



The Jess and Mildred Fisher College of Science and Mathematics

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ELECTRONIC NEWSLETTER

February/March 2012



OFFICE OF THE DEAN

*The Fisher College – Inspiring Student Exploration in Science and Mathematics
for the 21st Century®*

Dear Friends,

This spring has been a very busy one for all of us in the Fisher College. We've been conducting nationwide searches for seven new faculty members, and hope to conclude them soon. We've had several great events recently, including the annual Women in Science symposium. This half-day Saturday event featured speakers from the Naval Academy, the National Geographic Society, and our own Dr. Pamela Lottero-Perdue (Physics, Astronomy & Geosciences). Another event was a Saturday morning open house at Port Discovery in downtown Baltimore, celebrating the announcement of a new collaboration between Towson University and the well-known children's museum. Keep tuned for future announcements of FCSM research, education and outreach activities with Port Discovery.

We are very proud that FCSM students just won the [mid-Atlantic Collegiate Cyber Defense Competition](#) at the Applied Physics Laboratory in Laurel, MD. Twenty five different schools from Pennsylvania to North Carolina participated last month in the regional qualifying round, including Bowie State, George Mason, George Washington, Norfolk State, and the University of Maryland at College Park. Eight teams advanced to the final round: Capitol College, Howard Community College, James Madison University, Millersville University, Radford University, UMBC, West Virginia University, and Towson University. Now our team and their faculty mentor, Prof. Mike O'Leary, will travel to San Antonio, TX, for the national championship on April 20. Good luck, team!

I hope you will enjoy reading through this issue of the FCSM Newsletter. Before you do, please read the special note that Liina Ladon (Chemistry) asked me to include here on the first page. Thanks, Liina, and thank you, readers, for your consideration.

Sincerely,

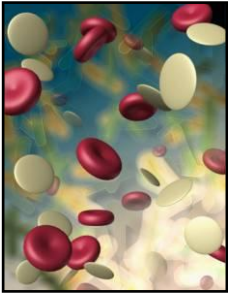
David A. Vanko
Dean

Fisher College Alums! Show your Tiger Pride!

I graduated from Towson University in 1976 and little did I know that I would be back in 1980 as a member of the TU Staff. In those few years of absence, I realized how much Towson University had prepared me for my profession. There are many alums working in the Fisher College and I am appealing to you to give back to the institution that has given you your career. I feel I can never repay all that Towson has done for me. It is easy to give up one gourmet coffee a week and contribute that amount to the College. Payroll deduction makes it painless. The amount is not important; it's the number of donors that makes the difference. As your Fisher College representative on the Alumni Board I am making this appeal for you to open your hearts and give back to your Alma Mater. Thank you!

Sincerely,
Liina H. Ladon, Department of Chemistry

To make your gift now go to www.Towson.edu/supportTU



DEPARTMENT OF BIOLOGICAL SCIENCES

Publications

Jay Nelson and his students Nicole E. Williamson (undergraduate) and Joshua P. Vandamm (undergraduate) and Corey A. Handelsman (graduate) had the following papers accepted for publication:

Williamson N.E., J.J. Cech Jr. and J.A. Nelson. In press. "Flow preferences of individual blacknose dace (*Rhinichthys atratulus*); Influence of swimming ability and environmental history." Environmental Biology of Fish.

Vandamm J.P., S. Marras G. Claireaux, C.A. Handelsman & Jay A. Nelson. In press. "Acceleration performance of individual European sea bass, *Dicentrarchus labrax* measured with a sprint performance chamber: comparison with high-speed cinematography and correlates with ecological performance." Physiological and Biochemical Zoology.

Joel Snodgrass and students published two papers:

Dobbs, E.K., M.G. Brown, J.W. Snodgrass, and D.R. Ownby. 2012. "Salt toxicity to treefrogs (*Hyla chrysoscelis*) depends on depth." Herpetologica 68:22-30.

Brown, M.G., E.K. Dobbs, J.W. Snodgrass, and D.R. Ownby. 2012. "Ameliorative effects of sodium chloride on acute copper toxicity among gray tree frog (*Hyla chrysoscelis*) and green frog (*Rana clamitans*) embryos." Environmental Toxicology and Chemistry 31:836-842.

Presentations

Harald Beck coauthored a poster at the Annual Meeting of the Association of American Geographers in New York, and presented a poster at the International Union for Conservation of Nature, Species Survival Commission (SSC) Chair's Meeting in Abu Dhabi, UAE. Harald co-chairs the SSC peccary group.

Cindy Ghent presented a workshop entitled "Technology in a Bag" at the MAEOE Conference in February 2012.

Sarah Haines and Bob Blake (Elementary Education) conducted a professional development workshop for grades 1-8 teachers at Wicomico Day School, Salisbury, MD. The focus of the workshop was outdoor science. Sarah also conducted a weekend-long Project Learning Tree facilitator workshop at the Washington County Outdoor School February 25-26. Former Congressman Wayne Gilchrest was a participant.

Sarah Haines, Cindy Ghent, and undergraduate student Katie Dell presented "An Evaluation of the Maryland Green Schools Program" at the Maryland Association for Environmental & Outdoor Education's annual conference held in Ocean City, MD, February 9-12.

Journal and Reviewing Activity

Harald Beck reviewed a manuscript for PLoS ONE.

Sarah Haines reviewed a manuscript for the Journal of College Science Teaching, and she reviewed thirteen children's trade books in a series for the National Science Teacher's Association's trade book service NSTA Recommends.

Meghan May reviewed manuscripts for Applied and Environmental Microbiology, Journal of Bacteriology, and Avian Pathology.

Jay Nelson reviewed manuscripts for Journal of Comparative Physiology – B, Oikos, and Physiological and Biochemical Zoology.

Joel Snodgrass reviewed papers for Ecological Engineering and Landscape and Urban Planning.

Community Outreach

Harald Beck, Roland Roberts, and Paporn Thebpanya (Geography Department) started a new long-term enclosure experiment on the effect of mammals on the wetland plant community at Eden Mill Nature Center. This project involves several TU undergraduate students and also functions as an outreach project for the local community.

Other Activities

Sarah Haines was appointed Vice Chair of the Accreditation Board for the North American Association for Environmental Education

Towson University's Upsilon Eta Chapter has been extremely busy in the year of 2011. During the spring semester, our members joined other STEM organizations to take part in Towson's Relay for Life. We held a fall bake sale with baked goods, apple cider, festive gourds and hay bales, and pumpkin painting; all funds went toward Race for the Cure. Many of our members and their families participated in the 5k run/walk. As a Biological Honor Society, we take pride in making a difference in the local community. This year, we sponsored a road through Towson University's Adopt-a-Campus program and assisted low-income senior citizens through CHAI's Weatherization Day program. Our organization has gone beyond helping our local community by raising money for a small South African Animal Shelter. In addition to the many philanthropic activities that we were engaged in, we were able to hold student-faculty workshops and some fun opportunities for members, such as "Pizza and Professors," our 2nd Annual Biology BBQ, and a STEM Halloween Party. Perhaps the most exciting change in our chapter this past year is our growing number of new members and supporters. We inducted 43 new members between both semesters. Our chapter is continuing to expand thanks to the hard work of the officers, members, and faculty/community support.



