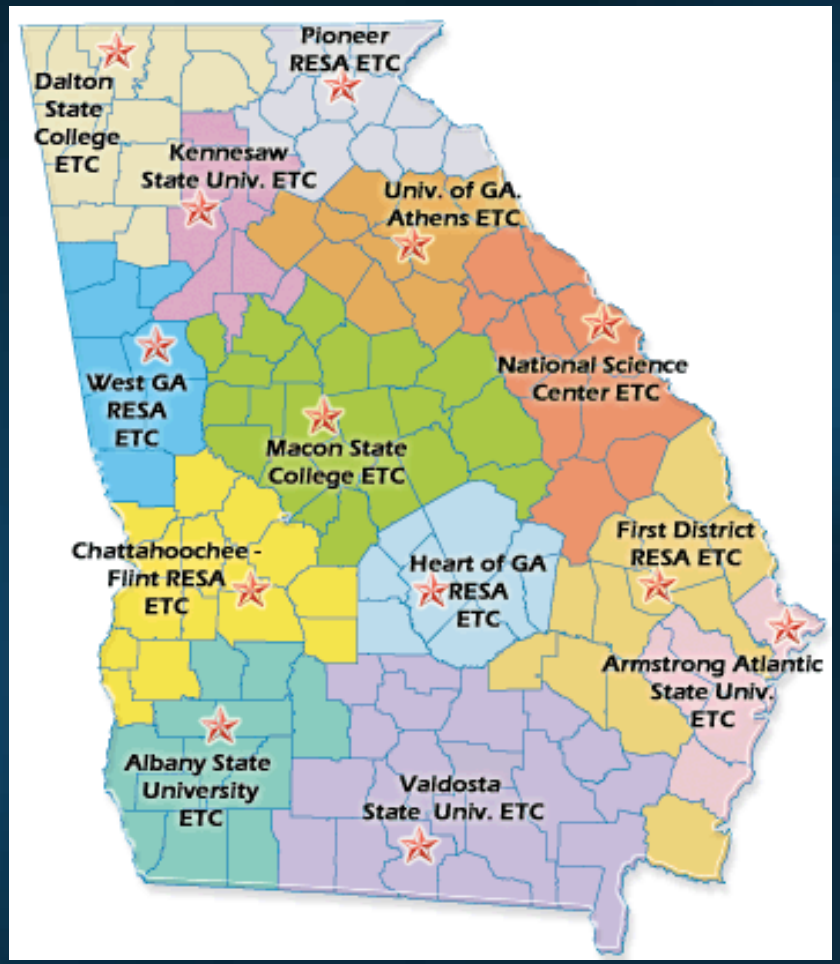
Biotechnology GPS Roll-Out
March 24, 2009

Phyllis Dumas and Phyllis Johnson

Roll Call for ETC's



We are about to get started…

Please MUTE your Microphone unless someone from your site is speaking

Plan for the Day

- Introduction
- Rationale behind pathway
  - Pathway development
  - Georgia Economy
  - Georgia Center for Innovation
- Employment Opportunities
  - Trends, shortages
- Courses in the pathway
  - Standards in each course
  - Teaching resources to include websites
  - Sharing ideas
- Assessment

“Linking classroom learning to real-world earning opportunities available in the state will help the state grow it’s own highly skilled workforce , attract future economic development, and ensure that every student is prepared to build a rewarding future right here in Georgia.”

Kathy Cox, Georgia Superintendent of Schools

Partners in this mission:

- Governor's Office of Workforce Development
- State Workforce Investment Board
- The State's colleges and universities
- The Governor's Centers of Innovation
- The Georgia Department of Labor,

and other groups

Georgia Centers of Innovation
http://www.georgiainnovation.org/

Purpose of Innovation Centers
To encourage new companies to invest and build in the state

- Agriculture Innovation Center, Tifton
- Life Science Innovation Center, Augusta
http://lifesciences.georgiainnovation.org/about/us
- Middle Georgia Innovation Center for Aircraft Lifecycle Support, Macon/Warner Robins
- Information and Technology Innovation Center, Columbus
- Maritime Logistics Innovation Center, Savannah
- Manufacturing Excellence Innovation Center, Gainesville

Georgia Workforce Trends, an Analysis of Long-term Employment Projections to 2014

Georgia Dept. of Labor – Michael Thurmond, Commissioner

Published by Workforce Information & Analysis Division

By the year 2014, health services will account for one in every twelve jobs in Georgia.

