

TO  Kansas City

Memorial Dr

↑

↑ ↘

EXIT ONLY

TO  EAST

Illinois

EXIT ↓ ONLY





USD 229



BP gasoline with Invigorate SELF



SELF SERVICE ISLAND WARNING  
NO STOPPING  
STOP ENGINE  
IT IS UNLAWFUL AND DANGEROUS  
FOR ANYONE TO SUSPEND  
GASOLINE INTO GLASS OR  
UNAPPROVED CONTAINERS  
IT IS UNLAWFUL AND DANGEROUS  
TO DISPENSE GASOLINE WITHOUT  
AN ATTENDANT ON DUTY

Invigorate



EXIT 104

INDIANA  
9

Maxwell  
Greenfield

1 MILE



GREENFIELD-CENTRAL  
HIGH SCHOOL



**International  
Genetically Engineered  
Machine Competition**











iGEM HS 2012 Jamboree  
International Genetically Engineered Machine  
2012 Jamboree  
Greenfield Central High School  
June 29-30





**caps**

# Arom-'Clock

**iGEM MIT**

Austin Rottglaube, Brandon Wilczak, Tim Schaefer, Graham Morrison, Jonathan Hernandez, and Ryan McLean

**Problem & Concept**

**Foundations & Outreach**

**Calculating CD's**

**How & When**

**Substrate Path**

**Safety & Laboratory Methods**

**Results & Future**

**WESTERN** **Albion** **GWKGO**

The poster is a scientific project display for iGEM MIT. It features a central title 'Arom-'Clock' with a yellow banana-shaped graphic containing a clock face. The poster is divided into several sections: 'Problem & Concept', 'Foundations & Outreach', 'Calculating CD's', 'How & When', 'Substrate Path', 'Safety & Laboratory Methods', and 'Results & Future'. It includes various diagrams, images of bananas and bread, and logos for 'caps', 'iGEM MIT', 'WESTERN', 'Albion', and 'GWKGO'. The poster is held up by a wooden tripod stand.





**caps** **iGEM** **iGEM** **UT** **iGEM** **UT**

# Arom-'Clock

Austin Rollingshaus, Brandon Whitcomb, Tim Schaefer, Graham Wehmeyer, Jonathan Hermanson, and Ryan McLean