The 2011-2012 Beta Beta Beta Officers along with Faculty Advisor at the Fall 2011 Induction Ceremony. Pictured from left to right: Jennifer Seluzicki, Rachel Hebert, Anastasia Handwerk, Emily Tyler, Giavanna Parmer, Robin Fencel, Whitney Wolfgang, and Dr. Matthew Hemm. (Not pictured is Officer Izzie Huetten-Arnizza)



DEPARTMENT OF CHEMISTRY

Publications

David Ownby coauthored two articles with Joel Snodgrass and their Summer 2011 REU students:

Brown, M.*, E. Dobbs*, J.W. Snodgrass, D.R. Ownby. "Ameliorative interactive effects of sodium chloride and copper on toxicity to Cope's Gray Tree Frog (*Hyla chrysoscelis*) and Green Frog (*Rana clamitans*) embryos." Environmental Toxicology and Chemistry. In Press. doi/10.1002/etc.1751

Dobbs, E.*, M. Brown*, J.W. Snodgrass, D.R. Ownby. 2012. "Dependence of salt toxicity to Cope's Gray Treefrog (*Hyla chrysoscelis*) on water depth." Herpetologica. 68(1):22-30.

Grants

Sonali Raje is PI on an MHEC-CPIP grant: Raje, S., Kaplan, G., Krach, M., Beeson, J. "Enhancement of College Preparation Skills and Application Process Awareness for W.E.B. Du Bois High School." \$110,595.

Richard Preisler and Sonali Raje submitted a proposal to USM for a Carnegie Course Redesign grant targeting CHEM 121 (Allied Health Chemistry Lecture I). \$37,000.

Honors Thesis Defense

Samantha Wood (faculty mentor: Tim Bruncker) defended her Department Honors Thesis on March 1. Her seminar was entitled "Synthesis of Chiral Tetradentate Amino Sulfoxide Ligands and their Ruthenium (II) Complexes."

Department Seminars

Dr. Jeffrey Winkler, University of Pennsylvania, presented a seminar entitled "Synthesis of Natural and Unnatural Products" on February 23.

Dr. Nicholas Deifel, Washington College, "Applying Supramolecular Chemistry to Uranium: Materials, Methods, and Motivations." February 6.

Dr. Kelly Elkins, Metropolitan State College of Denver, "Recovering Evidence from Crime Scenes," February 9.

Mr. Jack Hietpas, Syracuse University, "Detrital Mineral Microchemistry applied to Forensic Analysis," February 15.

Forensic Programs

Ellen Hondrogiannis presented a forensics lab to students from W.E.B. Dubois H.S. titled, "Using Science to Catch Criminals" on March 9. The experience was funded through Sonali Raje's MHEC-CPIP grant.

Mark Profili and four undergraduate members of the Forensic Science Student Organization attended the American Academy of Forensic Sciences Annual Meeting in Atlanta, GA in February. Mark manned a table for our Masters in Forensic Science program and distributed information packets to a large number of potential applicants.



DEPARTMENT OF COMPUTER AND INFORMATION SCIENCES

Publications and Presentations

Robert Hammell, along with two collaborators from the Army Research Laboratory, had their paper entitled “Capturing the Value of Information in Complex Military Environments: A Fuzzy-based Approach” accepted for publication and presentation at the 2012 IEEE International Conference on Fuzzy Systems. The conference will be held as part of the 2012 IEEE World Conference on Computational Intelligence, Brisbane, Australia, June 10-15.

At SIGCSE 2012, in Raleigh Durham, Blair Taylor chaired a special session, entitled “Teaching Secure Coding-Report from Summit on Education in Secure Software,” with Matt Bishop (UC Davis), Diana Burley (George Washington University), Steve Cooper (Stanford University), and Ron Dodge (United States Military Academy) and presented “Building Security In: Injecting Security throughout the Undergraduate Computing Curriculum” at the NSF Showcase.

At SITE 2012, in Austin, Texas, Blair Taylor presented “Using Security Injections to increase Security and Safety Awareness While Teaching Students to Use Technology” with Kara Nance (University of Alaska Fairbanks).

Jonathan Lazar, doctoral student Abiodun Olalere, and recent doctoral graduate (and now professor at Frostburg State U) Brian Wentz published a paper in the Journal of Usability Studies titled “Investigating the Accessibility and Usability of Job Application Web Sites for Blind Users.”

Jonathan Lazar, Brian Wentz and a team of 24 undergraduate researchers published a book chapter titled “Equal Access to Information? Evaluating the Accessibility of Public Library Websites in the State of Maryland” based on the March paper presentation at the Cambridge Workshop on Universal Access and Assistive Technology, in the book Designing Inclusive Systems: Designing Inclusion for Real-world Applications.

Jonathan Lazar, Suranjan Chakraborty, and undergraduate researchers Robert Weir, Bryan Sizemore, and Haley Henderson published a book chapter titled “Development and Evaluation of Sonified Weather Maps for Blind Users” based on the March paper presentation at the Cambridge Workshop On Universal Access and Assistive Technology, in the book Designing Inclusive Systems: Designing Inclusion for Real-world Applications.

Jonathan Lazar gave presentations about interface accessibility for people with disabilities to the following audiences:

- Brown Bag Series lecture on “Preventing Societal Discrimination: Accessible Web Design for People with Disabilities” at the Information Policy and Access Center at the University of Maryland, March 7.
- Guest lecture on “Blind Users and Screen Readers” to the Masters of Library Science course on Universal Usability at the University of Maryland, February 20.
- Testimony to the Health and Government Operations Committee in the Maryland House of Delegates, on Wednesday, February 15, related to House Bill 183 (about Internet Accessibility).
- Testimony to the Judicial Proceedings Committee in the Maryland State Senate, on Wednesday, February 15, related to Senate Bill 596 (about Internet Accessibility).

- "Evaluating the Accessibility of Public Library Homepages in the State of Maryland." Presentation at the Maryland Association of Public Library Administrators conference, January 27 in Arbutus, Maryland.
- Campus IT Accessibility: Creating a Campus-Wide Plan for Improvement." Presentation at the EDUCAUSE Mid-Atlantic Regional Conference, held January 12, in Baltimore, Maryland.

