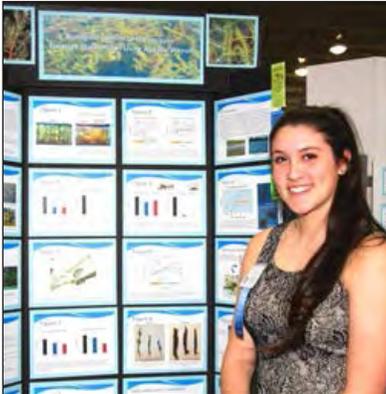


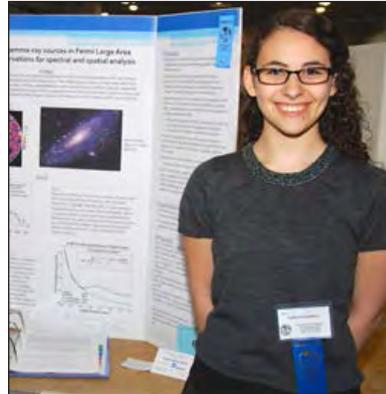
Meet the Winners



Connecticut Science & Engineering Fair ISEF Winners— I-to-r: Isabelle Goldstein, Anubhuti Mathur, Janine Kerr, Bridget Oei, Emma Goodman, and Megan Boyer



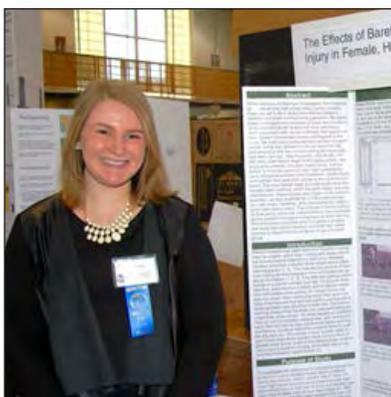
Janine Kerr, Junior, Danbury HS
 1st Place, Pfizer Life Sciences
 1st Place Urban School Challenge



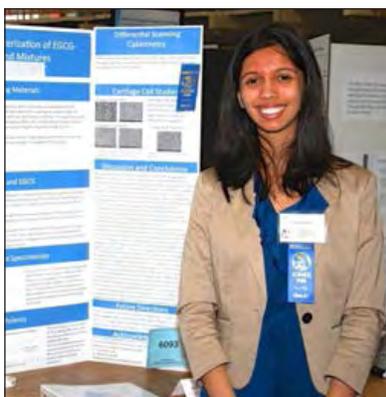
Isabelle Goldstein, Ridgefield HS
 1st Place, Dominion Physical Sciences



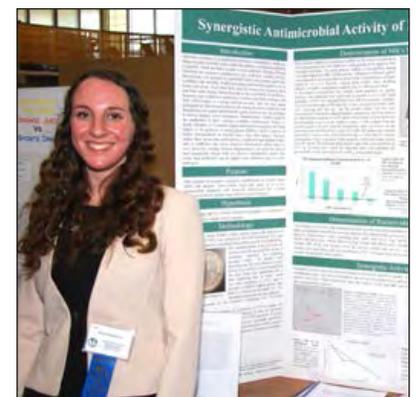
Bridget Oei, Senior, East Catholic HS
 1st Place Alexion Biotechnology
 2nd Place, Pfizer Life Sciences



Megan Boyer, Senior, Manchester HS
 3rd Place, Pfizer Life Sciences



Anubhuti Mathur, Junior, Glastonbury HS
 2nd Place, Dominion Physical Sciences



Emma Goodman, Junior, Greenwich HS
 4th Place, Pfizer Life Sciences

Meet the Chaperones

CONNECTICUT SCIENCE & ENGINEERING FAIR
at the
INTEL INTERNATIONAL SCIENCE & ENGINEERING FAIR
Los Angeles, California, May 11 - 16



Ann Frattalone – ISEF Week Coordinator

Ann Frattalone retired after 31 years of teaching Special Education, the last 20 years in the Connecticut Technical High School System. An alumnus of Greenwich High School, Ann received a Bachelor's degree from Western Connecticut State University and completed her Master program in Vocational Special Education at UConn, Storrs. She has been the Regular Awards Chair of the Connecticut Science Fair for the past 25 years and is the ISEF Week Coordinator.