**Problem & Concept**

**Foundations & Outreach**

**Catching ZZZ's**

**Rise & Shine**

**BioBrick Parts**

**Safety & Laboratory Methods**

**Results & Future**



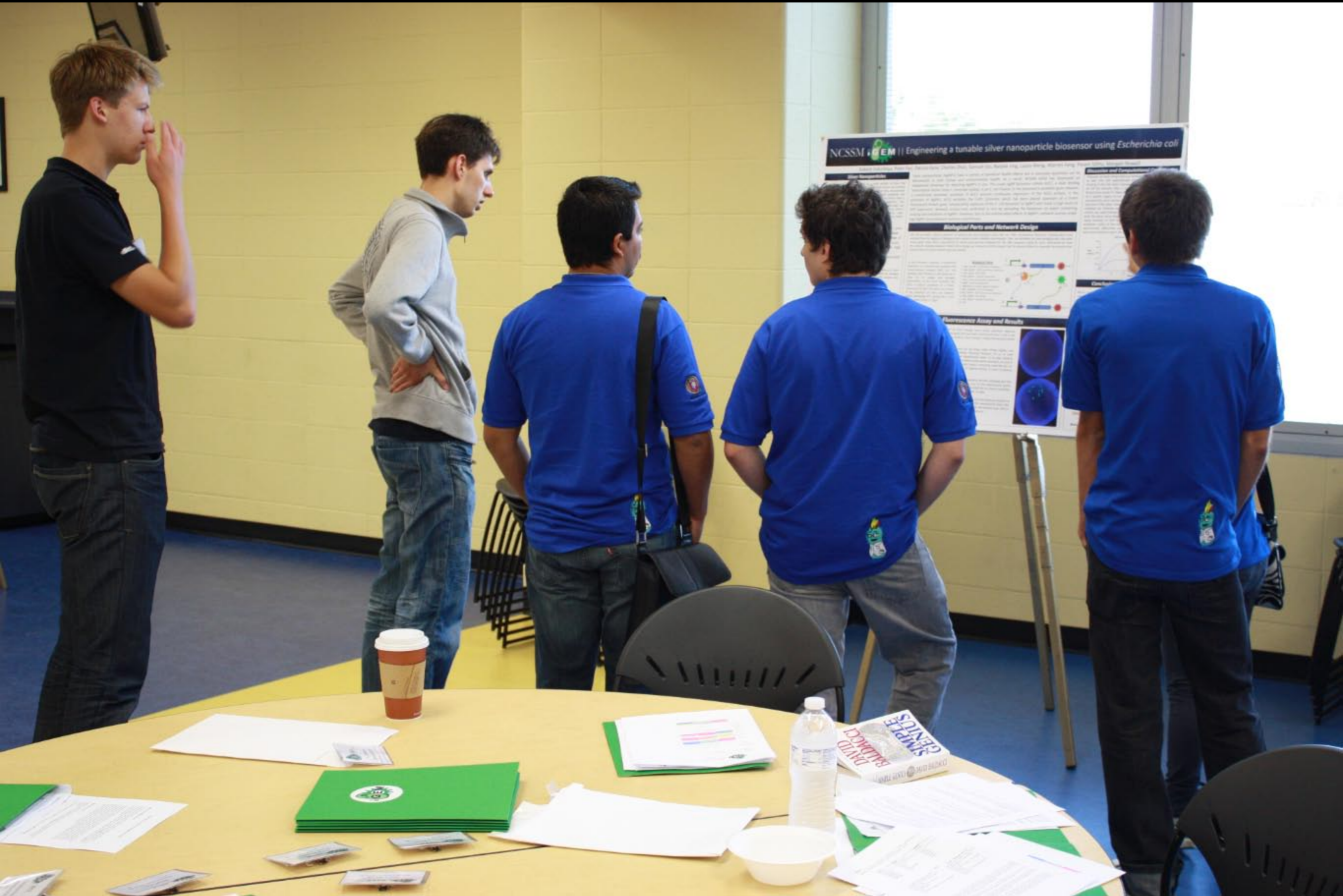












NCSSM iGEM || Engineering a tunable silver nanoparticle biosensor using *Escherichia coli*

**Abstract**

**Biological Parts and Network Design**

**Fluorescence Assay and Results**

**Discussion and Computational Simulation**

The poster contains several sections of text, diagrams, and images. A diagram shows a network of biological parts with nodes and connecting lines. Below it, a fluorescence assay image shows two petri dishes with glowing blue spots. The text describes the design and results of the biosensor.

**SIMPLE GENETICS**  
DAVID BALDOZI





**BIOSCIENCE**  
HIGH SCHOOL

Our Project: My research title: My Plan:

The poster features several diagrams, including a DNA double helix, a cell diagram, and a bar graph. It is mounted on a white board with a wooden pointer.

