



**NSDL/NSTA Web Seminar:
Teaching Biotechnology: New Tools and
Resources for the STEM Career Pipeline**



Wednesday, February 17, 2010

Resources from this web seminar are listed at:
<http://www.diigo.com/list/nsdlworkshops/web-seminar-wgbh-biotech>



Today's NSDL Experts



Daniella Quiñones
Marketing Coordinator
Teachers' Domain, WGBH



Dr. Lisa Rapp
Chair, Biotechnology Program
Springfield Technical Community College
Springfield, MA



<http://nsdl.org>



Web Seminar Overview



- What is Biotechnology?
- Why is it important?
- Teachers' Domain: Biotechnology
- Practical Applications for every Classroom

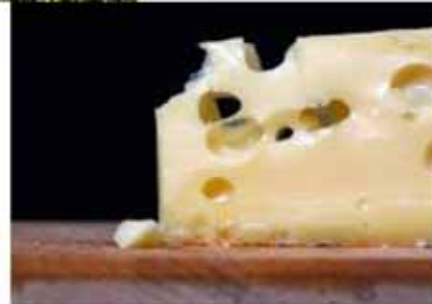


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What is Biotechnology?

Historically, biotechnology referred to the production of commercial products with the aid of living things.



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How familiar are you with Biotechnology?

Stamp your answer



Very Familiar	
Somewhat familiar	
A little familiar	
I'm here to learn more!	



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Does your school have a
Biotechnology Program?

- A. Yes
- B. No, but I'd like to learn how to start one.
- C. No, I'm just hear to learn more about it!



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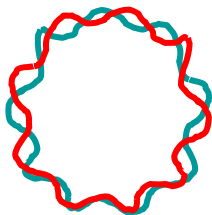


Modern Biotechnology



- Now we are now able to manipulate the **DNA** of organisms or create new organisms for our own use.

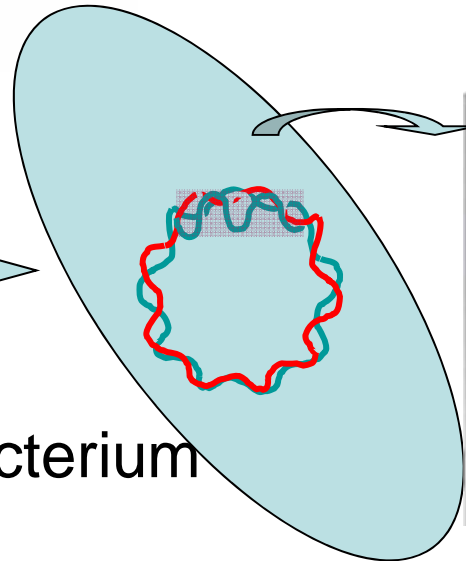
Human insulin gene



Bacterial DNA



bacterium



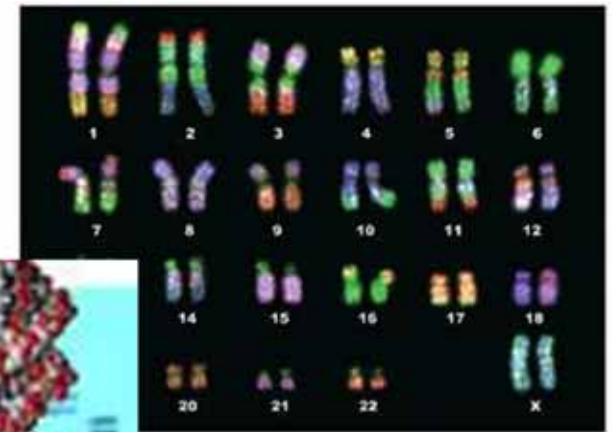
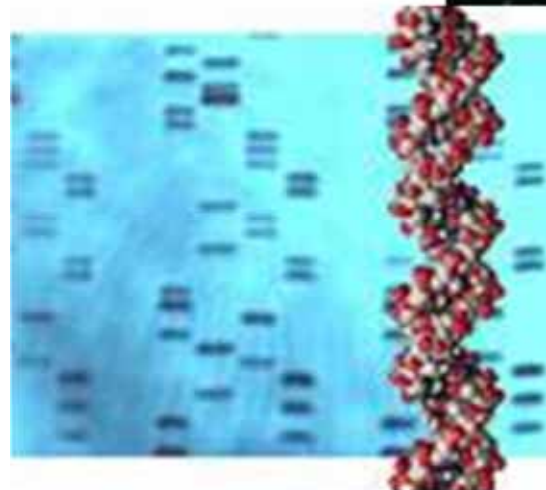
Which of the following products are made using biotechnology? Stamp your answers (Tip: Do not stamp on my picture! 😊)



Why is Biotechnology important for your students?