Ann is active in her community where for the last 17 years she has been a member of the Bridgewater Volunteer Fire Department Women's Auxiliary and currently is its President. Ann volunteers at the Senior Center and coordinates the town van that transports seniors to their appointments and activities. In her spare time she is a substitute teacher at their local elementary school and plays a little golf.



Andy Bramante – Greenwich High School

Andy Bramante is the Independent Science Research teacher, mentor, and research program director for more than 50 participating students at Greenwich High School, in Greenwich, CT. Prior to arriving at the high school 9 years ago, Andy enjoyed a 15-year career as an applications scientist and design specialist for various analytical instrumentation companies, including Foxboro, Hitachi, and more recently, PerkinElmer. His expertise lies in the various life & material science application of these analytical technologies, based on the many publications he has authored, most notably at PerkinElmer. Andy is also an Adjunct Lecturer at Sacred Heart University in Fairfield, CT, during the evenings, and was recently named a Distinguished Teacher of the Year for the Town of Greenwich, for 2011-2012. Andy is a native of New York City, and completed his undergraduate and graduate degrees in chemistry at Fordham University, at Rose Hill. He is a seasoned veteran of ISEF, and looks forward to an exciting and educational trip for all.



Meet the Chaperones

CONNECTICUT SCIENCE & ENGINEERING FAIR
at the
INTEL INTERNATIONAL SCIENCE & ENGINEERING FAIR
Los Angeles, California, May 11 - 16



Diane Corcoran Pintavalle – Glastonbury High School

Diane Corcoran Pintavalle has been teaching at Glastonbury High School since 1989. She teaches Advanced Placement Biology and is also the instructor for the Advanced Research Mentorship program. This program allows students to learn the process of scientific research or engineering by participating as a member of an authentic research team under the guidance of a mentor. With an innovative curriculum which allows students to act like true researchers and a mentor who is a practicing scientist or engineer, Diane's students have excelled in their independent research projects. Many students have advanced to national and international competitions. Diane is an adjunct biology professor for the University of Connecticut's Early College Experience and was also selected as a Joules Fellow in the UCONN School of Engineering's NSF funded Research Experience for Teachers. Diane was named a finalist in the 2012 and 2014 CT Technology Council's Women of Innovation program. She earned her Bachelor's and Master's degrees in Biology from Central Connecticut State University and in 2010, earned the MALS degree from Wesleyan University. She enjoys spending time at home with her family, cooking and kayaking. Diane is very much looking forward to her first trip to ISEF and is grateful to the CT Science & Engineering Fair for welcoming her to the team and to Glastonbury High School for supporting this important professional development opportunity.



Bob Wisner – Fair Director/Chairman of the Board of Directors

Bob began his association with the Connecticut Science Fair as a 7th grader from Hartford's Kennelly School. He competed in high school making it to the National Science Fair in 1958 and 1959. In 1960 as a result of his science project work Bob was offered an internship at United Technologies Research Center. After receiving his electrical engineering degree from UConn, Bob became a full-time research engineer doing research in high-energy lasers, adaptive optics, and power electronics resulting in 15 patents. His proudest career accomplishment was leading a research team in the development of an automated clinical gait analysis system used to evaluate children with cerebral palsy. After 35 years at UT Research Center and 5 at Oits Elevator Bob retired in 1999. His CSF volunteer days began in the early seventies when his 7th grade science teacher asked him to become involved. Bob became chairman of the Fair's board in 1974 and Fair Director in 1989. Bob and his wife, Sue, have three children and five grandchildren. Bob enjoys sailing and his electronics hobby.