HBIDGE  
SchGEM

aria  
protes  
ndology  
lines

earch  
lute  
bridge

center for advanced professional studies  
**GEW**  
2012  
• bioscience

center for advanced professional studies  
**GEW**  
2012  
• bioscience

center for advanced professional studies  
**GEW**  
2012  
• bioscience

center for advanced professional studies  
**GEW**  
2012  
• bioscience

www.igem.org  
**iGEM 2012 HS Jamboree**

Greenfield Central High School  
Greenfield, Indiana, USA  
June 29-30, 2012



# iGEM 2012 HS Jamboree

Greenfield Central High School  
Greenfield, Indiana, USA  
June 29-30, 2012







Center for advanced professional studies  
**GEM**  
2012  
bio

**iGEM**  
2012  
Rose-Hulman  
Institute of Technology

Center for advanced professional studies  
**GEM**  
2012









center for advanced professional studies  
iGEM  
2017  
bioscience

advanced professional studies  
iGEM  
2017

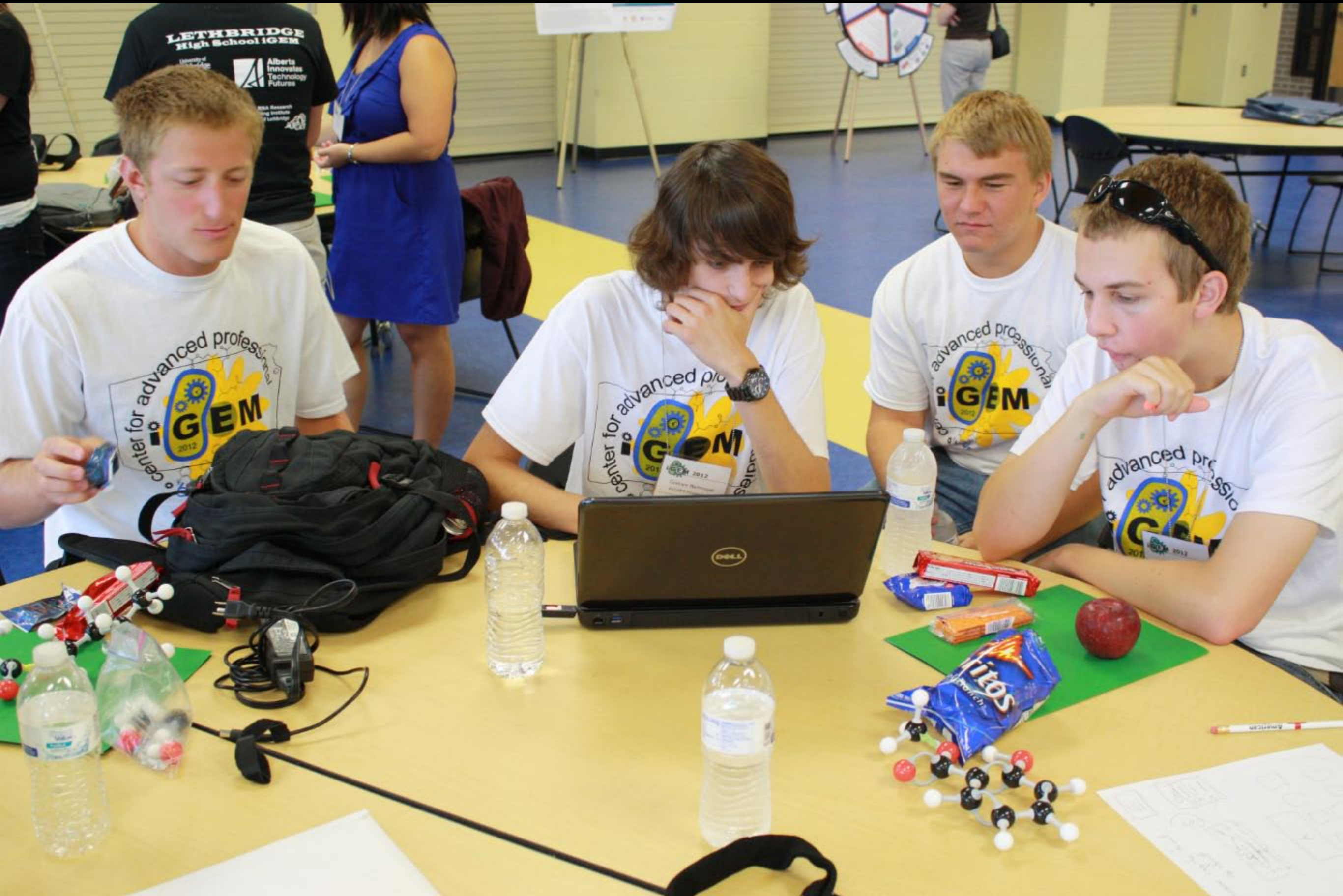
advance professional  
iGEM  
2017

Universal  
Fare

EXIT ONLY

Accent  
of Italy

Real Home  
Cookin'











Universidad Autónoma de Nuevo León  
Centro de Investigación y Desarrollo de Educación Bilingüe



# Semi-Quantitative Biosensor based on Sensitivity Tuners



Two presenters, a man and a woman, standing on a stage in front of a large projection screen. They are wearing blue polo shirts. The woman is holding a small device, possibly a biosensor, and looking towards the camera. The man is standing behind her, also looking towards the camera.

Acknowledgments

Instructors  
Janet Salinas  
Manuel Torres  
Elia Flores

Heber...  
David...

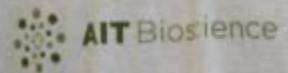
Special thanks to  
Dr. Socorro Guajardo

CIDEB  
GANE  
GEM  
BioLabs

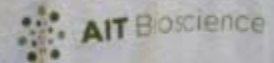




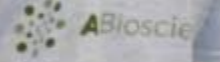
Thanks to our primary sponsor



Thanks to our primary sponsor



Thanks to our primary sponsor







**LETHBRIDGE**  
High School iGEM

center for advanced professional studies  
**iGEM**  
biosciences

iGEM

iGEM

iGEM









# Blue Valley CAPS Research

William Wehnemeyer, Jonathan  
K... .., Tim Schaefer, and Ryan  
McLean













# NCSSM iGEM | Engineering a tunable silver nanoparticle biosensor using *Escherichia coli*

Aakash Indurkha, Peter Fan, Patrick Kane, Charles Zhao, Samuel Joo, Natasie Ung, Laura Weng, Warren Teng, Param Saha, Nigam Havel

## Silver Nanoparticles

A silver nanoparticle is defined as a small particle of silver that behaves as a single unit. Silver nanoparticles have unique properties that make them useful in various applications. They are used in medicine, electronics, and environmental remediation.

Silver nanoparticles (AgNPs) have a variety of beneficial health effects but in excessive quantities can be detrimental to both human and environmental health. As a result, NCSSM iGEM has developed an inexpensive biosensor for detecting AgNPs in water. This novel AgNP biosensor utilizes AgNP-2, a plasmid carrying transcription factors from *S. cerevisiae* (AgNP-2), an *E. coli* chassis, in the biosensor's genetic network. A constitutive promoter upstream of AgNP-2 activates expression of the AgNP-2 gene. In the presence of AgNPs, AgNP-2 activates the GFP promoter which has been placed adjacent to the Fluorescent Protein gene. Subsequently, exposure of the *E. coli* biosensor to AgNPs will result in high levels of GFP expression. Network success was confirmed in vivo by spreading the biosensor on plates containing varying concentrations of AgNPs. However, due to the cytotoxic effects of AgNPs, network success under high AgNP concentrations remains unconfirmed.