Marius Zimand has presented the paper "Symmetry of information: a closer look" at the International Workshop on Theoretical Computer Science 2012, Auckland, New Zealand, Feb. 21- 24.

<http://www.cs.auckland.ac.nz/research/conferences/wtcs2012/>

The paper "Several Remarks on Index Generation Functions" by D. Simovici (U. Massachusetts, Boston) , M. Zimand and D. Pletea (U. Massachusetts Boston) has been accepted at IEEE 42nd International Symposium on Multiple-Valued Logic, ISMVL-2012: May 14-16, Victoria, BC, Canada <http://ismvl.cs.uvic.ca/>

Subrata Acharya had a book chapter published, "Accelerating Firewalls: Tools, Techniques and Metrics for Optimizing Distributed Enterprise Firewalls," 2012, in the Handbook of Optimization, Series: Intelligent Systems, by Springer, Editors: Ivan Zelinka, Vaclav Snasel & Ajith Abraham.

Service to the Discipline

Dr. Alfreda Dudley served as a Judge at the 2012 Baltimore City-Western High VEX Robotics Invitational on February 25. The tournament was held at Western High School, Baltimore, MD.

Dr. Subrata Acharya and Dr. Alfreda Dudley represented Towson University and the Department of Computer and Information Sciences at the 2012 CYBERWATCH MID-ATLANTIC COLLEGIATE CYBER DEFENSE COMPETITION held on March 17 at The Johns Hopkins University Applied Physics Lab – Kossiakoff Center.

Jonathan Lazar was named an Associate Program Chair of the ACM Conference on Assistive Technologies (ASSETS), to be held October 2012 in Boulder, Colorado.

Grants & Awards

Jonathan Lazar was awarded a \$60,000 grant from the American Library Association for the project entitled "Libraries and E-government: New Partnerships for Public Service."

Announcements

The new textbook The UX Book: Process and Guidelines for Ensuring a Quality User Experience published by Morgan Kaufmann Publishers featured a three page interview with Jonathan Lazar about the topic of Web Accessibility.



DEPARTMENT OF MATHEMATICS

Papers Published or Accepted for Publication

Mr. Nick Fout, Ms. Sarah Kutzberger, Ms. Lauren Lotz, and Ms. Jenn Marker's paper "Taxicab Travel: Mathematically Touring Baltimore" on unusual ways to motivate discovery learning in secondary mathematics classrooms, including creating live mummies with paper covered students to find the volume of three dimensional shapes, and using taxicab geometry to find a hidden treasure at the Poe museum, was accepted for publication by the Ohio Journal. The 2011 Towson University Honors College graduates worked with Dr. Gail Kaplan for over two years creating, testing, and writing this material.

Russell Hendel's paper, "An 'Odd' Equality," was published in the Fibonacci Quarterly, Vol. 80, Number 1, Feb 2012, pp 84-85.

Angel Kumchev's paper "On the convergence of some alternating series" was accepted for publication by the Ramanujan Journal.

Mircea Voisei's paper "Characterizations and continuity properties for maximal monotone operators with non-empty domain interior" was accepted and published in the Journal of of Mathematical Analysis and Applications, Volume 391, (2012), pp. 119–138.

Workshops

Gail Kaplan led a professional development workshop for Advanced Placement Calculus teachers to enhance student centered classrooms in Timonium under the auspices of the College Board on March 8.

Refereeing, Reviewing and Panel Service

Raouf Boules participated in the 2012 NASA Scholarship Program Panel Review that took place on February 24 in Arlington, VA.

Raouf Boules refereed a paper for the Journal of Excellence in College Teaching in February 2012.

Russell Hendel's review of Peter Caithamer's book, "Probability, Statistics and Financial Mathematics," was accepted and will appear in UMAP, the Journal of Undergraduate Mathematics and Applications published by COMAP the Consortium of Mathematics and Applications.

Russell Hendel reviewed a paper for UMAP, the Journal of Undergraduate Mathematics and Applications published by COMAP the Consortium of Mathematics and Applications.

Jay Zimmerman refereed four papers as part of the Program Committee for the Bridges Conference which will be held at Towson University in July 2012.

Miscellaneous Professional Activities

Lisa Antonious and Rebecca Sewell, teachers-in-residence at Towson University, led a presentation on using foldables in the elementary math classroom for students in Ming Tomayko's Elementary Math Methods course on March 12. The students saw numerous examples of how to use foldables effectively in the classroom and had the opportunity to make many different types of foldables.



Doris Cowl, Director of the America Counts tutoring program and adjunct faculty in the Department of Mathematics, was asked to be the judge for Math Jeopardy at Guilford Elementary/Middle School on January 25. Each grade from first through eighth had four students compete while all the students in the grade observed. Pictured are the student winners of the sixth, seventh, and eighth grade competitions.

Russell Hendel is a member of the Society of Actuary “End of Life” committee. The committee reviews the deliverables of the “End of Life” project, whose goal is to gather literature references on all facets of “End of life” issues. Russell is also a member of the Society of Actuary MLC exam committee. Committee members are currently preparing for the June 2012 meeting. The committee meets twice a year and is part of the process that designs the MLC actuarial exam.

Gail Kaplan proposed a STEM AP Conference for the middle states region at the last Advisory Council meeting of the College Board Middle States Region. The College Board is now seriously considering such a conference for 2012 – 2013. Dr. Kaplan joined senior staff members from the College Board to visit a specialty conference on mathematics held in the Dallas area to observe how to enhance their concept to include other STEM disciplines.

As College Level Representative for the MD Council of Teachers of Mathematics, Ming Tomayko organized a workshop for 18 higher education faculty from across the state of Maryland. The workshop was held on Saturday February 25 in the 7800 York Road building and gave participants a chance to learn more about the Common Core Curriculum and technological initiatives related to the implementation of the new curriculum. Also in attendance were Judy Macks and Felice Shore from the Department of Mathematics.

Student Club

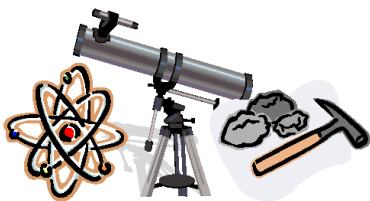
On March 14, the Mathematics Club hosted a visit by recruiters from the National Security Agency (NSA). The recruiters gave two presentations on the employment and internship opportunities at the NSA. They also took part in the Club’s Pi(e) Day celebration.