It is projected to increase by almost 100,000 jobs, placing its employment levels at more than 420,000 jobs by 2014

Industry Validation

http://www.salary.com/

http://www.bls.gov/oco/

http://www.nchste.org/national-standards/

Our Students - use this:

Peach State Pathways: Education and Career Planning Tool

http://www.gadoe.org/ci_cta.aspx?PageReq=CICTAPlanningNew

Instead of this:

Helping students with career choices:

(FREE Career Keys at www.georgiacollege411.org to "Career Info"

Health Careers Manual – SOWEGA AHEC

http://www.sowega-ahec.org/HealthCareersinGeorgia.htm

And employment information:

- State and Regional at Georgia Labor Market Explorer at http://explorer.dol.state.ga.us/

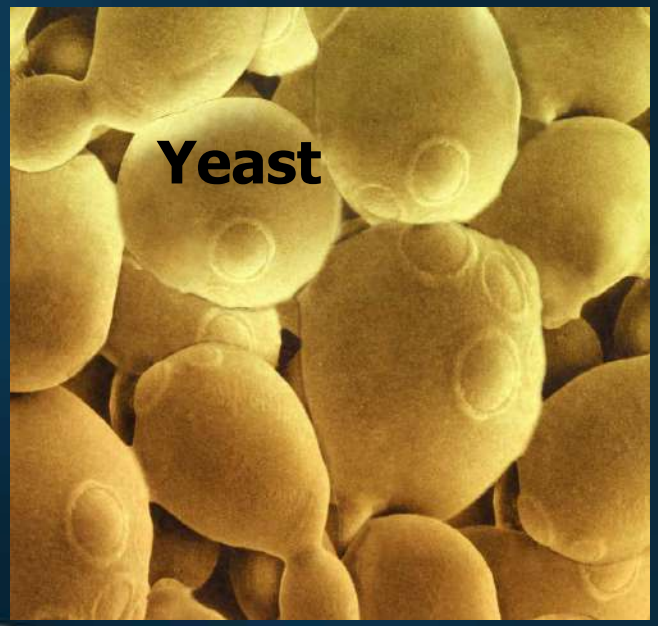
- Occupational Supply and Demand at www.occsupplydemand.org This site contains Georgia specific information regarding supply and demand and also identifies nontraditional occupations based on national data for Georgia

What is Biotechnology?

Biotechnology is the use of living organisms to make a product or solve a problem.

Microbial Biotechnology

- Fungi, yeast & bacteria are used to manufacture vaccines, medicines & anticancer drugs.