CONNECTICUT SCIENCE & ENGINEERING FAIR

www.ctsciencefair.org

Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Megan Boyer, Grade 12

Manchester High School, Manchester, CT

The Kinematics of Barefoot and Shod Running

Connecticut Science & Engineering Fair Awards

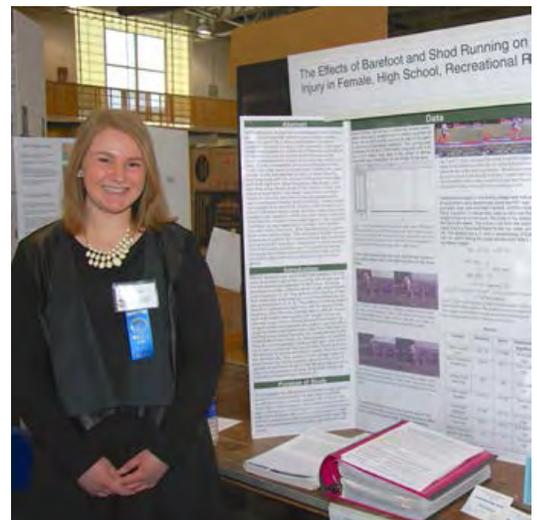
- Pfizer Life Sciences Awards --- 3rd Place- Life Sciences Senior High- \$200 & Plaque
- U.S. Metric Association --- Certificate & \$50 gift card to Amazon given by CSEF

Abstract

While previous studies have investigated the incidence of injuries among high school cross country runners, there has yet to be a study conducted to compare barefoot and shod running in this population. My experiment investigates the influence of these two conditions on biomechanical risk factors that have previously been associated with injuries in female high school runners. Eleven recreational runners participated in this study. Ten trials were conducted per condition for each runner. A trial was defined as one run down the fifty-foot long track with the runners striking the force plate with their right foot. Step frequency, step length, contact time, knee flexion angle in the stance phase, sole angle at touchdown, the peak impact force, and the length of time the maximum force was sustained for were compared between both conditions. Stride length and contact time were both shorter in the barefoot condition, which led to less prominent rearfoot striking among the majority of runners. The knee flexion angle and sole angle were also smaller when barefoot, which are both impact reducing mechanisms. Impact forces were higher in the barefoot condition, as was expected for runners who typically run with shoes. However, other biomechanical adaptations were clearly made. This includes a shorter period of time during which the maximum force was sustained during barefoot running in comparison to shod running. This information could be used to support a prospective study that follows barefoot and shod high school runners to determine the incidence of injury in each group.

Biography

Megan Boyer is a senior at Manchester High School and this is her first year competing in the Connecticut Science and Engineering Fair. She is enrolled in the Science Research in the High School course offered in a partnership between SUNY Albany and her school. Her research looks at the biomechanical gait differences that occur when running with shoes and without, and how this could affect risk of injury. Outside of the lab, Megan is the Vice President of Manchester High's National Honor Society and the Social Chair of the Activities Planning Board. In addition, Megan is a dancer of fourteen years who is also an assistant student teacher in preschool tap classes. Her love of children and science has inspired her to pursue a career in the field of pediatric medicine. She will be attending the University of Connecticut in the fall and intends to major in Biology on a pre-medical track.



CONNECTICUT SCIENCE & ENGINEERING FAIR

www.ctsciencefair.org

Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Isabelle Goldstein, Grade 12

Ridgefield High School, Ridgefield, CT

Partitioning gamma-ray sources in Fermi Large Area Telescope observations for spatial and spectral analysis