## Biological Parts and Network Design

We have designed a genetic circuit for sensing and responding to silver nanoparticles. The circuit consists of several key components: a constitutive promoter, a transcription factor (AgNP-2), a sensor (AgNP-2), and a reporter gene (GFP). The circuit is designed to be robust and easy to assemble.

### Biological Parts

- 1. *BBJ1* (constitutive promoter)
- 2. *BBK10* (transcription factor)
- 3. *BBK11* (sensor)
- 4. *BBK12* (reporter gene)
- 5. *BBK13* (GFP)
- 6. *BBK14* (AgNP-2)
- 7. *BBK15* (AgNP-2)
- 8. *BBK16* (AgNP-2)
- 9. *BBK17* (AgNP-2)
- 10. *BBK18* (AgNP-2)
- 11. *BBK19* (AgNP-2)
- 12. *BBK20* (AgNP-2)
- 13. *BBK21* (AgNP-2)
- 14. *BBK22* (AgNP-2)
- 15. *BBK23* (AgNP-2)
- 16. *BBK24* (AgNP-2)
- 17. *BBK25* (AgNP-2)
- 18. *BBK26* (AgNP-2)
- 19. *BBK27* (AgNP-2)
- 20. *BBK28* (AgNP-2)
- 21. *BBK29* (AgNP-2)
- 22. *BBK30* (AgNP-2)
- 23. *BBK31* (AgNP-2)
- 24. *BBK32* (AgNP-2)
- 25. *BBK33* (AgNP-2)
- 26. *BBK34* (AgNP-2)
- 27. *BBK35* (AgNP-2)
- 28. *BBK36* (AgNP-2)
- 29. *BBK37* (AgNP-2)
- 30. *BBK38* (AgNP-2)
- 31. *BBK39* (AgNP-2)
- 32. *BBK40* (AgNP-2)
- 33. *BBK41* (AgNP-2)
- 34. *BBK42* (AgNP-2)
- 35. *BBK43* (AgNP-2)
- 36. *BBK44* (AgNP-2)
- 37. *BBK45* (AgNP-2)
- 38. *BBK46* (AgNP-2)
- 39. *BBK47* (AgNP-2)
- 40. *BBK48* (AgNP-2)
- 41. *BBK49* (AgNP-2)
- 42. *BBK50* (AgNP-2)
- 43. *BBK51* (AgNP-2)
- 44. *BBK52* (AgNP-2)
- 45. *BBK53* (AgNP-2)
- 46. *BBK54* (AgNP-2)
- 47. *BBK55* (AgNP-2)
- 48. *BBK56* (AgNP-2)
- 49. *BBK57* (AgNP-2)
- 50. *BBK58* (AgNP-2)
- 51. *BBK59* (AgNP-2)
- 52. *BBK60* (AgNP-2)
- 53. *BBK61* (AgNP-2)
- 54. *BBK62* (AgNP-2)
- 55. *BBK63* (AgNP-2)
- 56. *BBK64* (AgNP-2)
- 57. *BBK65* (AgNP-2)
- 58. *BBK66* (AgNP-2)
- 59. *BBK67* (AgNP-2)
- 60. *BBK68* (AgNP-2)
- 61. *BBK69* (AgNP-2)
- 62. *BBK70* (AgNP-2)
- 63. *BBK71* (AgNP-2)
- 64. *BBK72* (AgNP-2)
- 65. *BBK73* (AgNP-2)
- 66. *BBK74* (AgNP-2)
- 67. *BBK75* (AgNP-2)
- 68. *BBK76* (AgNP-2)
- 69. *BBK77* (AgNP-2)
- 70. *BBK78* (AgNP-2)
- 71. *BBK79* (AgNP-2)
- 72. *BBK80* (AgNP-2)
- 73. *BBK81* (AgNP-2)
- 74. *BBK82* (AgNP-2)
- 75. *BBK83* (AgNP-2)
- 76. *BBK84* (AgNP-2)
- 77. *BBK85* (AgNP-2)
- 78. *BBK86* (AgNP-2)
- 79. *BBK87* (AgNP-2)
- 80. *BBK88* (AgNP-2)
- 81. *BBK89* (AgNP-2)
- 82. *BBK90* (AgNP-2)
- 83. *BBK91* (AgNP-2)
- 84. *BBK92* (AgNP-2)
- 85. *BBK93* (AgNP-2)
- 86. *BBK94* (AgNP-2)
- 87. *BBK95* (AgNP-2)
- 88. *BBK96* (AgNP-2)
- 89. *BBK97* (AgNP-2)
- 90. *BBK98* (AgNP-2)
- 91. *BBK99* (AgNP-2)
- 92. *BBK100* (AgNP-2)