Mathematics Department Colloquia Seminars and Talks

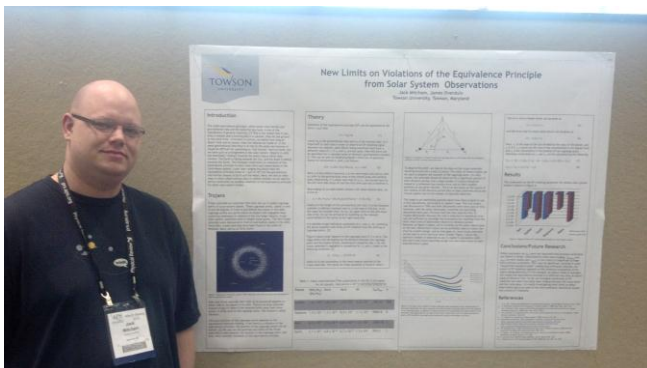
On Thursday, March 29, Dr. Joshua Lansky of American University will present a colloquium entitled “Finite Reductive Groups: Representations and Liftings.”

On Thursday, April 5, Dr. Thomas Seidman of the University of Maryland, Baltimore County will present a colloquium entitled “The Existence of Periodic Solutions of Hybrid Dynamical Systems.”

Both colloquium talks will be held from 4:00-5:00 in YR7800 Room 320, with refreshments preceding the talk at 3:30 pm.

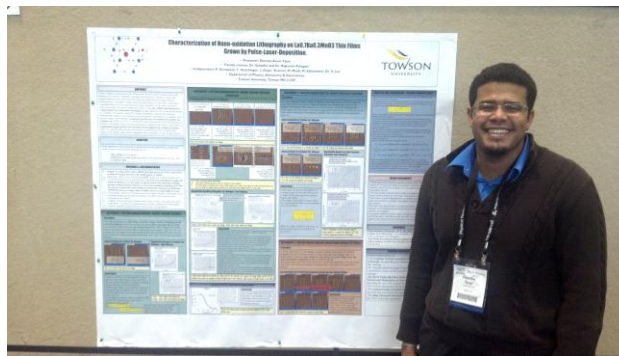


DEPARTMENT OF PHYSICS, ASTRONOMY & GEOSCIENCES



Jack Mitcham displays his poster presented at the 2012 APS March Meeting. Jack is an undergraduate student working under the supervision of Dr. James Overduin.

Kevin Tanyi, a graduate student in the PSM program in Applied Physics, displays his poster presented at the 2012 APS March Meeting. Kevin's work is supervised by Dr. David Schaefer and Dr. Raj Kolagani.



Proposals

On March 5, Dr. Lottero-Perdue (PI) and co-PIs Drs. Bamberger (Mathematics), Haines (Biological Sciences) and Blake (Elementary Education) submitted a proposal in response to the Maryland State Department of Education RFP: "Elementary STEM Certification." Their proposal was entitled "Hub, Spoke & Capstone: A TU Integrated Elementary STEM Endorsement for Practicing Teachers."

Dr. Steve Lev, Dr. Ryan Casey, Dr. David Ownby, and Dr. Jeffrey Simpson submitted a proposal to the National Science Foundation CBET division entitled "Determination of uptake and elimination rates for isotopically enriched ZnO nanoparticles by Eisenia Fetida and the Potential for Trophic Transfer." The proposal requested funds of \$130,970 for two years.

Publications

V.N. Smolyaninova, G. Yong, Rajeswari M. Kolagani, Amlan Biswas, H.K. Ermer,** K. Wang,* and A. Piazza,* "Large photoinduced conductivity reduction in thin films of metallic ferromagnetic manganites," Applied Physics Letters 99, 222507 (2011). (* - undergraduate student co-author; ** - graduate student co-author)

V.N. Smolyaninova, I.I. Smolyaninov, A.V. Kildishev and V.M. Shalaev, "Trapped rainbow techniques for spectroscopy on a chip and fluorescence enhancement," Applied Physics B (2012) (DOI) 10.1007/s00340-011-4856-x

Miranda, R.J., & Hermann, R.S. (2012). "An integrated instructional approach to facilitate inquiry in the classroom." Science Scope, 35 (8), 66-72.

Dr. Rommel Miranda's research paper entitled, "Urban high school teachers' beliefs of essential science teaching dispositions," was accepted for publication in the National Science Education Leadership Association (NESLA) research journal, The Science Educator.

Hermann, R.S. (In Review). "High school biology teachers' views on teaching evolution." Journal of Science Teacher Education.

Hermann, R.S. (In Review). "A worldview theory approach to exploring factors influencing high school biology students' understanding evolution." Journal of Research in Science Teaching.

Hermann, R.S. and Miranda, R.J. (In Review). "Embedding vocabulary in an inquiry-based lesson on stratigraphic principles." The Science Teacher.

Dr. Cody Sandifer and Dr. Eric Brew (Florida International University) have been selected to be co-editors of a Best Practices in Physics Teacher Education book sponsored by the Physics Teacher Education Coalition, the American Physical Society, and the American Association of Physics Teachers. The book's expected publication date is 2015.

Joel Moore had a manuscript accepted for publication in Geochimica et Cosmochimica Acta: Moore, Lichtner, White, and Brantley, "Using a reactive transport model to elucidate differences between laboratory and field mineral dissolution rates in regolith profiles."

Presentations and Abstracts

On Feb 3-4, Dr. Cody Sandifer and Mr. Jim Selway attended the Physics Teacher Education Coalition (PhysTEC) Conference in Ontario, California. The conference had strands on learning assistants, induction and mentoring, building physics teacher education programs, and recruiting physics teachers. Jim co-presented a seminar on “How to Help the Isolated Physics Teacher.”

On March 1, Dr. Lottero-Perdue was invited to present her experiences, research, and insights regarding Engineering in Elementary (EiE) at the Delaware Science Coalition meeting. Science leaders from across the state of Delaware were present.

On March 3, Dr. Lottero-Perdue presented at the TU Women in Science symposium. Her talk was entitled: “A non-traditional STEM career pathway: Developing engineering education for elementary teachers and students.”

Lottero-Perdue, P.S. (2012). “Handheld digital video cameras as a means to support engineering instruction.” Accepted for publication in the peer-reviewed proceedings of the American Society for Engineering Education.

Tyler Goehringer, (physics major), presented a talk at the SPS undergraduate research session titled “Magnetoresistance of Strained Rare Earth Manganese Oxide Thin Films: Effect of Post-Deposition Thermal Treatment” Authors: Tyler Goehringer, Parul Srivastava, E. Kevin Tanyi, David Schaefer, Rajeswari Kolagani (Research Mentor).

Parul Srivastava (Applied Physics Masters Student) presented a talk entitled “Role of Interface Transport in the Magnetoresistance of Strained Rare Earth Manganite Thin Films.” Authors: Parul Srivastava, Tyler Goehringer, Cacie Hart, Gilles Dongmo-Momo, Ekembu Kevin Tanyi, Grace Yong, Vera Smolyaninova, David Schaefer, Rajeswari Kolagani (Research Mentor).