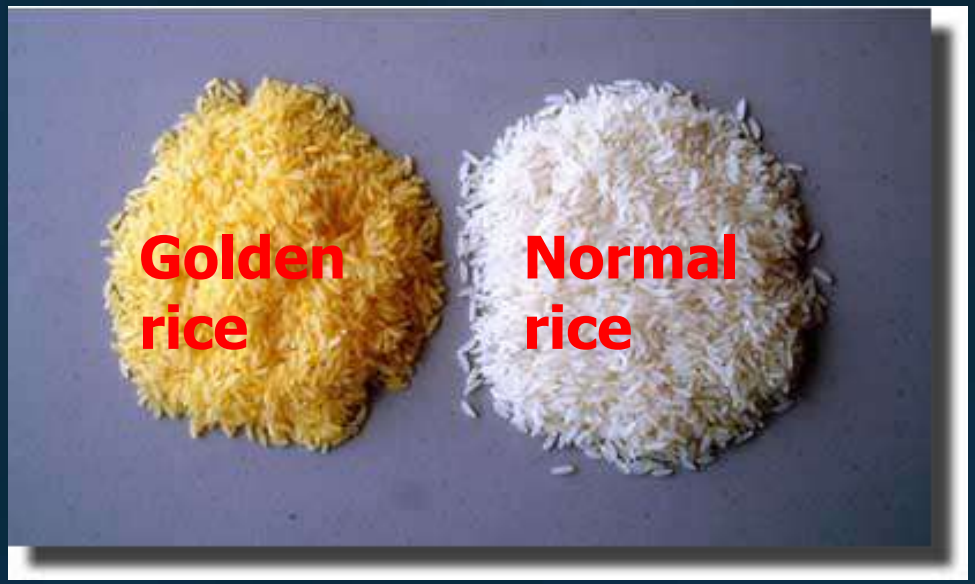


Bacteria

Agricultural Biotechnology

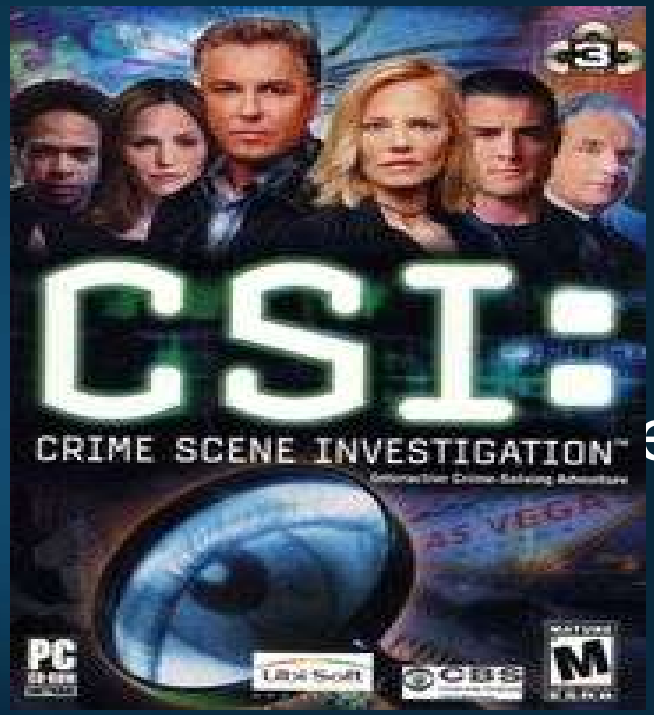
- Golden Rice is genetically engineered to contain b-carotene which your body uses to make vitamin A.

Disease resistant tomatoes



Forensic Biotechnology

Solving crimes



ene analysis

Animal Biotechnology

- Cloning & transgenic techniques are being used to help endangered species & to produce pharmaceuticals.

Dolly, the first cloned sheep.

Environmental Biotechnology

Using microbes for:

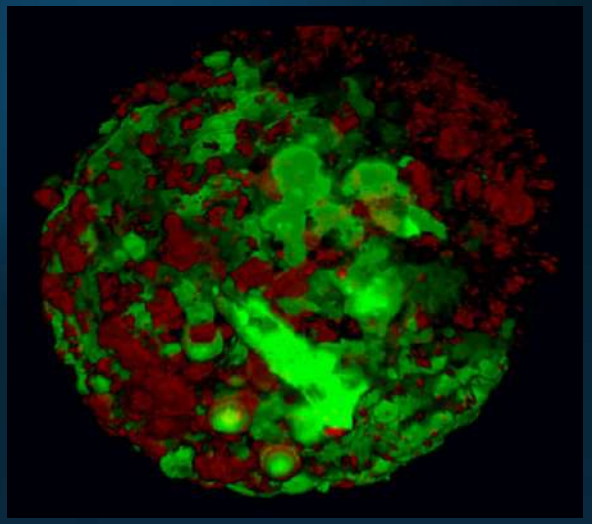
Cleaning up oil spills

Clean Water

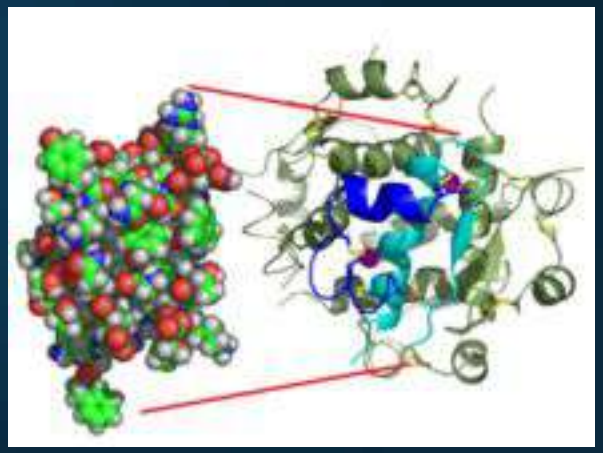
Medical Biotechnology

- Gene therapy, disease prevention & diagnostic kits like a:

Rapid test for strep



Cancer killing virus

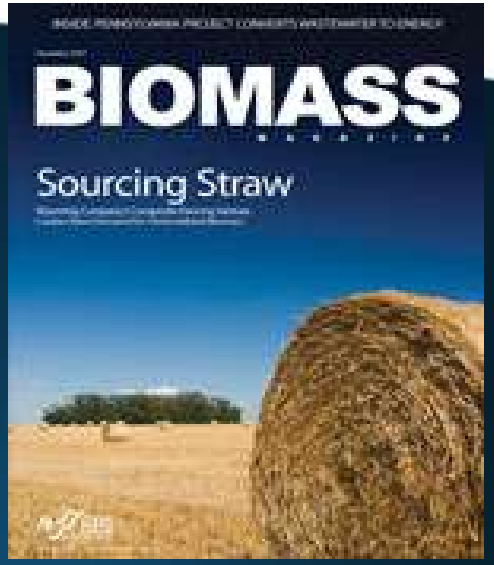


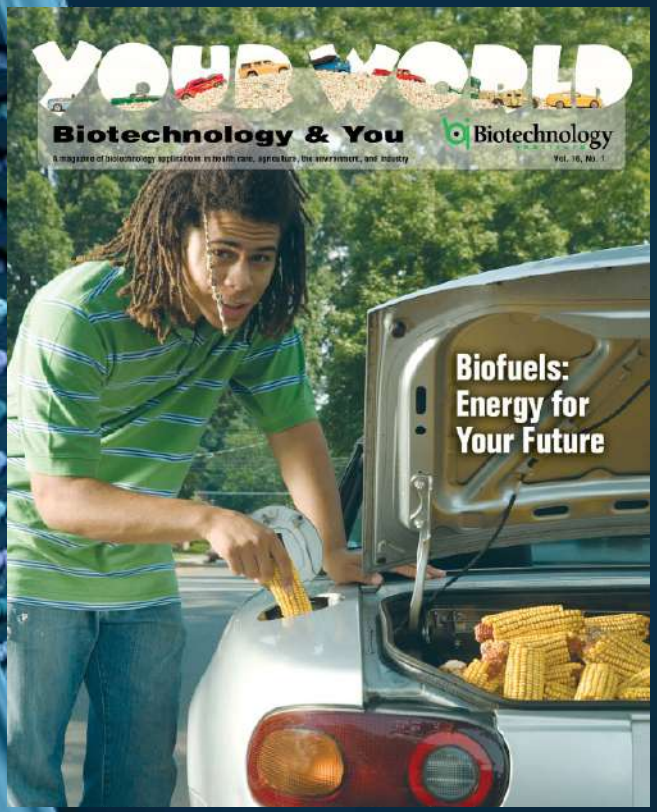
Insulin

First bioengineered drug

Biofuels

- To replace fossil fuels:





Cooking oil to make biodiesel

Georgia's Life Sciences Industry

- **7th largest cluster in the US**
- **270 'core' companies**: Pharma, biotech, device, diagnostic, R&D, agbiotech, biofuels; about 700 including med and diagnostic labs
- **15,000 private sector employees**
  - ($61,500 average salary)
  - > 30,000 public and private sectors
- **$7 billion** in annual product sales
- **160 marketed products**, 300 in development Cancer, infectious diseases, heart disease, neurological disorders, diabetes, inflammatory diseases
- **38% jump** in number of companies 2001-2006: Compared to 14% for the state's economy as a whole