## Fluorescence Assay and Results

The biosensor network was constructed in vivo through Silver Nanoparticle Sensing. The network consists of several key components: a constitutive promoter, a transcription factor (AgNP-2), a sensor (AgNP-2), and a reporter gene (GFP). The circuit is designed to be robust and easy to assemble. The results of the fluorescence assay show that the biosensor network successfully detected the presence of silver nanoparticles in water. The fluorescence intensity increased significantly in the presence of silver nanoparticles, indicating that the biosensor network is functional. The results also show that the biosensor network is sensitive to the concentration of silver nanoparticles, with higher concentrations resulting in higher fluorescence intensity. The results further demonstrate that the biosensor network is robust and easy to assemble, making it a promising tool for detecting silver nanoparticles in water.

## Discussion and Computational Confirmation

The biosensor network was designed to be robust and easy to assemble. The results of the fluorescence assay show that the biosensor network successfully detected the presence of silver nanoparticles in water. The fluorescence intensity increased significantly in the presence of silver nanoparticles, indicating that the biosensor network is functional. The results also show that the biosensor network is sensitive to the concentration of silver nanoparticles, with higher concentrations resulting in higher fluorescence intensity. The results further demonstrate that the biosensor network is robust and easy to assemble, making it a promising tool for detecting silver nanoparticles in water.

## Conclusion and Future Work

The biosensor network was designed to be robust and easy to assemble. The results of the fluorescence assay show that the biosensor network successfully detected the presence of silver nanoparticles in water. The fluorescence intensity increased significantly in the presence of silver nanoparticles, indicating that the biosensor network is functional. The results also show that the biosensor network is sensitive to the concentration of silver nanoparticles, with higher concentrations resulting in higher fluorescence intensity. The results further demonstrate that the biosensor network is robust and easy to assemble, making it a promising tool for detecting silver nanoparticles in water.

## Acknowledgements

We thank the following individuals for their contributions to this project: [Names of contributors]. We also thank the following organizations for their support: [Names of organizations].













# Arom-'Clock



Austin Rottinghaus, Brandon Whitcomb, Tim Schaefer, Graham Wehmeyer,  
Jonathan Hermanson, and Ryan McLean

### Problem & Concept

Understanding of the molecular biology of the banana odor gene, the Cph8 gene, and the EnvZ sensor kinase. The goal of this project was to create a genetic circuit that could produce the banana odor in a controlled manner.

### Methods & Construct

The genetic circuit was designed to produce the banana odor gene under the control of a light sensor. The construct was transformed into E. coli cells and the resulting colonies were analyzed for the presence of the banana odor.

### Safety & Laboratory Methods

As a prerequisite for working in the CAPS Bioscience laboratories, all team members were required to read through a comprehensive safety manual that included the following topics:

- General Safety
- Laboratory Dress and Hygiene
- Chemical Safety
- Glassware and Handling of Equipment
- Microbiological Safety

Our iGEM project idea was the brainchild of Brandon and Austin, who were inspired by responses to a survey of CAPS Bioscience, Business, Humans Services, and Engineering strand students of the everyday problems that they experience. After learning the basic techniques of preparing solutions, growing broth cultures, streaking plates, isolating colonies, preserving stock cultures, and autoclaving samples, work on the main project ran from late March until the end of school in May. Tim and Graham joined the project midstream, and after school was out, Graham, Jono, and Ryan worked until just prior to the jamboree. More specific methods follow:

Transformation plates were grown at 37°C overnight in an incubator. Chemically competent cells were generated using a protocol obtained from New England Biolabs (NEB) using E. coli strain HB101. Additionally, we used NEB 5-alpha Competent E. coli cells for more recalcitrant transformations. We followed the New England Biolab's High Efficiency Transformation protocol for transformation of our parts. All bacteria were cultured in LB media with either kanamycin or ampicillin, and liquid cultures for plasmid prep were grown at 37°C overnight in a shaking incubator and then used. For plasmid purification from the liquid culture, an Aurum Plasmid Mini Kit (spin method) was used. Concentrations of DNA were taken using a Eppendorf Spectrophotometer at a 10µl sample to 40µl dilutant ratio. All restriction digestions were performed with New England Biolabs restriction enzymes and buffers, and the reactions were incubated for 30 minutes at 37°C followed by a 20 minute heat-inactivation step at 80°C. All gels were 2% agarose with ethidium bromide added and run at 120V until complete. A Sigma GenElute™ Gel DNA Extraction Kit was used to extract the digested DNA out of the gel.