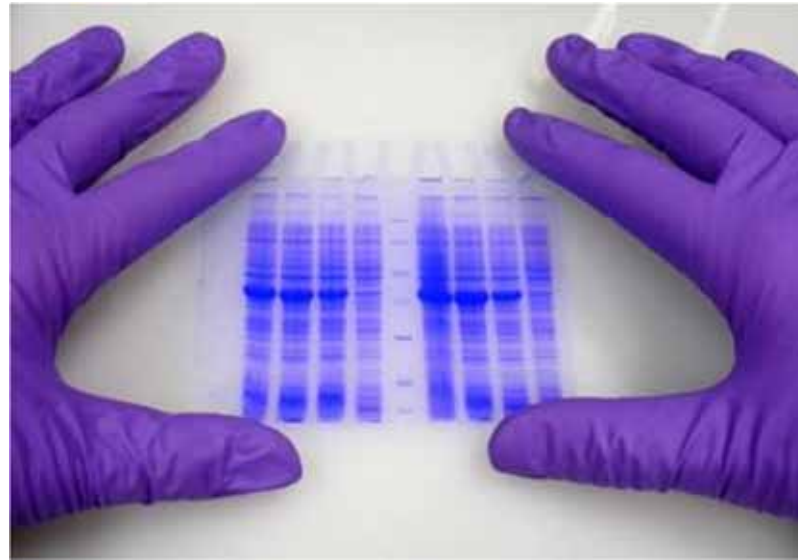
It is all around us



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Biotech Class = Hands-on and Fun!



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What degree do you need to work in biotechnology?



A. Certificate

B. A.S.

C. B.S.

D. Ph.D.

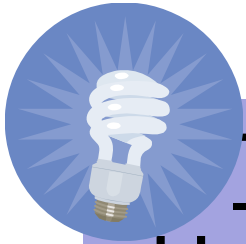


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Careers





Teaching Tip:
Help students see
possible careers in
biotech using
Teachers' Domain
videos



Karmella Haynes a synthetic biologist who is using biotechnology to create living "devices" that help visualize how cancer develops.

<http://www.teachersdomain.org/resource/biot09.biotech.car.karmella/>



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Resource: Synthetic Biologist Karmella Haynes

Recommended for: Grades 9-12



[Save to a folder](#)

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Media Type:
QuickTime Video

Length: 2m 38s
Size: 6.5 MB

or

Permitted use:
Download Only



This video produced for *Teachers' Domain* profiles Karmella Haynes, a post-doctoral researcher working in the emerging field of synthetic biology. Karmella explains how she uses biotechnology to build living machines, or devices, from genes. She then puts these devices into the cells of living things and studies the results. Haynes hopes that one day the devices she's working on will carry out complicated functions in human bodies, such as curing a disease. The video demonstrates how Karmella is using synthetic biology to detect cancer cells before they spread.

Click View

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Background Essay

[Discussion Questions](#)

[Standards](#)

[Print Background Essay](#)

Synthetic biology is the science of taking different parts from nature—specifically, DNA and protein—and putting them together in new and useful ways. Much like engineers build industrial equipment from machine parts, synthetic biologists build living devices from biological parts. These “devices” are made through modifying pieces of DNA—splicing genes together with

Related Resources:



[Associate Scientist Andres Berrio](#)
(QuickTime Video)



[Careers in Biotechnology](#)
(Flash Interactive)



Let's pause for
questions from
the audience....