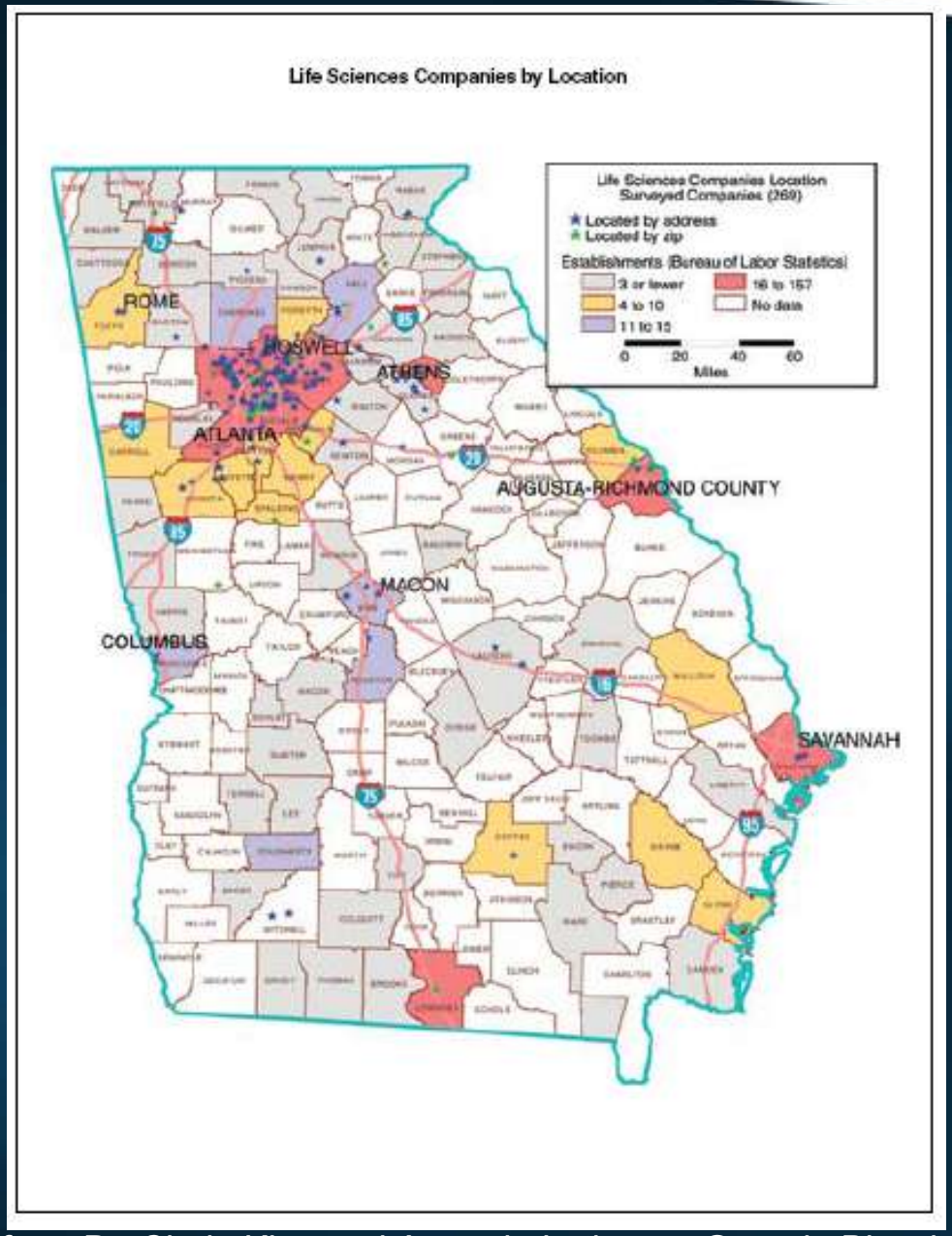
Information from Dr. Cinda King and Amanda Latimer – Georgia Bioscience Institute

The statewide economic impacts of the life sciences industries in 2007 were:

- 17,941 jobs in life sciences companies;
- 62,033 jobs in all industries (including life sciences);
- $16 billion in output (sales);
- $6.2 billion in state GDP;
- $3.6 billion in labor income (earnings); and
- $517 million in tax revenues for state and local governments.

- On average, for every direct job created by life sciences companies an additional 2.5 jobs are created in other industries.
- The bottom line: One job out of every 68 in the State of Georgia owes its existence to either the life sciences industry or to life sciences research and development.