Connecticut Science & Engineering Fair Awards

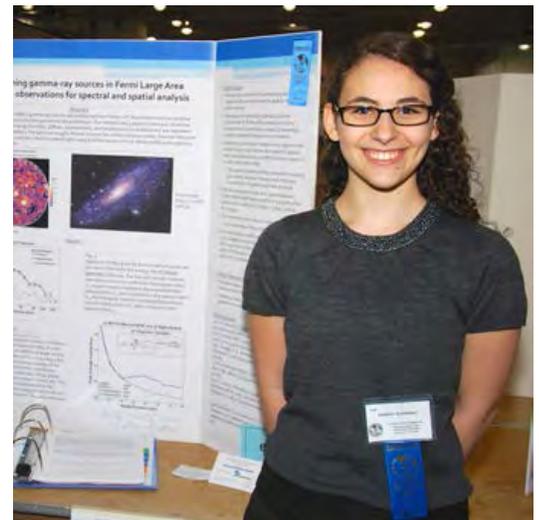
- Dominion Nuclear Connecticut Physical Sciences Awards --- 1st Place - Physical Sciences Senior High Individual - \$500 & Plaque, trip to compete at Intel ISEF
- H. Joseph Gerber Medal of Excellence, an award of the Connecticut Academy of Science and Engineering with CCAT --- Physical Sciences 1st HS \$1,000 cash, Solid Silver Medal of Excellence, invite to CASE Annual Mtg
- Astronomical Society of Greater Hartford --- Senior Project-\$150, subscription to Sky and Telescope magazine and ASGH meeting invitation -1st place

Abstract

The Weakly Interacting Massive Particle (WIMP) theory for dark matter predicts the production of gamma radiation from WIMP annihilation and decay. To examine the possibility of WIMP dark matter, gamma ray sources from M31 are partitioned from the Fermi Gamma-ray Space Telescope from the LAT instrument with 5 years of clean and ultraclean cut-data in the 1–300 GeV range. Background, halo, and point source distributions are then used in a spectral and spatial analysis. The spectrum is well described by a power law, but the polar averaged radial density is a good fit with a line of sight integral of the linear and squared Navarro - Frenk - White (NFW) density profile with an $R^2 = 0.9992$. The NFW fit also exhibits a significantly larger contribution coefficient from decay processes than annihilation. The correlation between theory and predictions suggests that either WIMPs are the source of the radiation, astrophysical processes are influenced by dark matter that follows this density fall off, or astrophysical processes follow this profile randomly. These findings raise fundamental questions on the origin of galactic halo gamma rays, and warrants continued research in the field.

Biography

Isabelle Goldstein is a senior in the Connecticut Ridgefield High School Science Research program. Her love for the universe since childhood has led her to research dark matter, which she will be presenting at the Intel International Science and Engineering Fair this year. Outside of science Isabelle spends a large portion of her time with the Ridgefield Conservatory of Dance where she studies ballet, modern, and jazz dance. As a high school senior, she is getting ready to leave home to study astrophysics and physics with Carnegie Mellon University.



CONNECTICUT SCIENCE & ENGINEERING FAIR

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Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Emma Goodman, Grade 11

Greenwich High School, Greenwich, CT

Synergistic Antimicrobial Activity of Manuka Honey and Silver Nitrate

Connecticut Science & Engineering Fair Awards

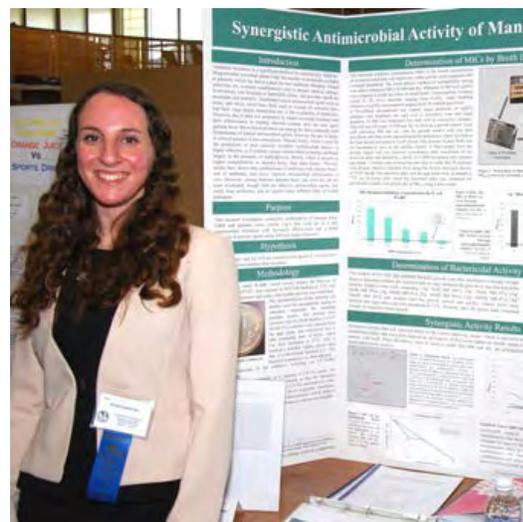
- Pfizer Life Sciences Awards --- 4th Place- Life Sciences Senior High- Plaque
- Lunch with a Patent Attorney --- Lunch with a Patent Attorney