E. Kevin Tanyi (Applied Physics Masters Student), presented a poster entitled “Characterization of Nano-oxidation Lithography on $\text{La}_{0.7}\text{Ba}_{0.3}\text{MnO}_3$ Thin Films Grown by Pulsed-Laser-Deposition.” Authors: Ekembu Kevin Tanyi, David Schaefer (Research Mentor), Rajeswari Kolagani and Parul Srivastava.

Grace Yong presented a poster titled “Investigation of Un-reacted, Multi-phase, Solution Derived Targets for Pulse Laser Deposition (PLD) of High T_c Superconducting $\text{Y}_2\text{Ba}_4\text{Cu}_8\text{O}_{16}$ (Y248) In-Situ, Epitaxial Thin Films.” Authors: Grace Yong, Rodney Dixon, Stephen Monk, Vera Smolyaninova and Rajeswari Kolagani.

Jack Mitcham presented a poster on “New limits on violations of the equivalence principle from solar system observations” Authors: Jack Mitcham and James Overduin (Research Mentor).

Dr. Jia-An Yan presented a talk with title of “Field effects on the optical vibrations in bilayer grapheme” at the 2012 APS March meeting in Boston.

Dr. Alex Storrs presented a poster titled “A Reevaluation of the Hubble Space Telescope Spectra of the Impact of the LCROSS Satellite with the Moon” at the 219th meeting of the American Astronomical Society in Austin TX. This was coauthored with TU student Ludovic Guillou.

Community Engagement and Professional Service

Vera Smolyaninova reviewed a paper for Physical Review B, a paper for Optics Letters, and two papers for Journal of Optical Society of America B.

Vera Smolyaninova served on an NSF panel.

Dr. Rommel Miranda presented portable planetarium shows to 100 students (grade 6-8) at the Friendship Academy of Science and Technology, and 100 students (grades K-1) at St. Joseph School in Cockeysville.

Dr. Rommel Miranda facilitated an Egg Drop/Momentum Lab with two classes of high school students from W.E.B. Dubois at Towson University.

Ron Hermann reviewed the manuscript of a chapter to be included in the International Handbook of Research in History and Philosophy for Science and Mathematics Education to be published by Springer in 2013.

Dr. Asli Sezen was appointed as co-coordinator of Strand 7: Pre-service Science Teacher Education for the Programming Committee of the National Association for Research in Science Teaching (NARST). The appointment is for two years, from 2012-2014.

On February 22, Jennifer Scott gave presentations to second, third, and fourth graders at Krieger Schechter Day School using Towson's portable planetarium.

Dr. David Schaefer presented a "Physics Magic Show" to 63 fifth graders at the Johns Hopkins Basic Biomedical Building – Mountcastle Auditorium as part of the Hopkins Basic Science Day activities. The show was given on Thursday, March 8.

On Saturday, February 25, Dr. Lottero-Perdue, Dr. Mary Stapleton and Ms. Natalie Dussourd co-hosted KidWind professional development (PD) at the TU Center for STEM Excellence in Columbus Center, Inner Harbor. The PD was led by Joe Rand of KidWind and Kristen Graf of Women of Wind Energy, and provided to approximately 30 teachers within and beyond the Baltimore metropolitan area. Teachers learned about wind turbines, designed their own blades for a model turbine, and then tested the electrical output for those model turbines. There will be a KidWind competition for 30 teams of middle/high school students in the Baltimore Area at the TU University Union on May 19.

Dr. Jia-An Yan reviewed a manuscript for the Physical Review Letters.

The monthly planetarium shows continue to be well attended. Recent Shows include:

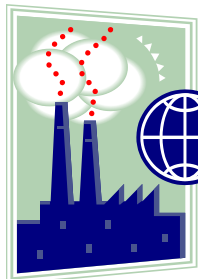
Date	Name	Presenter
November	The Big Bang	Dr. James Overduin
December	What Was the Christmas Star	Dr. Alex Storrs (two shows)
January	Stars Over Dineh Bike'yah	Dr. Alex Storrs
February	Mars Attacks	Dr. Alex Storrs
March	Space Invaders	Mr. Brian Eney

Additionally, the planetarium hosted the President's Council on Dec. 8, the KIPP Harmony Academy on Dec. 2, the Monessori School on Jan. 21, and continues to be used by several classes each semester.

Student Awards

The following students were accepted into NSF-Sponsored Research Experiences for Undergraduate programs for the Summer of 2012:

Chris Thibodeau – National Radio Astronomy Observatory
Gilles Dongmo Momo – MIT REU Program
Zoey Warecki – Cornell University REU Program



ENVIRONMENTAL SCIENCE AND STUDIES PROGRAM

On April 23 Towson University will be holding its 4th Annual Environmental Conference called 'Envirofest' this year in the West Village Commons. The conference is co-sponsored by Environmental Science and Studies. It is organized by the Environmental Initiatives Subcommittee of which Dr. Jane Wolfson is the chair and the Office of Civic Engagement.

Dr. Jane Wolfson will be participating in a panel presentation at a forthcoming NSF STEP grant meeting in which she will be reporting on the successful strategies deployed by the TOPS program [Towson Opportunity in STEM]. Her panel is addressing "Improving Student Success in Foundational Courses in the Sciences."



MOLECULAR BIOLOGY, BIOCHEMISTRY BIOINFORMATICS (MB3) PROGRAM

On Friday, February 17, the MB3 club seminar series resumed. Dr. Elana Ehrlich, a new faculty member in Biology this year, spoke about her research. The title of her presentation was “The Cullin5-Ring E3 Ubiquitin Ligase is Involved in HSP90 Client Protein Degradation; Implications in Cancer Biology.”

On Friday March 2, the speaker was an MB3 student, Ms. Shoshanna Oberstein. The title of her presentation was “Where the mouse stores all that ‘junk’ and why it’s really gold: Detecting repetitive element expression in the mouse transcriptome.”

On March 16, the series continued with another student presentation. Kenneth Harris presented his research entitled “Ino80’s genetic relationship with Asf1.”



SCHOOL OF EMERGING TECHNOLOGIES

The School of Emerging Technologies worked with Mike McGuire and Subrata Acharya from the Computer Science Department and with Lakota TSI Inc. on a joint proposal to NIST entitled “Mobile Environment for Online Access to Electronic Medical Records and Geo-Spatial Situation Data for First Responders.”

The School of Emerging Technologies continues to work with the Towson University Cyber Defense team. The Towson team won the 2012 Mid-Atlantic Collegiate Cyber Defense Competition, beating out 24 other schools from Pennsylvania through North Carolina. The team will be heading off to the National Competition in San Antonio in April.