### Results & Future

Brandon, Austin and Tim successfully transformed the banana odor generator, mint odor generator, and the Cph8 light sensor/EnvZ complex. Multiple attempts to transform the Cph8 light sensor/EnvZ complex failed. Attempts at problem solving, including using different competent cells and antibiotics, proved unsuccessful.



In June, Graham and Jono made transformed parts in preparation for the jamboree. The promoter purification and the

### Rise & Shine

In the night, when a photon hits the light sensor complex, Cph8, EnvZ is able to release, resulting in the production of the banana odor gene. The banana odor gene is then expressed in the E. coli cells, which produce the banana odor.

### BioBrick Parts

The genetic circuit was constructed using BioBrick parts. The parts included the Cph8 light sensor, the EnvZ sensor kinase, and the banana odor gene.



caps

# Arom-🐝'Clock

iGEM

**Problem & Solution**  
Aroma-Behavioral, Aromatic Molecules, The Secondary, Essential Metabolites, Growth, Metabolism, and Host-Cell...



**Methods & Results**  
CULTURE



**Safety & Laboratory Methods**

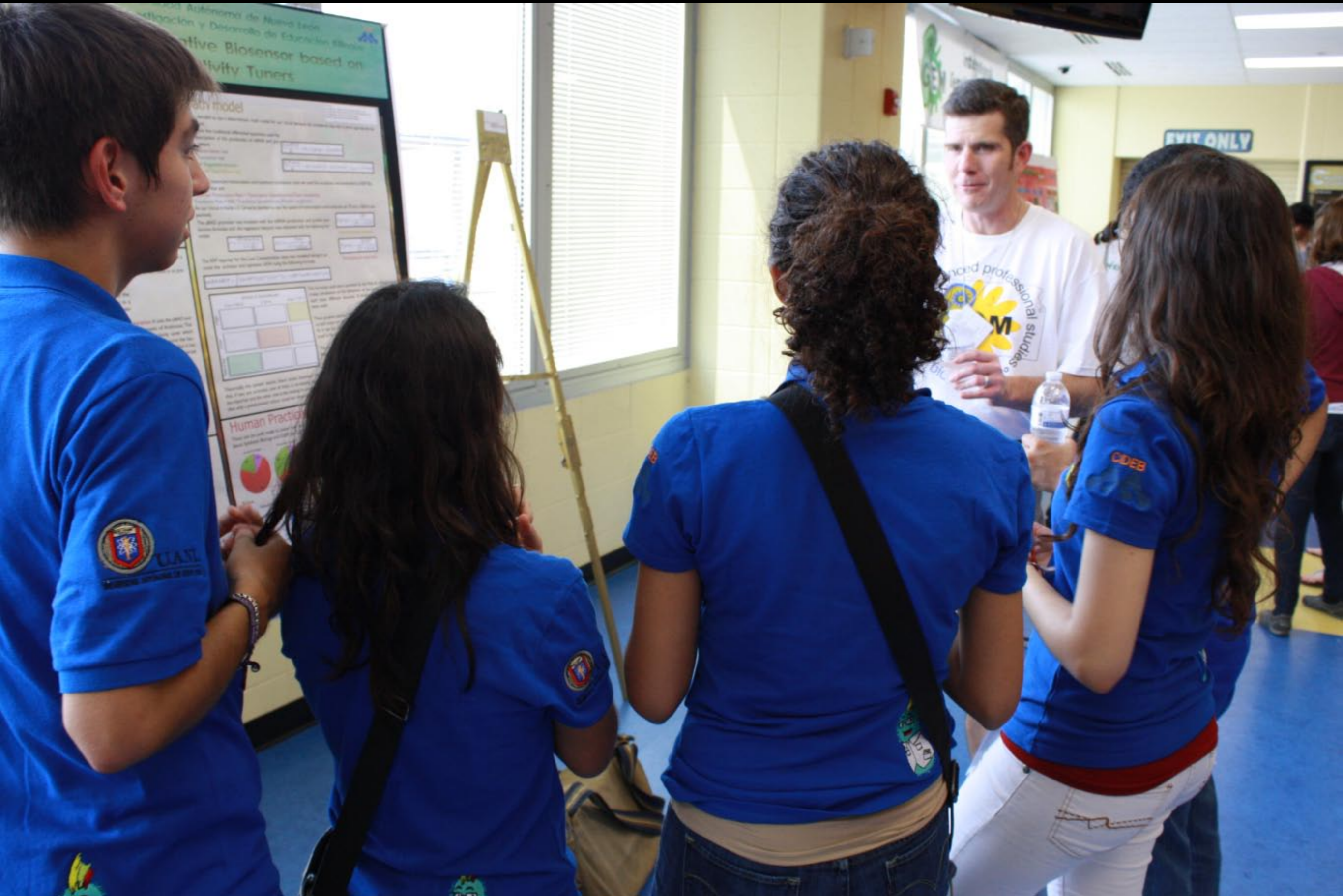
**Research & Future**

Advanced Professional Science & Technology  
**GEM**

Advanced Professional Science & Technology  
**GEM**

Advanced Professional Science & Technology  
**GEM**

JUICY  
COUTURE







**caps** **iGEM** **MIT**

# Arom-Clock

Austin Rottighere, Brandon Whitcomb, Tim Schaefer, Graham Wehmeyer, Jonathan Hammanson, and Ryan McLean

