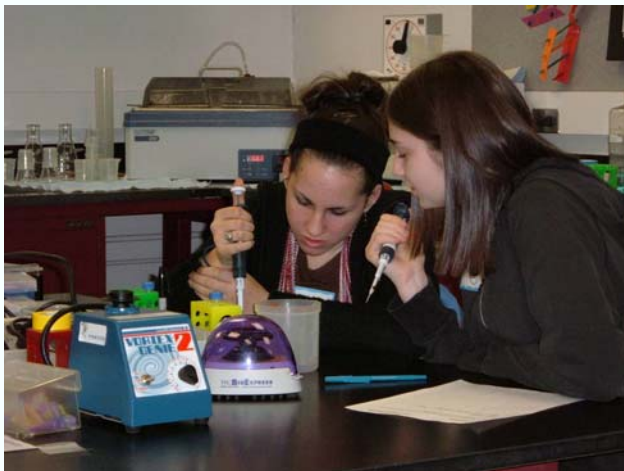
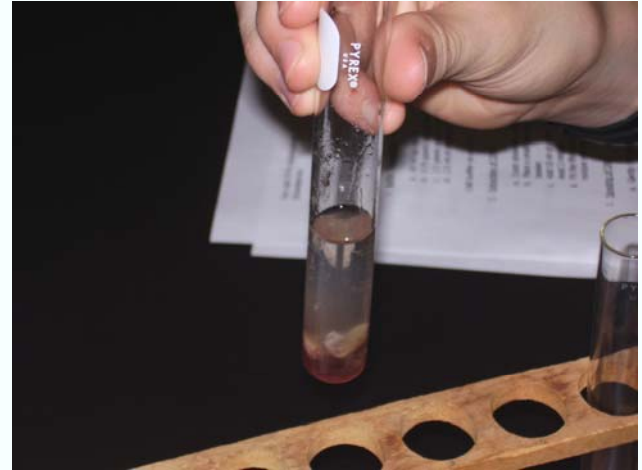
**Add up to 7 classroom experiences
integrated into the courses below to your portfolio.**

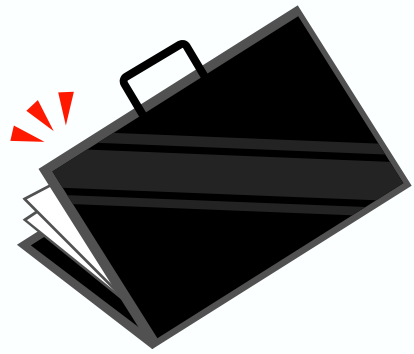
(5 points each)

	<i>Genes in a Bottle</i>	<i>7R</i>
	<i>Fruit Fly Genetics</i>	<i>7A</i>
	<i>pGLO Bacterial Transformation</i>	<i>7A; LER</i>
	<i>Bioremediation of Oil Spills</i>	<i>8R</i>
	<i>Restriction Digestion & Analysis of Lambda DNA</i>	<i>LER</i>
	<i>Analysis of Pre-Cut DNA</i>	<i>LERx</i>
	<i>Forensic DNA Fingerprinting</i>	<i>Forensics</i>
	<i>Crime Scene Investigator</i>	<i>Forensics</i>
	<i>Protein Fingerprinting Kit</i>	<i>APES</i>
	<i>GMO Investigator</i>	<i>APES</i>
	<i>PV92 PCR Informatics</i>	<i>AP Bio</i>



Student Experiences





Historical Perspectives

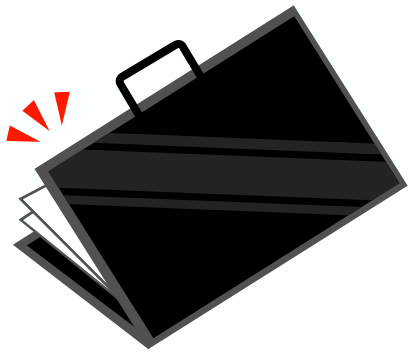
Trace the development of a premise or the success of a pioneer in biotechnology.

- Timeline (10 points)

Create a timeline of critical events including a synopsis of each in the life a pioneer or the development of an idea.

- Snapshot (10 points)

Put the pioneer or premise in the context of their times. Connect biotechnology to cultural, legal, economic or other scientific aspects of the same time period



Scholarly Review

Share your opinion regarding recent events in biotechnology.

- Scrapbook (10 Points)
Summarize 5 current articles from a newspaper, scientific journal or periodical related to biotechnology topics.
- Researcher Chat (5 points)
Write a letter to an influential leader in the biotechnology field inquiring about some aspect of their research and evaluate their response.
- Lecture (5 points)
Attend a lecture. Then describe and write a one page response to one of the presenter's main theses. Include a question for future research in that area.
- Book/Movie Review (5 points)
Choose a work of fiction which incorporates a biotech premise and evaluate the scientific accuracy of its presentation OR select a non-fiction work, summarize and evaluate its effectiveness at communicating its concept.

Dr. Tim Tully Presents at Cold Spring Harbor Laboratories

[2006 cultural series](#)

[special events](#)

[community tours](#)

[children's events](#)

[net-letter signup](#)

[contact us](#)



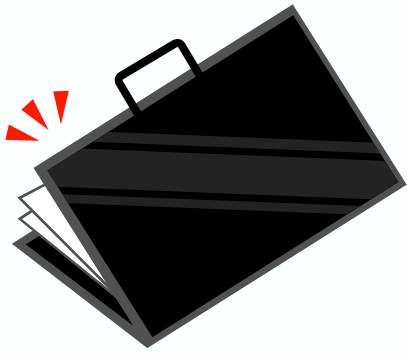
7 pm • Tuesday, Oct. 24th
*Tim Tully Recent Progress in
Neuroscience Research*

csHL events 2006
lectures

◀ | [lectures page](#) |
[click here to register](#)

Dr. Tim Tully is the St. Giles Foundation Professor of Neuroscience at Cold Spring Harbor Laboratory. In this lecture, he will describe the approaches that are now being taken at CSHL to understand the brain, what goes wrong in a variety of diseases including Alzheimer's, Parkinson's, autism, and schizophrenia, and how researchers are working to improve the treatment of these and other brain disorders.

Bioethics



Research an ethical concern related to biotechnology (genetic profiling, genetically modified food, human cloning, and stem cell research).

- Editorial (5 points)

Compose an editorial for the school newspaper or a letter to the editor which can be sent to a local newspaper.

- Brochure (10 points)

Create an educational pamphlet and cover letter to persuade an elected official to support your position.

- Panel Discussion (10 points)

Lead a philosophical discussion of your peers as part of an after school panel.

- How a Bill Becomes a Law (5 points)

Find an example of pending legislation, summarize and critique including reasons you would support or recommend changes to the bill.



SCIENCE CARTOONS PLUS

S. Harris Ethics Cartoons

www.sciencecartoonsplus.com/gallery.htm



Independent Activities

Go beyond the traditional classroom experience and explore new academic territory.

- Independent Research (30 points) which could be based upon a scholarly review activity.
- School Webpage feature (10 points)
 - Tutorial for classroom activity*
 - Biotech fact of the month*
 - Website Review*
- Summer or weekend course (10 points)
- Assist a presenter at a workshop or facilitate a classroom experience (10 points)
- Visit a museum exhibit (10 points)
- Internship at a lab or corporation (30 points)
- Job profile for career center in guidance (5 points)
- Extension of any classroom experience (5 points)



Maria
1899-1918

The Romanov Family

Start