Together with the Department of Computer and Information Sciences, the School co-sponsored the workshop “Introduction to Mobile Development with PhoneGap” by Andrew Trice of Adobe. More than fifty students attended.



THE STEM EDUCATION CENTER

We are now **The STEM Education Center** (formerly The Center for Science and Mathematics Education) expanding our development of teaching and assessment skills of our graduate students and community outreach under the leadership of Drs. Sarah Haines and Linda Cooper.

NSF Saturday Workshop, January 28th:

For the current academic year, the NSF grant participating teachers were provided the opportunity to designate their Saturday workshop topic preferences. The January workshop focused on Environmental Justice. The morning session featured a “Baltimore Toxics” tour of east Baltimore. Baltimore environmental activist, Mr. Glenn Ross, led a Baltimore Toxics Bus Tour of east Baltimore toxic environmental sites. The afternoon session led by Dr. Ali Whitmer, Associate Dean at Georgetown University, taught the participants about Baltimore’s distribution of environmental advantages (access to parks) and disadvantages (proximity to a toxic release inventory sites) and how the concentration of either

could depend upon the neighborhood's socio-economic status. Dr. Whitmer engaged the teacher's with a game called "Whose Resource is it anyway?" to foster discussion of equitable distribution of environmental resources; what constitutes "equitable distribution" and problems of achieving this distribution among today's population and future generations.

Math/Science Partnership Santa Barbara Winter Meeting, Feb. 8-10: G6-12 Fellows and graduate students, Julie Baynard, Natalie Mollett, and Tammy Newcomer, accompanied Mary Hardcastle from Parks & People, to attend the February BSF Pathways Math and Science Partnership Winter Professional Development Meeting in Santa Barbara, CA. They focused on ways to enhance professional development in culturally relevant ecology, learning progressions and environmental literacy.

Maryland Association for Environmental & Outdoor Education conference, Feb. 11:

Baltimore Partnership for Environmental Literacy (BPESL) G6-12 Fellow, Tammy Newcomer, and Dunbar AP Environmental Science Teacher, Shan Rajendran presented an "Investigating Local Water Conductivity," workshop at the MAEOE Annual meeting in Ocean City, MD. Shan Rajendran has participated in the Math & Science Partnership Project for two years - as both a Summer Institute participant and as a Research Experiences for Teachers (RET) Fellow. In this workshop environmental educators learned innovative ways for students to investigate local water quality with conductivity probes. Conductivity is an important indicator of pollution from road salt, sewage, and fertilizer. Participants tested this indicator in water samples from urban and forested streams near Towson and ocean water from Ocean City. They further used probes to investigate the effects of man-made and natural substances on groundwater quality.

Science Works, Feb. 16:

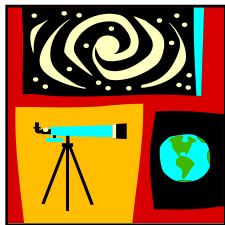
On February 16, graduate students Tammy Newcomer and Natalie Mollett gave a presentation based on the Plant Growth curriculum developed under STEM Education Center's NSF project to Science Works (a professional development program for Baltimore Science teachers learning community), at Baltimore Polytechnic Institute. Ten high school science teachers were exposed to Vernier Labquest and probe gear and how these tools can be used in the classroom to measure carbon dioxide and oxygen gas production in plants. We enjoyed sharing the activities and equipment with these teachers and hope they will be able to incorporate similar real-life experiments into their classes. We would like to thank Mrs. Susana Ibay, a Biology teacher at Frederick Douglass High School and grant participating teacher, for inviting us to this event. Through science teacher's participation in grant activities, Baltimore City Public Schools has many Labquest interfaces that are available for loan by teachers.

Learning is Fun, March 6:

Graduate Students, Julie Baynard and Natalie Mollett, accompanied Hereford Middle School teacher and grant participant, Wally Isham's eighth grade Environmental Science class to the Baltimore Zoo. A short presentation on climate change with a "show and tell" of two zoo inhabitants, preceded the tour of the zoo.

Project Learning Tree

Since January 1, five environmental education organizations have requested over 100 Project Learning Tree educational guides from the STEM Education Center for their use in spring workshops and ongoing teaching activities. We are very proud of this outreach effort and the fact that it is growing!



HACKERMAN ACADEMY OF MATHEMATICS AND SCIENCE

Saturday Morning Science at Towson University

The Hackerman Academy's Saturday Morning Science continued its spring 2012 series on February 4 with actor Bob Smith portraying Benjamin Banneker in a "living history" performance titled "The Life and Science of Benjamin Banneker." On February 18, Dr. Don Thomas presented a program on "Rovers on Mars" and on March 3 Craig Holcomb from the National Security Agency spoke on "The Science Behind Cyber Security." Total attendance for the first 5 programs this spring was 2,050.



Students from Southside Academy High School in Cherry Hill attended the Benjamin Banneker program on February 4, 2012 in Smith Hall. Following the program they toured some of the science labs and enjoyed a pizza lunch before returning home.

Cherry Hill Initiatives

Working with schools in the Cherry Hill neighborhood, the Hackerman Academy presented a number of outreach programs as follows:

Saturday Morning Science in Cherry Hill

As part of the new *Saturday Morning Science in Cherry Hill* series, 16 students from Southside Academy visited Towson University on March 4 to hear the presentation on Benjamin Banneker. Following the program, Dr. Roland Roberts and graduate student Matthew Hanson spent time with the students showing them the greenhouse and some of the reptile and insect collections. After a great morning visiting the Towson University campus, the students enjoyed a pizza lunch before returning home.

On February 11, Valerie Garcia from Wildlife Adventures presented a program titled "Wildlife on the Edge" at the Southside Academy. Following the program the students had the opportunity to see many of the animals up close in a special hands-on session.

The Noyce Scholars from the Fisher College volunteered to help out with the event and helped make it a memorable experience for all the young students participating.

On March 10, Mark Branch from the NASA Goddard Space Flight Center presented a program titled "Rapping with DJ Scientific" at Southside Academy. Following his presentation Ms. Trena Ferrel from the NASA education office led the students in a space-themed hands-on activity.

Cherry Hill School Visits

- 2/1 In conjunction with Julie Damico and the BEST Program, the Hackerman Academy visited New Era Academy and made three presentations on living and working in space to 50 chemistry and technology students in grades 10-12.
- 2/8 The Hackerman Academy visited Arundel Elementary/Middle School and made three presentations on living and working in space to 55 students in grades K, 4, and 6.
- 2/27 The Hackerman Academy visited New Era Academy and made three presentations on spacesuit technology to 50 chemistry and technology students in grades 10-12. During the visit 6 of the students were able to try on an actual Russian spacesuit.