### Problem & Concept

The Arom-Clock is a genetic circuit that uses the natural circadian rhythm of the *E. coli* bacterium to create a clock. The clock is based on the natural oscillations of the *lacZ* gene expression, which is controlled by the *luciferase* gene. The clock is designed to be a simple, robust, and easy-to-use system for timekeeping in a laboratory setting.

### Foundations & Outreach

The Arom-Clock project was inspired by the work of the Rottighere and Whitcomb labs at MIT. The project was a collaboration between the Rottighere and Whitcomb labs and the Schaefer lab at MIT. The project was supported by the MIT iGEM team and the MIT Center for Advanced Professional Education.

### Safety & Laboratory Methods

All iGEM projects take place under the supervision of Brandon and Austin, who have received training from the MIT iGEM team. The project was conducted in a laboratory setting at MIT. The project was supported by the MIT iGEM team and the MIT Center for Advanced Professional Education.

### Results & Future

The Arom-Clock project was successful in demonstrating the natural circadian rhythm of the *E. coli* bacterium. The project was supported by the MIT iGEM team and the MIT Center for Advanced Professional Education.

**Getting E. coli's**

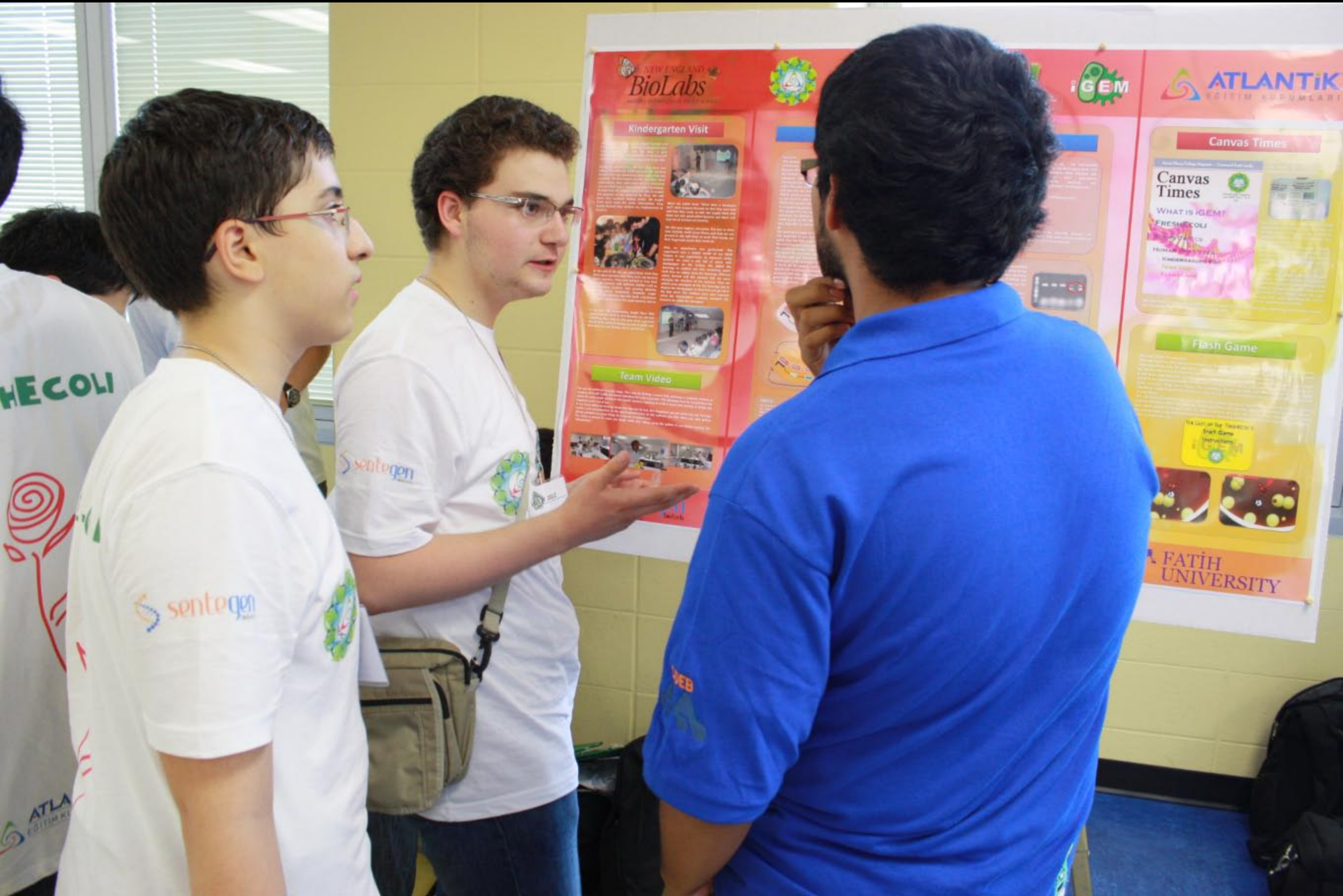
**Rise & Shine**

**Chemical Structure**

**Diagram**

**Photos**





NEW ENGLAND  
**BioLabs**  
BIOLOGICAL LABORATORIES



**iGEM**

**ATLANTIK**  
EĞİTİM KURUMLARI

### Kindergarten Visit



### Team Video



### Canvas Times

**Canvas Times**

WHAT IS iGEM?

FRESHCOLI

HOMEWORK

FLASH GAME

### Flash Game

The Last of the Year's Best  
Flash Game  
Instructions



**FATIH UNIVERSITY**









**iGEM** International  
Genetically Engineered  
Machine Competition

2012 iGEM High School Challenge







# Pink Spotlight

– more than just elegant



Collection



Order Now

Necklace  
Bracelet

30\$  
15\$



# Sunny Breeze

– colorful into the summer

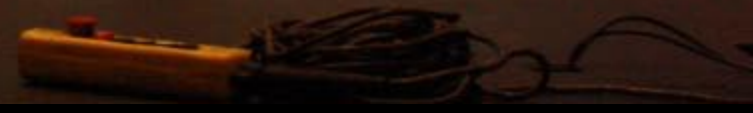


Collection

**SALE**

Necklace ~~30\$~~ Now 29\$

er Now!

The advertisement on the screen features a woman's face on the left wearing a necklace. On the right, there is an image of a bracelet with colorful beads. A large red "SALE" tag is overlaid on the top right. Below the bracelet image, the text "Necklace" is followed by a crossed-out "30\$" and "Now 29\$". A hand cursor icon points to the word "Now!".