Abstract

Antibiotic resistance is a significant problem in contemporary medicine. Drug-resistant microbial strains limit the number of treatments available to patients, which has led to a push for new antibiotic therapies. Traditional topical antibacterial agents such as honey and silver are once again gaining favor due to their low propensity to induce microbial resistance and effectiveness in treating infected wounds. This research investigates synergistic combinations of manuka honey (MH) and aqueous silver cations (Ag^+) that could act as a new antimicrobial treatment with increased effectiveness and a broad spectrum of activity against many different types of bacteria. *E. coli* K-12 W1485, which closely mimics the behavior of pathogenic O157-H7, was cultured in broth and subjected to broth dilution susceptibility testing to determine minimum inhibitory concentrations (MIC) of MH and Ag^+ . To investigate synergistic interaction between MH and Ag^+ against *E. coli*, a 96-wellplate checkerboard was created with 2.5-160 μM AgNO_3 and 0-20% MH. The MICs were observed as the lowest concentrations that lacked visible growth, which was confirmed via OD650. Samples from the wells that inhibited bacterial growth were then plated and checked for visible growth after 24 hours to look for synergistic bactericidal activity. The combination index was calculated as 0.75, indicating synergistic growth inhibition. Cytotoxicity studies using human epidermal keratinocytes (HEKa), a MTS cell proliferation assay, and microscopy will be conducted to confirm that MH/ Ag^+ is not harmful to normal skin cells. Combined results will demonstrate that a MH/ Ag^+ regimen will be effective as an antimicrobial treatment for infected wounds.

Biography

For her first time competing at the CSEF, Emma Goodman, a junior at Greenwich High School, investigated synergistic combinations of two traditional topical antibacterial agents, manuka honey and silver, as a potential new antimicrobial treatment with increased effectiveness, limited resistance, and a broad spectrum of activity for infected wounds. During her first year of science research, Emma was an intern at PsychoGenics, a biotech company that researches neurodegenerative diseases. Emma enjoys spreading her love of science through tutoring and as both President and Founder of Cool Kids Chemistry and Vice President of the Science Research Club, two science outreach programs which educate and mentor younger students. A passionate musician as well, Emma attends the Manhattan School of Music's precollege program and is principal clarinet of the Norwalk Youth Symphony. She has performed at Carnegie Hall, Tanglewood, and the Granada International Music Festival, and has participated in the Western Regional, All-State, and All-New England music festivals. As a leader in the arts, Emma is Vice President of her school's Tri-M Music Honor Society, and was selected as a member of the Logan Arts Leadership Institute at Interlochen Arts Camp. Emma is an avid reader, for which she was recently named a Harvard Book Award winner, and enjoys translating classical Latin texts. In her free time, Emma likes to attend



CONNECTICUT SCIENCE & ENGINEERING FAIR

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Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Janine Kerr, Grade 11