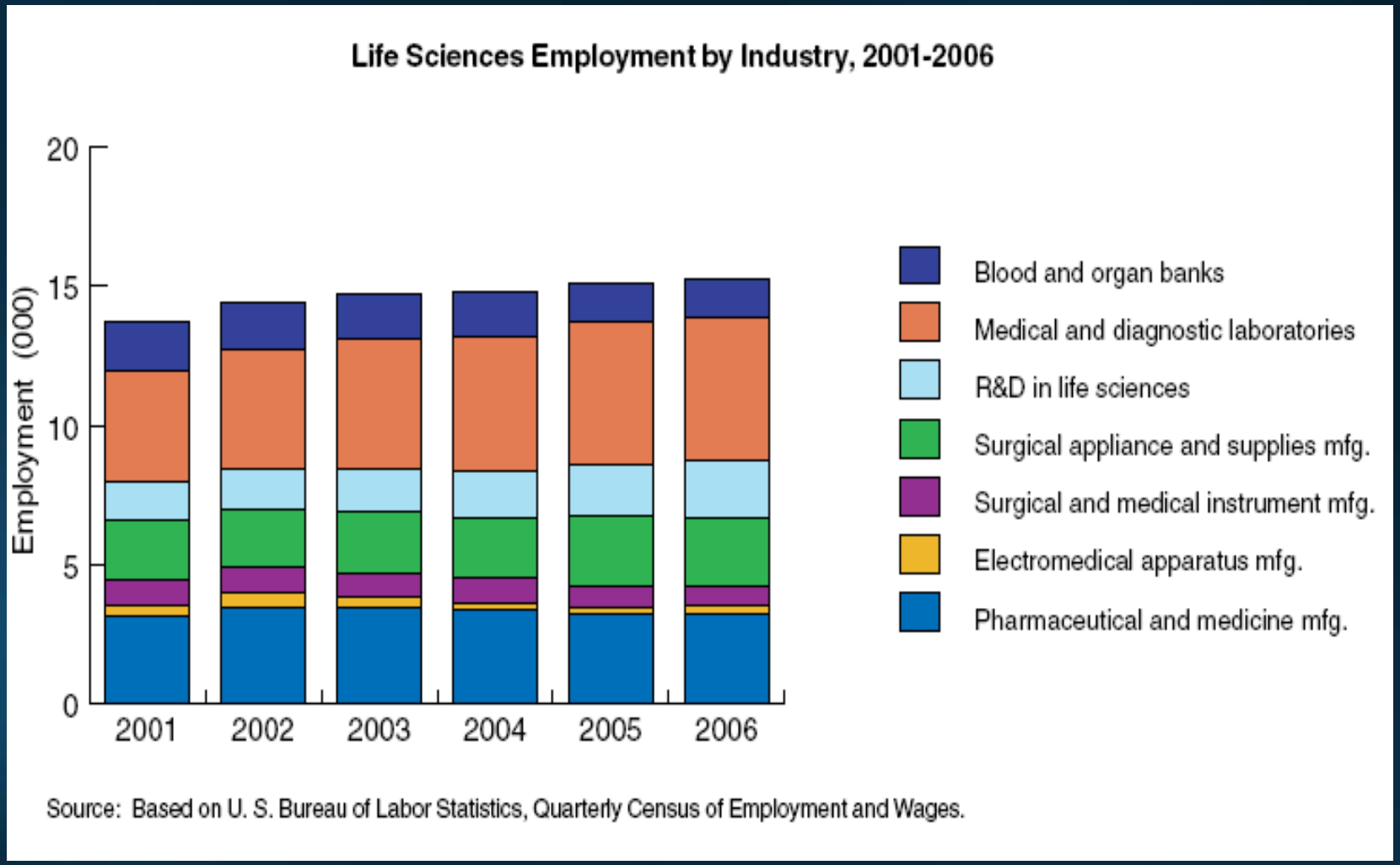
Information obtained from the GA Life Sciences Industry Analysis 2008



*Information from Dr. Cinda King and Amanda Latimer – Georgia Bioscience Institute

Industry Profile

- Pharmaceutical, medical devices and diagnostics firms most common, with manufacturing and R&D highlighted as the most prevalent industries.
- Most Georgia companies are small in employment size
  - 38 percent have fewer than 10 employees
  - 26 percent employ over 50 employees
- Companies plan to add new jobs – most are professional researchers and technologists and senior and other management positions
  - Other jobs will be in manufacturing, sales and marketing, office support, and regulatory and legal positions.
  - Availability of skilled managers and technicians highlighted as the most pressing labor force issue
  - Availability of skilled researchers considered a strong point



Information from Dr. Cinda King and Amanda Latimer –Georgia Bioscience institute

Major Georgia Bioscience Employers

- **Pharmaceuticals and Biologics**
  - Altea Therapeutics
  - AtheroGenics
  - CryoLife
  - Inhibitex
  - Noramco (Johnson & Johnson)
  - Sciele Pharma
  - Solvay Pharmaceuticals
  - UCB
- **Medical Devices**
  - CardioMEMS
  - Ciba Vision (Novartis)

Research Labs

Centers for Disease Prevention and Control

USDA

Yerkes Primate Center

American Cancer Society

Animal Health

Merial (Merck, Sanofi Aventis)