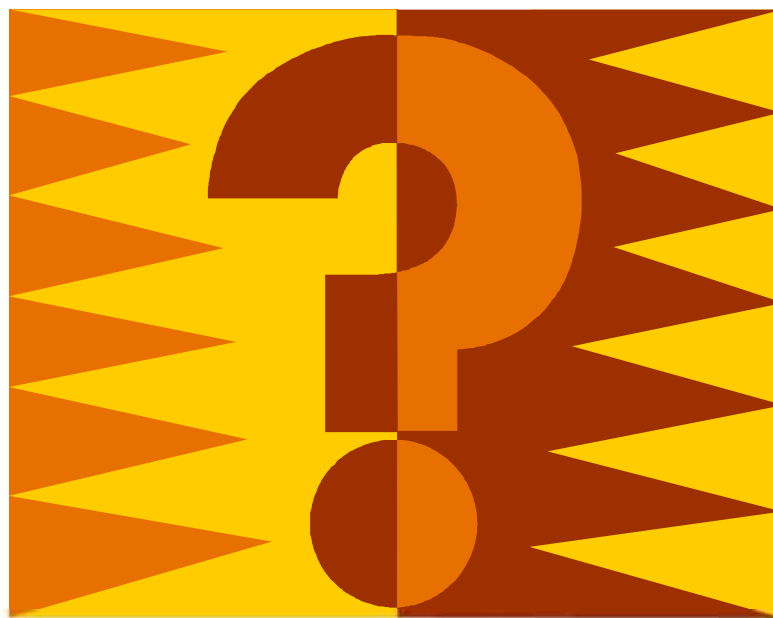


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Let's find out more about your
interests in Biotechnology....



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I teach...(stamp all that apply)

Subject	Middle School	High School	Higher Ed
Biology			
Life Science			
Chemistry			
Physical Science			
Anatomy			
Earth Science			
Biotechnology			



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What methods do you use to integrate media into your lessons?



KWL method	
I use repetition	
I pause during key moments to explain	
I use discussion questions for assessment	
I don't use a lot of media in my science class	

What is Teachers' Domain?

- Free online media resources from public television and other trusted sources



- Professional development Science courses feature the resources in the collections



<http://nsdl.org>

Teachers' Domain Editions



- K-12
- Massachusetts Teachers' Domain
- VITAL NY
- College Edition (Science)



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How do I Sign Up?

www.teachersdomain.org

The screenshot shows the homepage of the Massachusetts Teachers' Domain. At the top, the logo for "MASSACHUSETTS teachers'domain" is displayed, with the tagline "Digital Media for Massachusetts Educators". Below the logo, there is a sign-in section with fields for "Sign-in Name:", "Organization:" (pre-filled with "WGBH EDUCATIONAL FOUNDATION"), and "Password:". A red arrow points to the "Not yet registered?" link, which is highlighted in a yellow box. The "Not yet registered?" link is accompanied by the text "Let us show you how to download, share, and save resources. It's simple, safe, and free! [Learn More](#)". Below this, there is a "Register Now" button. The page also features a search bar, a "Browse:" section with links to various subject areas (The Arts, History and Social Science, English Language Arts, Mathematics, Science and Technology/Engineering), and a "Featuring:" section with a large image of a "NOVA scienceNOW" resource titled "RNA Explained".

MASSACHUSETTS teachers'domain Digital Media for Massachusetts Educators

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Sign-in Name: Organization: WGBH EDUCATIONAL FOUNDATION Change Organization Password: Sign in Forgot Your Password?

Not yet registered? Let us show you how to download, share, and save resources. It's simple, safe, and free! [Learn More](#) Register Now

Massachusetts Teachers' Domain provides thousands of free digital media resources for classroom use and professional development. WGBH, WGBY and the Department of Elementary & Secondary Education will continue to align these resources to the evolving Massachusetts Curriculum Frameworks. [more information](#)

Search Advanced Search

Browse:

Massachusetts TD Resources:

- The Arts
- History and Social Science
- English Language Arts
- Mathematics
- Science and Technology/Engineering

All Teachers' Domain Resources:

By K-12 Subject

Professional Development:

- About TD Professional Development
- Online Courses
- Teaching Strategies

Also on Teachers' Domain:

Featuring:

NOVA scienceNOW

RNA Explained

Flash interactive for grades 9-12

What's New?

Rate and Review Teachers' Domain resources with our new feature! [more...](#)

Teachers' Domain Professional Development: Online Graduate Courses for K-12 Science Teachers. [more...](#)

Welcome to the new Massachusetts Teachers' Domain. [more...](#)



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Finding the Biotechnology Collection

MASSACHUSETTS Digital Media for Massachusetts Educators
teachers'domain

PRESENTED BY: **WGBH**

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Massachusetts Teachers' Domain provides thousands of free digital media resources for classroom use and professional development. WGBH, WGBY and the Department of Elementary & Secondary Education will continue to align these resources to the evolving Massachusetts Curriculum Frameworks. [more information](#)

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All Teachers' Domain Resources:

- By K-12 Subject

Professional Development:

- About TD Professional Development
- Online Courses
- Teaching Strategies

Special Collections:

- Public Media Series
- State and Local Collections
- Curriculum Topics and Themes
 - [Advanced Technological Education](#)
 - [Alaska Native Perspectives on Earth and Climate](#)
 - [Biotechnology](#)
 - [Building Blocks](#)
 - [Civil Rights](#)
 - [Climate Change and Global Warming](#)
 - [Cool Careers in Science](#)

Featuring:

AMERICAN EXPERIENCE
NOVA
NATURE

NOVA on TEACHERS' DOMAIN

Einstein's Thoughts on the Ether
QuickTime Video for grades 6-12

What's New?