Danbury High School, Danbury, CT

Biological Control of the Invasive Eurasian Watermilfoil Using Aquatic Weevils

Connecticut Science & Engineering Fair Awards

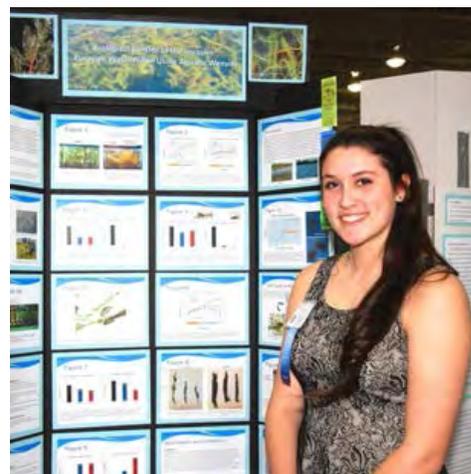
- Pfizer Life Sciences Awards --- 1st Place- Life Sciences Senior High- \$500 & Plaque, Trip to compete at Intel ISEF
- CASE Urban School Challenge Awards with Bristol-Myers Squibb & Travelers --- 1st Place High School - \$500 and Plaque, Medallion and trip to compete at Intel Int. Sci. & Eng. Fair
- Environmental Sciences Awards with CACIWC --- HS Finalist - CACIWC gifts, CSF Medallion, Acrylic award
- H. Joseph Gerber Medal of Excellence, an award of the Connecticut Academy of Science and Engineering with CCAT --- Life Sci. Senior 1st HS- \$1,000 cash, Solid Silver Medal of Excellence, invite to CASE Annual Mtg
- H. Joseph Gerber Medal of Excellence, an award of the Connecticut Academy of Science and Engineering with CCAT --- \$500 to 1st Place HS Urban School Challenge Science Department for Equipment/Supplies
- American Society of Safety Engineers, CT Valley Chapter --- \$150 grade 9-12 project
- Banning Family Life Science Award --- For excellence in invasive species research, \$100 cash
- Alumni Botany Awards --- Alumni Middle School Botany Award- \$100 Cash
- Yale Peabody Museum --- Family "six-pack" of free passes to the Yale Peabody Museum

Abstract

Eurasian water milfoil (EWM) is an invasive species of aquatic plant that grows in thick mats with stems that grow up to three meters long. The milfoil grows and spreads rapidly, crowding out native plants, interfering with recreational activity, and causing severe ecological damage. Since its accidental introduction into the United States in the 1940's, milfoil has been found in almost every state. Present methods of control include the use of dangerous chemical herbicides that cause mortality in non-target species such as native plants and aquatic vertebrates and invertebrates. I developed an approach to control EWM using small native aquatic insects that feed on it called milfoil weevils. Adult weevils lay their eggs on the stems of milfoil plants, and once hatched the larvae burrow into the stems destroying them. Milfoil was harvested from a local lake and grown in fish tanks. After four weeks exposure to the milfoil weevils I measured both the stem growth rate and overall biomass of the milfoil stems and roots. I found that the weevils were effectively able to control the growth of EWM dependent upon weevil stocking density significantly reducing milfoil growth by 54%. In addition, I compared the effect of weevils to the herbicide Diquat. Although efficacious, Diquat was toxic to non-target species and aquatic invertebrates. Therefore, I was able to demonstrate that biological control using milfoil weevils is a promising and environmentally-safe approach towards controlling the growth of this ecologically dangerous and economically threatening invasive species.

Biography

Janine is a junior at Danbury High School. This is her fifth year participating in the CSEF and she is thrilled to be heading to ISEF. Janine has won numerous awards in her last few years, including 2nd place at the 2013 CSEF (Biotechnology), two gold medals at the GENIUS Olympiad, and 5th Place at the 2013 CT Junior Science and Humanities Symposium (JSHS) including an invitation to travel to the national competition. Janine has taken a keen interest in invasive species research, previously studying zebra mussels and the Emerald Ash Borer. This year her research focused on a method of biological control for the invasive Eurasian water milfoil, an aquatic weed threatening Connecticut's lakes and streams as well as those of our entire country. Janine's approach was to boost the number of a naturally occurring species of aquatic weevil that feeds upon the milfoil. This approach shows great promise and would be more environmentally-sound than the use of chemical herbicides. Outside of her scientific pursuits, Janine was a captain of her high school soccer team and plays for a local premier soccer club. She also plays Varsity and AAU Basketball. Janine enjoys refereeing for youth leagues in both sports. Janine is heavily involved in dance and participates in hip-hop, jazz, and tap style dancing. Janine is just beginning her college search and plans to concentrate in environmental science and management.