Agricultural/ Environmental

Monsanto

Range Fuels

Contract Research

Quintiles

Instrumentation

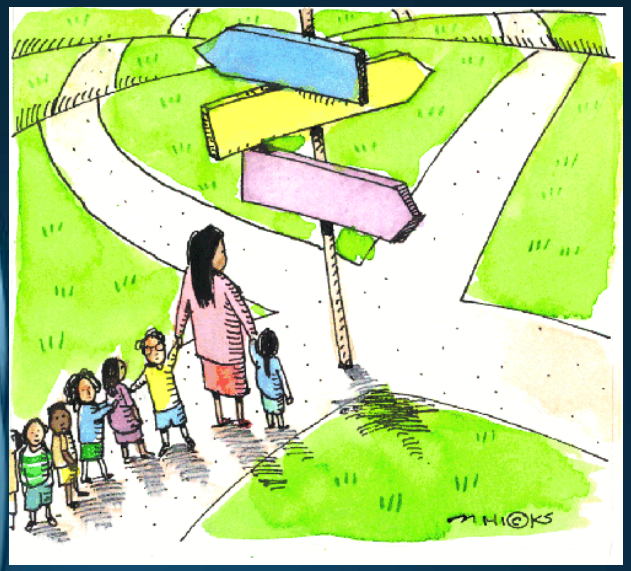
Immucor

OPTI Medical Systems

Life Science Industry Careers

- **Research and Development**
  - Discovery, testing, product development,
- **Operations**
  - Process development, manufacturing production, and scale up, packaging, environmental health
- **Quality**
  - Quality assurance and control, validation
- **Clinical Research**
  - Clinical research, monitoring and reporting, regulatory affairs, documentation
- **Business Development**
  - Business development, product management marketing, sales
- **Finance and Administration**
  - Intellectual property, accounting, human resources, information systems, project management

Pathway Selection



Selection of a pathway will be based on self- awareness and the investigation of occupations plus related educational levels aligned with the pathway. Most high-demand, high-skilled, high-wage occupations in all concentrations still do require education beyond high school. Implementation of career pathways is a collaborative effort between the local system, the Technical College System of Georgia and the University System of Georgia.

Biotechnology Research and Development Pathway

- Introduction to Healthcare Science*
- Introduction to Biotechnology*
- Applications of Biotechnology*
- Biotechnology Internship / Independent Research

Phase III Healthcare Standards

http://www.gadoe.org/ci_cta.aspx?PageReq=HSPhaseIII

Georgia CTAE – Curriculum Units

http://www.georgiactae.org/cs_theraserv_intro.html

CTAE Foundation Skills

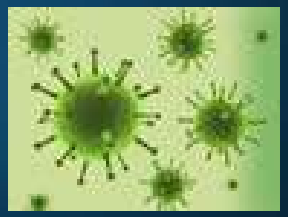
http://georgiactae.org/cs_foundations.html

Other Lesson Plans

http://www.khake.com/page77.html

Lilly
Answers That Matter.

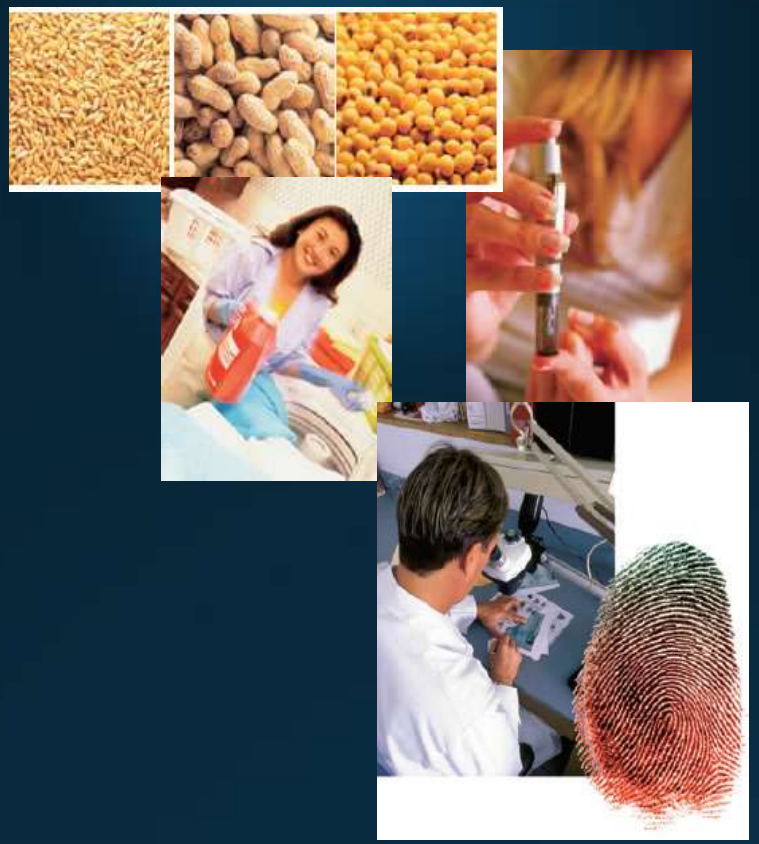
http://www.ciesc.k12.in.us/lilly.htm



http://www.nchste.org/cms/wp-content/uploads/2008/11/biotech_science-websites.pdf 11 pages of web sites

Course 4: Biotechnology Internship/ Independent Research Project

- An advanced course which places students in a workplace setting or offers the opportunity for students to complete an independent research project that applies biotechnology.