NEW! The [Biotechnology](#) collection explores research tools, techniques, applications, and careers in the field of biotechnology. [more...](#)

Rate and review Teachers' Domain resources with our new feature! [more...](#)

Welcome to the new Massachusetts Teachers' Domain! [more...](#)

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BIOTECHNOLOGY

Biotechnology is a rapidly growing field that uses research tools from biology and chemistry to find solutions to current scientific problems. Some biotechnology professionals look for the genetic basis of disease or factors that affect lifespan. Others focus on solving food shortages, the climate crisis, or criminal investigations.

These resources explore common laboratory techniques used for treating disease and improving diagnosis, and examine the ethical debate over such research. Career profiles demonstrate the multifaceted nature of biotechnology jobs and the wide range of opportunities in this field.

[Applications](#)

[Careers](#)

[Concepts](#)

[Tools and Techniques](#)

[Lesson Plan](#)



www.teachersdomain.org/special/biot/

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The Teachers' Domain Biotechnology Collection is funded by the Amgen Foundation.



Let's pause for
questions from
the audience....



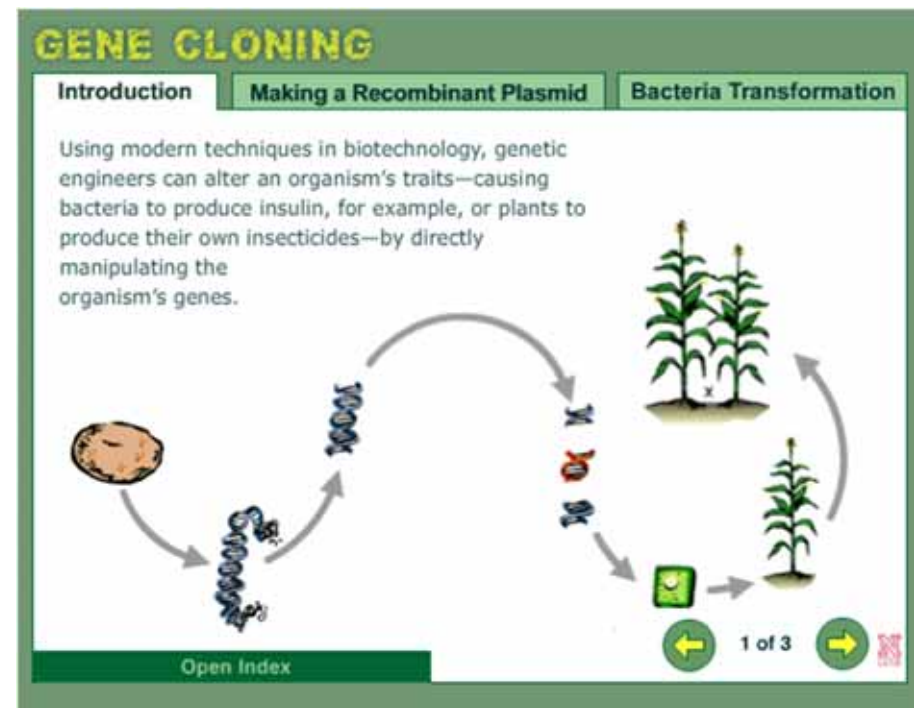
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How can you integrate the Media Collection into the classroom?



- Example 1: Applications
- **INTERACTIVE:** Gene Cloning
- This interactive activity details the steps involved in producing clones of genes that can then be used to transform the characteristics of an organism.



Example 2: Career Exploration

INTERACTIVE: Careers in Biotechnology



This interactive serves as an overview to a wide variety of biotechnology related careers.

Careers in Biotechnology

Introduction: Making a Difference

Fighting diseases, cleaning up the environment, and improving the efficiency and profitability of manufacturing—these are some of the many contributions that people working in the biotechnology industry are making. Biotechnology professionals are serving a vital role in health care. By finding novel ways to encourage living organisms to produce important medicines and other products, they are improving the longevity and quality of people's lives. Now you can find your own path into this exciting field.