CONNECTICUT SCIENCE & ENGINEERING FAIR

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Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Anubhuti Mathur, Grade 11

Glastonbury High School, Glastonbury, CT

Synthesis and Characterization of EGCG-PLGA Conjugates and Mixtures

Connecticut Science & Engineering Fair Awards

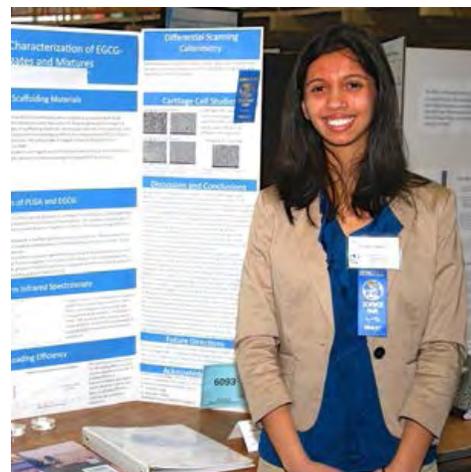
- Dominion Nuclear Connecticut Physical Sciences Awards --- 2nd Place- Physical Sciences Senior High Individual - \$300 & Plaque, trip to compete at Intel ISEF
- Office of Naval Research- U.S. Navy / U.S. Marine Corps --- High School- Certificate, \$75.00 gift certificate

Abstract

The engineering of biomaterials with suitable biochemical, physiochemical, and mechanical properties is a major challenge in tissue engineering. There is a need to develop novel materials that have desired physics properties that also incorporate biomolecules that enhance their biological response. Epigallocatechin gallate, or EGCG, has successfully been used in several medical applications, such as in cancer therapeutic drugs. The goal of this project is to explore EGCG's potential as a biomolecule for enhancing the functionality of structures called scaffolds for tissue repair and regeneration. EGCG was encapsulated into scaffolds composed of a well established polymer called poly(lactic-co-glycolic acid), or PLGA, of three types: microparticles, electrospun matrices, and thin films. The products were subjected to analytical techniques that confirmed the presence of EGCG in the PLGA scaffolds, including loading efficiency analysis, Fourier Transform Infrared Spectroscopy, and Scanning Electron Microscopy imaging. In addition, EGCG and PLGA were chemically conjugated. The chemical conjugation was supported using Differential Scanning Calorimetry, through which the glass transition temperature of the conjugates and PLGA were seen to be different. Cartilage cell studies were conducted with electrospun matrices encapsulated with EGCG due to the decreased diameter and increased hydrophilicity of the fibers in that increased the surface area of the matrix and created a more favorable environment for cells to grow on. The cell studies showed that cartilage cells exhibited greater confluency on EGCG-PLGA electrospun than on electrospun matrices of only PLGA. Future studies include assessing cartilage cell performance on electrospun matrices of EGCGPLGA chemical conjugates.

Biography

Anubhuti Mathur is a junior at Glastonbury High School. This year she has been conducting a research study at the University of Connecticut Health Center's Institute for Regenerative Engineering. She is exploring the potential for an antioxidant found in a green tea extract called EGCG to be incorporated into regenerative materials called scaffolds. Anubhuti was inspired to pursue research by her classmates, whose passion for their projects encouraged her to explore a field of research she found exciting. In addition to placing 2nd in the Physical Sciences division at the Connecticut Science and Engineering Fair, Anubhuti placed 3rd at the Connecticut Junior Science and Humanities Symposium and 1st in the Health Sciences Proposal division at the Southern Connecticut Invitational Science and Engineering Fair. In school, Anubhuti is a varsity debater, captain of the science bowl team, an officer of the medical club, and a Model UN delegate. An enthusiastic chemistry student, she has also been a member of her school's Chemistry Olympiad team for the past three years, and qualified for the National Chemistry Olympiad. Anubhuti also enjoys dancing. She actively participates in her school's multicultural dance group called InvASIAN and is also training in Kathak, a classical Indian dance form. While Anubhuti is still exploring various career paths, she currently hopes to major in chemistry in college and attend medical school.



