Partners in Science
Mentoring Future Scientists
November 5, 2011
Liberty Science Center
Successful STEM (science, technology, engineering, math) education and a science-savvy public are today’s imperatives, yet by the time US students reach high school their average knowledge and aptitude rank between 20th and 30th internationally.

This Changes Everything
Liberty Science Center engages diverse audiences in relevant issues that connect nature, humanity and technology. Through innovative and meaningful experiences, we inspire action to strengthen communities and advance global stewardship.
Critical Regional Reach

- 600,000 annual visitors
- 210,000 students and teachers from the New Jersey Region
- 85,000 (40%) students and teachers from New Jersey’s 31 formerly designated Abbott School Districts
Skyscraper!
Infection Connection
Communication
Our Hudson Home
Eat and Be Eaten
I Explore
Energy Quest
Jennifer A. Chalsty Center for Science Learning and Teaching
It’s a science experiment that lasts for days!

The program transforms the traditional field trip into a focused 2–4 day learning experience centered on a chosen theme. Each school residency supports a standards-based classroom curriculum and multiple learning styles, and can be customized to fit individual class needs.
Active Partnership with U.S. Coast Guard
Live From...

- Cardiac Classroom
- Neurosurgery
- Kidney Transplant
- Robotic Surgery
Electronic Field Trips
Teacher Programs
Participate in real-life scientific research!

For the past 25 years, Partners in Science takes students beyond textbooks and school-based lab by immersing them in authentic scientific research conducted by professional scientist.
History of Partners in Science

- “First Program” – Liberty Science Center
- 25th Year Anniversary – Summer 2011
- Served over 1000 students
- Summer 2011 – 25 students
  - 60% Female, 40% Male
  - 20% Minority
- Public Relations
  - NJ 12 Program
  - NJ Dept of Education
  - Siemens Winner
Requirements

- **Students**
  - Complete Sophomore or Junior Year
  - Commit for 8-weeks in the summer
  - Attend Professional Development Workshop
  - Possess Motivation, Maturity, and Eager to Learn
  - Present during the Final Symposium

- **Mentors**
  - Mentoring and providing guidance
  - Engaging students via a research project
  - Helping students with presentation, posterboard, and the research paper.
  - Providing a safe working environment
Timeline

- November – April
  - Seeking Funders and Sponsors
  - Seeking Mentors
- February – Students nominated into the program
- March – Interviews at Liberty Science Center
  - 125 interviewees in 2011
- April/May – Second Interviews with a Mentor
- June – Orientation at Liberty Science Center
- July/August – Internship at Mentor’s Facility
- Late August – Final Symposium at Liberty Science Center
Mentors
THE KEY FOR SUCCESS

Rutgers University
Princeton University
University of Medicine and Dentistry of New Jersey
New Jersey Institute of Technology
Stevens Institute of Technology
Columbia University in New York City
Meadowlands Environmental Research Institute
Newark Beth Israel Medical Center
Bronx Community College
Partners in Science

- **Highlights**
  - Real-world Applications
  - Future Careers
  - Final Symposium
    - PPT Presentation
    - Poster Board
    - Research Paper
  - Networks
  - Alumni

- **Challenges**
  - Variety of Projects
  - Diversity of Mentors
  - Alumni Network
  - Differences in Applicants
  - Increase enrollment of minorities
  - Funding
New Jersey Space Grant Consortium Sponsorship

- Partners in Science Sponsorship
  - Thomas Hartke
  - Liane Tarnecki
  - Pratheek Mangini
  - Tara Raj
  - Manisha Bandamede
  - Michael Horsfield
Identifying Heat Induced failure mechanisms in yttria-stabilized zirconia thermal barrier coatings

Thomas Hartke – Delbarton School
What did we investigate?

1. Compressive Stress Mechanisms
2. Heterogeneities and oxide imperfections in the TGO
3. Thickening of the TGO
4. Chemical depletion and diffusion
5. Microcracking of the topcoat
6. TGO separation
Using PCR For triple-fusion adk construct

Research Conducted By: Pratheek Mangini
Bridgewater– Raritan High School
Methodology

Homologous Recombination:

- Genetic recombination
- Construct
  - Homologous flanking regions
  - Ampicillin resistance gene in the center
- Remove the ADK gene from the chromosome
- Replace it with an Ampicillin resistance gene
- Isolate the cells successfully recombined

Example of Homologous Recombination
Heat Management of Quantum Cascade Lasers Using Epitaxial-Side-Down Mounting

Tara Raj
Hunterdon Central High School
Princeton University Department of Electrical Engineering
Mid-InfraRed Technologies for Health and the Environment
What are Quantum Cascade Lasers (QCLs)?

- Semiconductor lasers that emit light in the mid-infrared region of the electromagnetic spectrum

- Applications include:
  - Non-invasive glucose sensing
  - Atmospheric gas detection
  - Cloaking devices
Future Goals

- Additional Students
- Expansion of the Program
- Diversity of Projects
- Alumni Association

Thank you!