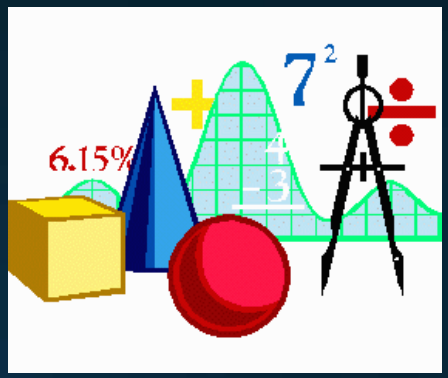
- **Biotechnology Internship/ Independent Research Project**

Minimum of **135 hours** with content focus as delineated in the biotechnology curriculum and performance standards of the Georgia Career Related Education (CRE) Manual.

A minimum of **90** internship/independent research project hours is required.

The additional **45 hours** may be utilized in the class or laboratory based on the guidelines set forth by the instructor and as required by affiliating agencies.

Integration of Academics



Integration of CTSO
HOSA (co-curricular)

http://www.hosa.org/index.html

http://www.georgiahosa.org/

"Assessment should provide "feedback" or it is not truly assessment. Any assessment should supply the 'performer' – the student – with usable information about how the performance fared, and how performance might be improved." - Grant Wiggins

http://webquest.sdsu.edu/rubrics/weblessons.htm

The **Rubric** is an authentic assessment tool which is particularly useful in assessing criteria which are complex and subjective. **Authentic assessment** is geared toward assessment methods which correspond as closely as possible to real world experience.

It is a formative type of assessment because it becomes an ongoing part of the whole teaching and learning process. Students themselves are involved in the assessment process through both peer and self-assessment.

As students become familiar with rubrics, they can assist in the rubric design process. This involvement empowers the students and as a result, their learning becomes more focused and self-directed.

Authentic assessment, therefore, blurs the lines between teaching, learning, and assessment.

The **advantages** of using rubrics in assessment are that they:

- allow assessment to be more objective and consistent
- focus the teacher to clarify his/her criteria in specific terms
- clearly show the student how their work will be evaluated and what is expected
- promote student awareness of about the criteria to use in assessing peer performance
- provide useful feedback regarding the effectiveness of the instruction
- provide benchmarks against which to measure and document progress

Rubric for Timeline Project

	4	3	2	1
Completeness	Includes all 13 time periods	Includes 10-12 time periods	Includes 8-10 time periods	Includes less than 8 time periods
Life Expectancy	Includes life expectancy for all ti periods	Includes life expectancy for 10-12 time periods	Includes life expectancy for 8-10 time periods	Includes life expectancy for less than 8 time periods
Requirements for beliefs/events	Meets all requirements	Missing 1-2 requirements	Missing 3-4 requirements	Missing more than 4 requirements
Accurateness	All events are accurate and in correct order	1 mistake noted	2-3 mistakes noted	4 or more mistakes noted
Illustrations	Contains illustratio for each time period/belief/event	Missing 1 illustrati	Missing 2-3 illustrations	Missing 4 or more illustrations
Quality	Demonstrates outstanding effort, timeline is neat and attractive	Timeline is acceptable, somewhat neat and attractive	Timeline appears rushed, somewhat sloppy	Timeline is unorganized, sloppy and difficult to fol

Rubrics can be created in a variety of forms and levels of complexity, however, they all contain common **features** which:

- focus on measuring a stated **objective** (performance, behavior, or quality)
- use a **range** to rate performance
- contain specific performance characteristics arranged in levels indicating the **degree** to which a standard has been met

Training for healthcare teachers

- Gwinnett Tech – June 9-11 (potential for 2 PLU's)
- Athens Tech – July 7-10 (potential for 3 PLU's)

This training includes visits to biotech industries on the last day.

This will be posted on www.ctaern.org

I will forward a flyer detailing the training

"It's important to remember that biotech is the one industry that's poised to grapple with every major human and environmental challenge, from global hunger to global warming…"

G. Steven Burrill, Biotech 2003 (Life Sciences: Revaluation and Restructuring)

Special Thanks

- Guest speaker – Dr. Phil Gibson, Program Director Georgia Bioscience Technology Institute, Gwinnett Technical College

Also thanks to:

- Amanda Latimer, M.S.

Biotech Instructional Coordinator – Georgia Bioscience Technology Institute, Athens Technical College

- Cinda Herndon-King, PhD

Director, Education Programs

Georgia Bio