CONNECTICUT SCIENCE & ENGINEERING FAIR

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Top Winners in the 2014 Connecticut Science & Engineering Fair

(Student information as of April 2014)

Bridget Oei, Grade 12

East Catholic High School, Manchester, CT

*Investigating the Efficacy of Bioluminescent Mushroom *Panellus Stipticus* as a Biosensor to Detect the Toxicity of Water Contaminants*

Connecticut Science & Engineering Fair Awards

- Pfizer Life Sciences Awards --- 2nd Place- Life Sciences Senior High- \$300 & Plaque, Trip to compete at Intel ISEF
- Environmental Sciences Awards with CACIWC --- 3rd Place HS- \$100, Plaque, CACIWC gifts
- EnergizeCT/CL&P/eesmarts Future Sustainability Awards --- 1st Place High School - \$800 Cash, Plaque, and Trip to Compete I-SWEEEP, Houston
- Alexion Biotechnology Awards --- 1st Place- Senior High- Trip to compete at Intel ISEF, \$1000 & plaque,
- Connecticut Science Supervisors Association --- \$125 for a high school project
- Milton Fisher Science Fair Award for Innovation and Creativity --- For Excellence in Creativity and Innovation by a High School student, \$200 cash
- University of New Haven 11-12th Grade Awards in Engineering & Science --- \$100 For Top High School Project in Sustainability

Abstract

Conventional chemical assays of water samples typically target certain chemicals and are difficult to apply to a broad range of water contaminants. An economical and robust bioassay method for determining the toxicity of water contaminants should help improve public health worldwide. This research explored the effect of six common water contaminants - CuSO₄, ZnSO₄, NaNO₃, HgCl₂, Atrazine, and Permethrin, on the bioluminescence of the *Panellus Stipticus* mushroom. *Panellus Stipticus* was cultivated using two methods; a nutrient culture method and a plug spawn method. The harvested mushrooms were introduced to contaminants that were diluted according to EPA Maximum Contaminant Level values and at other varying concentrations. Decay in *Panellus Stipticus* bioluminescence intensity was visually monitored as well as measured using a Sper Lux/FC meter. Decay can be visibly observed with bioluminescent intensity reduction of 10%. The bioluminescent intensity of *Panellus Stipticus* was measured at 4.7 lux. 30 minutes exposure to metal salts, CuSO₄, HgCl₂, and ZnSO₄, reduced the bioluminescent intensity by 68-72%. 90 minutes exposure to alkali metal salt contaminant, NaNO₃, showed a reduction of bioluminescence intensity by 15%. *Panellus Stipticus* subjected to Atrazine and Permethrin contaminants showed a reduction of bioluminescence intensity by 12-13% after 150 minutes. Bioluminescence intensity decay of 10% or greater could be detected within 130 minutes under all contaminant concentrations. This makes *Panellus Stipticus* a viable qualitative and quantitative biosensor to detect toxicity of water sources.

Biography

Bridget Oei is a senior and Student Body President at East Catholic High School. She is an Archdiocese of Hartford Summa Scholar, a National Merit Commended Scholar, an AP Scholar and member of the National Honor and Tri-M Music Honor Societies. Bridget is the recipient of the 2014 Connecticut Women of Innovation Youth Leadership Award. She was a 2nd place Intel ISEF Grand Award Winner; a four-time medalist and a two-time Grand Award Winner at the I-SWEEEP Science Olympiad; and a 2012 inductee to the National Gallery for America's Young Inventors receiving a citation from President Barack Obama. Bridget is a recipient of the George Eastman Leadership Award for her work in developing a fine arts program for Grace Academy, an all-girl grade school in inner city Hartford, CT for low income families. Besides academics, science, and community service activities, Bridget has a passion for dance. In Irish Step Dancing, Bridget is the 2014 Young Arts National Winner, the current and two-time New England Champion, a 10 time North American medalist and currently ranked 2nd, and a two-time World Medal holder and currently ranked 6th. She also placed 5th and received a scholarship from the Hartt School of Performing Arts at this year's Connecticut Classic ballet competition. Bridget will be attending the University of Connecticut on a full scholarship as a Stamps and Nutmeg Scholar. Bridget also plays the piano, fiddle and is an avid sailor and surfer.