Career Paths:

- Research and Development
- Manufacturing and Production
- Quality Control and Assurance
- Clinical Research



All photographs and quotes provided courtesy of Amgen.



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Example 3: Concepts



- VIDEO: Engineering Biofuels
- This video profiles the work of a biologist experimenting with ways to produce a cleaner-burning fuel from biological matter, using genetically modified microorganisms.



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Example 4: Tools and Techniques



VIDEO: Agarose Gel Demos

- Watch a "how-to" video on the proper technique of preparing an agarose gel for use in gel electrophoresis



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What are the challenges to bringing biotechnology into the classroom?
Stamp all that apply



Content knowledge	Biotechnology isn't in my state standards	Lack of time in my curriculum
Lack of equipment	Lack of school/admin support	Lack of funds



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Resources



- WGBH Teachers' Domain ☺
- DNA Interactive: <http://www.dnai.org/>
- Dolan DNA Learning Center
<http://www.dnalc.org/>
- Bio-Link
 - <http://www.bio-link.org/newslist.htm>
- Biotechnology Industry organization
 - <http://www.bio.org/speeches/pubs/er/>
- Edvotek, Bio-Rad, Carolina Biological
- State initiatives
- Your local community college or university
- Local industry





Let's pause for
questions from
the audience....



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Spring 2010 Biotechnology PD Opportunities from WGBH Teachers' Domain



Interested in participating? Email
Daniella_Quinones@wgbh.org

★ Puerto Rico

Teaching Biotechnology Online Course

Available Summer 2010

<http://pbsteacherline.org>




- PBS Teacherline
- 30 hours, grad credit
- Integrates digital media
- Builds upon lesson plan


Introduction to Biotechnology
Lab Techniques

Video

We will now explore some lab techniques related to the process used for producing the *spit 1* enzyme. One of the critical skills in a biotechnology lab is the proper use of a micropipette, so introducing students to proper technique early and often is important. The following videos show how to use micropipettes and how to pour and run a gel.




Pipetting Demos
[View](#)
[See resource page](#)



Agarose Gel Demos
[View](#)
[See resource page](#)

Record your thoughts about the processes featured in these videos in your notebook.

Now, watch a video about researcher Karmella Haynes, a synthetic biologist who is using biotechnology to create living "devices" that help visualize how cancer develops.



Synthetic Biologist Karmella Haynes
[View](#)
[See resource page](#)

Record your thoughts on the video. How does Karmella use biotechnology techniques that you were introduced to this session?



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Today's NSDL Experts



Daniella Quiñones

daniella_quinones@wgbh.org



Dr. Lisa Rapp

LRapp@stcc.edu

**THANK
YOU!**



<http://nsdl.org>



Resources from this web seminar are listed at:

<http://www.diigo.com/list/nsdlworkshops/web-seminar-wgbh-biotech>

Learn about new tools and resources, discuss issues related to science education, find out about ways to enhance your teaching at:

<http://expertvoices.nsdl.org/learningdigitalK12>



<http://nsdl.org>



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Welcome to Your Professional Development

The Learning Center is NSTA's e-professional development portal to help you address your classroom needs and busy schedule. You can gain access to more than 3,300 different resources that cater to your preference for learning. Over 925 resources, such as journal articles, science objects and web seminars are available [for free](#). A suite of practical tools such as My Library, My Transcript, and My Professional Development Plan and Portfolio tool help you organize, personalize, and document your growth over time. If desired, you may review an [archived Web Seminar](#) overview of the NSTA Learning Center, or download the ["How to Guide"](#) PDF (2.7 MB).



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Viewed Enailed

1. Energy: Different Kinds of Energy
2. Plate Tectonics: Layered Earth
3. Energy: Thermal Energy, Heat, and Temperature
4. Universe: The Sun as a Star

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By Subject	By Grade Level	By State Standards
<ul style="list-style-type: none"> Earth & Space Science Life Science Physical Science 	<ul style="list-style-type: none"> Elementary Middle School High School College 	Select your state to begin: <input type="text" value="Choose a state"/>



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Learn at your own pace online with these 1-2 or 6-10 hour interactive activities.



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Learn online from certified instructors with your colleagues. 1-2 hour seminars, week and month long courses are available. Earn state

Multimedia Overview

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Flash Player Required

Free Learning Resources

[Solar System: A Look at the](#)

<http://learningcenter.nsta.org>



<http://www.elluminate.com>

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