# Surf 'n' Fly

– as cool as usual



Order Now

Price  
at

40\$  
22\$























Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience

Center for advanced professional studies  
GEM  
bioscience





















**iGEM** International Genetically Engineered Machine Competition

*Handwritten notes on a white t-shirt:*  
Vente a México para festejar Chido  
Estuvo genial su proyecto  
Call Me!  
so, hope  
visit  
Mexico soon!

*Text on a white t-shirt:*  
Professional Struggles










Erin ☺  
Kwan  
-Lethbridge



Chris Kim  
Graham  
Hart

THANKS TO OUR SPONSORS!  
GREENFIELD AREA CHAMBER OF COMMERCE  
EMORY UNIVERSITY  
DRAPER  
IGEM  
KIWANIS INTERNATIONAL  
GREENFIELD-CENTRAL COMMUNITY SCHOOL CORPORATION  
NEW ENGLAND BIOLABS INC.  
TINKER CELL

Erin  
Kelly

IGEM  
CIDER

A row of nine trophies is displayed on a table covered with a dark blue cloth. The trophies are arranged in a line, each on a black base. The table is positioned in front of a light blue backdrop. A white banner is draped across the front of the table, featuring the iGEM logo and text.

 **iGEM** 2012 iGEM High School Jamboree  **iGEM**















# 2012 Award Ceremony!







www.igem.org

Rebecca Schini

John Rihm

GCHS

Jenna Rickus

Judges

Volunteers

Vinoo Selvarajah

Kitwa Ng







Best Hail Mary

2022 Hail Mary Competition

1. Innovation

2. Creativity

3. Problem Solving

4. Teamwork

5. Communication

2022 Hail Mary High School Competition





Best Model

CIDEB-UANL Mexico





Best Model

CDEB-UANL Mexico











Best Poster

iGEM 2012 iGEM High School Jambor





Best Poster

APS Kansas



iGEM 2012 iGEM School J... ore

Best Poster















iGEM 2012 iGEM High School Jamboree iGEM















Competition



# International Genetically Engineered Machine Competition









**International  
Genetically Engineered  
Machine Competition**





# International Genetically Engineered Machine Competition









# CHUCK-A-BURGER

.COM

CURB  
SERVICE  
DINING  
ROOM

CARRY OUT



PHONE  
IN FOR  
QUICK  
PICK UP  
427-9524

# CRUISIN'

SINCE 1957





Parties of 4 or more Only

Science Summer Camp '12









2012  
KANSAS



ENVIROTHON  
99 - Saliva Kansas