Student from the New Era Academy tries on a Russian spacesuit during a visit by the Hackeman Academy on February 27.

3/5 The Hackerman Academy led an after-school STEM Club program on surface tension for ten students at New Era Academy

Outreach Activities

The Hackerman Academy visited the following schools, institutions, and community groups and made presentation on career planning, the Space Shuttle, and science in space reaching nearly 1,800 students, teachers, family members, seniors, and community leaders. School visits covered Baltimore City and Baltimore, Harford, Howard, and Anne Arundel counties illustrating the breadth of the outreach being done by the Hackerman Academy.

BEST Program School Visits

In conjunction with Julie Damico and the BEST Program, classroom visits were held at the following schools at the request of the current class of BEST teachers:

- 2/1 Three presentation on living and working in space to 50 high school students at the New Era Academy (Baltimore City).
- 2/28 Two presentations on space technology to 150 students in grades 9-12 at Joppatowne High School (Harford County).
- 3/6 Presentation on living and working in space to 300 students in grades 9-12 at Hammond High School (Howard County).

Additional School Visits

- 2/7 Presentation on living and working in space to 300 students in grades K-8 at Mountain Christian Elementary/Middle School (Harford County).
Four presentations on living and working in space to 125 students and parents at Halstead Academy (Baltimore County) as part of their first Family STEM Nights.
- 2/17 Presentation on living and working in space to 285 sixth graders and special needs students at Arbutus Middle School (Baltimore County).
- 2/23 Three presentations on living and working in space to 75 students and parents at Oliver Beach Elementary (Baltimore County) as part of their Family STEM Night.
- 3/5 Two presentations on the human body in space to 45 ninth grade students in the BioMed Allied Health magnet program at Glen Burnie High School (Anne Arundel County).
- 3/6 Two presentations on the human body in space to 45 ninth grade students in the BioMed Allied Health magnet program at Glen Burnie High School (Anne Arundel County).

- 3/7 Keynote presentation on the importance of STEM for 250 students and parents attending STEM Night at Cedarmere Elementary School (Baltimore County).
- 3/8 Invited presentation on living and working in space to 125 students at Bay Brooke Elementary (Baltimore City) as part of the USA Science & Engineering Festival's Nifty Fifty program.
- 3/9 Four presentations on living and working in space to 85 second graders from Waverly Elementary School that visited Towson University as part of the Howard County Public School's *College & Career Readiness Program*. Also assisting in the visit was Dr. Alex Storrs and the Noyce Scholars.

Hackerman Academy in the News

- 2/10 "Top of the Morning From Towson University" interview with astronauts Tom Jones, Mary Cleave and Don Thomas regarding STEM, Saturday Morning Science, and efforts to get more young students interested in careers in math and science. Public Access cable program broadcast on cable channels 75 and 99.
- 2/13 BCPS-TV interview for their "Around the County" program discussing the importance of inspiring young students to pursue careers in math and science. The program is posted at http://www.bcps.org/news/ed_channel/
- 2/22 "Space Night is out of this world at Halstead Academy" article in the Towson Times newspaper regarding their Family STEM night activities.
- 2/29 "Out-of-this –world experience at Halstead's Space Night" article in the Towson Times newspaper regarding their Family STEM Night.

"Space Night at Halstead Academy" picture featuring Hackerman Academy director Dr. Don Thomas during STEM Night program posted on the Spotlight website for the Baltimore County Public Schools.
- 3/10 "Taking science to the schools" online interview regarding Towson University's STEM outreach programs and the upcoming USA Science & Engineering Festival in Washington D.C. The interview is posted at: <http://www.baltimoresun.com/videogallery/68681578/News/Taking-science-to-the-schools#gl-2>

"Reach for the Stars" photograph in the Baltimore Sun Saturday March 10, 2012 regarding special program at Bay Brook Elementary/Middle School in Baltimore City.



MPIRE PROJECT

Project Description

Towson University (TU) and Baltimore City Public Schools (BCPS) are partnering in a Middle School Physics Instruction and Readiness (MPIRE) project to provide physics and physics pedagogy professional development for middle school science teachers. This project is being funded by a \$170,000 Maryland Higher Education Commission Improving Teacher Quality (ITQ) grant.

The project consists of five-day professional development (PD) institutes during two consecutive summers with PD meetings and co-planning/co-teaching support for teachers during the school year. A total of 98 hours of professional development will be provided to 24 teachers to improve physics content knowledge so that they will be better prepared to teach middle school physics.

Drs. Hermann and Sandifer serve as co-directors of the project and work directly with the BCPS science supervisor (Ekaterina Denisova) and middle school science coordinators. The physics content training is collaboratively planned by all project partners, and is connected to the Maryland State standards, the BCPS Scope and Sequence standards, and the Common Core mathematics and English-language literacy standards.

Training will be delivered by the nationally recognized Physics Teaching Resource Agents (PTRAs), the project directors, Dr. Robert Blake (from the College of Education), and BCPS personnel.

MPIRE Project: Spring 2012 Activities

Different activities from Towson's MPIRE project are highlighted each newsletter. In this edition, the Winter 2011-Spring 2012 project activities are described.

Winter 2011 and Spring 2012 Activities:

- A one-day Saturday follow-up session on lesson implementation and Newton's Laws was held for participating teachers in December.
- Mid-project assessments were completed, and a March interim report was submitted to the Maryland Higher Education Commission (MHEC).



ROBERT NOYCE SCHOLARSHIP PROGRAM

Preparing Tomorrow's Teachers Today!

The Robert Noyce Teacher Scholarship Program promotes professionalism among STEM teachers by providing substantial annual scholarships to students who are interested in becoming STEM teachers.

Teacher Preparation

During a Hackerman Academy event on March 9, the Noyce scholars conducted two hands-on activities for 85 second graders from Waverly Elementary. Adriana Brungardt, Brian Eney, and Sherry Leslie facilitated a hands-on activity involving Liquid Nitrogen, while Catherine Lorenzo and Taharah Shaw demonstrated an activity based on the importance of recycling. The Waverly Elementary students were divided into 4 groups of about 22 each and the groups were rotated through the activities.

The Liquid Nitrogen Activity: using liquid nitrogen, the scholars showed the children the properties of freezing gasses and liquids. They demonstrated what happens when bananas, balloons, and flowers are dipped into a container of liquid nitrogen.



The Recycling Activity: the Waverly students learned how to dispose of styrofoam. Extraction of polystyrene, a form of styrofoam, from the acetone solution allows the manufacture of new styrofoam and prevents used styrofoam from entering landfills.



Recruitment

We aim to produce outstanding STEM teachers and invite you to join us in achieving this goal. We are currently accepting applications by April 14 for our Fall 2012 to Spring 2013 academic year. You can visit our website at <http://www.towson.edu/fcsm/Noyce/> for more information.



PhysTEC – PHYSICS TEACHER EDUCATION COALITION

The Physics Teacher Education Coalition (PhysTEC) project is a nationwide project that has the mission of improving and promoting the education of future physics teachers. At each of the PhysTEC sites around the United States, physics faculty, education faculty, and a full-time teacher-in-residence (TIR) work together to improve secondary physics education programs.

Towson University's current PhysTEC project will run from 2010-2013. The project team consists of Dr. Ronald Hermann and Dr. Cody Sandifer, two full-time science education faculty in the Department of Physics, Astronomy & Geosciences (PAGS), and a full-time TIR. The 2011-2012 TIR is James (Jim) Selway, a former Baltimore County physics teacher of 30+ years.

At Towson, the PhysTEC project team is making a concerted effort to expose physics majors early in their academic career to (a) the possibility of teaching as a career and (b) actual teaching experiences at both the K-12 and university levels. This is being done through general advertising (posters, open meetings, classroom visits), school- and outreach-based early teaching courses (SCIE 170), and the STEM-TC learning assistant program.

Other efforts are geared towards helping our education majors develop a greater sense of belonging to an educational community. These efforts include the creation of a comprehensive physics education web site, the establishment of a new secondary STEM education club, formal and informal discussions with the physics TIR, and the funding of small grants that allow education majors to attend and present at NSTA and AAPT meetings.

Please visit the national and local web sites for more information about PhysTEC:

<http://www.phystec.org> (national)

PhysTEC Project: Spring 2012 Activities

Different activities from Towson's PhysTEC project are highlighted each newsletter. In this edition, Spring 2012 project activities are described.

- *SCIE 170C Outreach Course* – A new one-credit SCIE 170C early teaching course is being taught by Jim Selway, which puts our future physics teachers into local high school classrooms with practicing teachers. There are four secondary physics education majors in the course. Additionally, the course is intended to increase the communication and collaboration between local teachers and the university.
- *AAPT/PhySTEC Conference*- On Feb 3-4, Dr. Cody Sandifer and Mr. Jim Selway attended the Physics Teacher Education Coalition Conference in Ontario, California. The conference had strands on learning assistants, induction and mentoring, and building physics teacher education programs, and recruiting physics teachers. Jim co-presented a seminar on "How to Help the Isolated Physics Teacher".
- *Gateway Science Initiative Symposium at Johns Hopkins* – Jim Selway attended the symposium on teaching excellence in the sciences on January 20. It featured four nationally known educators, Jo Handelsman, David Botstein, Eric Mazur, and Freeman Hrabowski, and was held to generate ideas for Hopkins professors to improving their teaching methods in introductory courses. Jim scheduled a tour with Steve Ramesh, the director of their lab program, to observe several Johns Hopkins physics labs which are being transformed from traditional labs to inquiry based activities.
- *STEM page*- The PhysTEC project team is developing a STEM page for Towson's website that will give an overarching view of all TU STEM programs.
- *Baltimore County Physics Olympics* – Jim Selway attended the BCPS Physics Olympics, which included 150 of the top physics students in the Baltimore County schools. He gave a five-minute presentation on the value of becoming a physics teacher and the opportunities at Towson University. This was a wonderful opportunity to mingle with the Physics teachers and ask them to do their part in the recruitment of future physics teachers.
- *Math Support Group* – A group of five professors and nine learning assistants (LA's) met to discuss ways in which math support could be provided for students who are having difficulty in the entry level physics courses. Thirteen math skills were identified, and a self-evaluation math skills sheet was constructed. A tutoring schedule has been set up for students in need of help. Additionally, resource sheets for each skill are being developed to be placed on BlackBoard for access by students and LA's.



STEM Leaders

Penny Wars is in full swing. This year, the clubs are battling to donate the winnings to one of the following charities:

BBB - MD SPCA

Math Club – Kohl's Cares and local children

MB3 – Michael J. Fox Foundation for Parkinson's research

MSTC – Living Classrooms Foundation

WIS – House of Ruth

DONATE your pennies to add points to a club and donate your silver to subtract! The club with the winning point value donates all collected money to their charity.

Individual Club news:

The Math club celebrates pi day on 3/14 again this year and their Math Jeopardy was a great success.

MB3 continues with their seminar series and soon will have a representative from the UMD School of Pharmacy on campus for an information session.

MSTC has been busy tutoring and holding career and graduate information sessions.

WIS helped out at the annual WIS Forum, which was a great success again this year.

BBB will be having their annual Professors and Pizza event in early April.

Also – there are several STEM groups are teaming together to form “Science against Cancer” – for Relay for Life. MB3 also has a Relay for Life Team.



TOPS (Towson Opportunities in STEM)

Programming

February 14 three chemistry and computer information systems students were invited to receive a tour of the Northrup-Grumman BWI Manufacturing Facility. This trip was sponsored but the Northrup-Grumman Women Engineers Group.

The TOPS freshman cohort attended the Women in Science Forum held on Saturday, March 3. Many students appreciated the information they gained on potential pathways to careers in STEM along with the perspective on varied experiences.

COSC, IS, and IT majors attended the Hackerman Academy Talk on the Science of Cyber Security on March 3.

Residential Learning Community

February 24 the informal, “Meet the faculty” seminar series continued with a talk from Dr. Blair Taylor (COSC). These seminars allow TOPS students to meet faculty members from STEM-related disciplines and gain insight into how they became interested in their fields, what their research interests are, and the exciting things that are happening in their content areas. Dr. Taylor differentiated between software security and secure software while providing contemporary, real world, examples.

Outreach

Working with BEST Teacher Matthew Doty, Annie McMahon presented a full day of college access workshops at the Crossroads Center in White Marsh. This was followed on February 17 with a trip to Towson’s campus for the same students Annie worked with the day before. During this trip, the group of 45 high school freshmen visited the planetarium and met with a panel of TOPS students.

The afterschool enrichment program at Northwood-Appold Community Academy (NACA) continued as TOPS, MSTC, and NSCS students worked with 18 middle school students to prepare for the math and science portions of the MSA (Maryland School Assessment).

Annie McMahon gave an invited workshop titled “Introverts, Extroverts, and Dominant Culture” to the Northrup-Grumman Women Engineers Group on February 14. All participants were actively engaged as they determined their personality types and how that influenced their interaction with others in the workplace.

Research

Aqsa Jamil will participate in a ten week research program in Molecular Biology at the Hopkins Bloomberg School this summer.