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## EREF Fall Classic Golf Tournament Raises More than \$270,000!

Members of the waste industry gathered at the historic Pinehurst resort for the 2011 EREF Fall Classic Golf Tournament on October 13, 2011. Thirty-three foursomes dominated the course on a beautiful North Carolina day. Players and sponsors mingled at an evening reception prior to the tournament, where veteran players reunited with each other and first time players were welcomed. Many thanks to all participants and sponsors for contributing to the success of this event – the foundation's second largest Golf Tournament in history – and for helping to further EREF's goal of improving solid waste management practices through research and education.

*(continued on page 4)*



*Congratulations to the 2011 EREF Fall Classic Champions! (L to R) Allison Lang (Republic Services), Michael Toppi (Aspen Specialty), Mathew Raino (Aspen Specialty), Jamey Amick (Republic Services)*

## Plan Now to Donate to the 2012 Auction



Held in conjunction with WasteExpo, the EREF Equipment Auction is the foundation's largest fundraiser. The auction is a direct result of the generosity of members of WASTEC and NSWMA, who donate the items that so far have raised more than \$12 million to benefit EREF.

### Make the EREF Auction Part of Your WasteExpo Success Story!

The Silent Auction provides a novel way for donors to increase their booth traffic. WasteExpo attendees can bid on silent auction items as they visit participating booths in the Exhibit Hall on Tuesday. On Wednesday bid sheets are moved to the EREF booth and bidding will continue until just before the Live Auction begins.



The Live Auction is an exhilarating event! Everyone gathers at the EREF booth to enjoy food, drinks and fellowship during the Auction Reception. An Auctioneer keeps the audience members on their feet as he auctions off the donated items, which typically include trucks, compactors, balers, trips and specialty event tickets. *(continued on page 5)*

## CHAIRMAN'S MESSAGE

Recently the United Nations announced that the world's population has topped 7 billion. With another 1.5 billion people expected to join us by 2030, sustainable production and consumption will be more important than ever and will have a huge impact on the waste industry. While the economic crisis will push volumes to go down, our clients will at the same time expect us to help them achieve their environmental performance and resource efficiency goals.



A good example of what might come next is Europe 2020 – a 10-year strategy proposed by the European Commission for reviving the economy of the European Union (EU). It aims at “smart, sustainable, inclusive growth” with greater coordination of national and European policy and its flagship initiative supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth. In mid-September policy was proposed that includes, among other guidelines dedicated to waste, further support for recycling in the EU and, for the first time, fixation of targets and incentives to incorporate recycled materials into products. This, with increased pressure from emerging economies on certain raw materials demand, should further push material and energy recovery.

And, this trend is going to grow in the U.S. market as well.

Our industry has a unique opportunity to influence policy through EREF. EREF's 501(c)3 non-profit status means that it is prohibited from lobbying and must provide objective, nonbiased research. Thus, grants awarded by EREF are from an independent funding source, which gives greater credibility to the research than if funded directly by a corporate sponsor. Additionally, all proposals undergo a robust technical review process before being awarded, ensuring the project yields quality, dependable results.

Earlier this year EREF introduced its Regional Summit on Sustainable Solid Waste Management Practices, and held two successful Summits – one in Indianapolis focused on aluminum waste and bioreactor landfills, and one in Raleigh focused on landfill gas to energy. The purpose of the Regional Summits is to provide a forum through which EREF can broaden its educational reach to the industry and disseminate the wealth of information it develops. Registration for regulators was free of charge, making it possible for those who work for agencies with little to no travel budget the ability to attend and learn from some of the industry's foremost research experts. See page 8 for more information.

EREF is lighting a path for our industry to educate others and influence policy.

Sincerely,

A handwritten signature in blue ink, appearing to read "H. Saint Bris".

Henry Saint Bris  
Senior Vice President of Strategy, Suez Environnement  
Chairman, EREF Board of Directors

### Check Out EREF's New Video!

EREF has produced a short video designed to educate industry members, as well as the general public, about EREF's mission and to show how we are funding and directing scientific research and educational initiatives.

[Click here](#) or go to YouTube.com and search for “Environmental Research & Education Foundation” to view the video.



## PRESIDENT'S MESSAGE

Dear Friends and Colleagues,

It has been roughly a year since EREF began implementing a new long-term strategic plan that emphasizes increased communications and better dissemination of the great work that EREF funds and conducts. In 2011 the foundation more than tripled its communication efforts, funded nearly \$432,000 in new research grants, awarded four new scholars and initiated an intern program. This success was possible in large part to the support of EREF stakeholders and volunteers. The 2011 Charitable Equipment Auction held at WasteExpo in Dallas, TX raised nearly \$1.1 million and was the 3rd largest in EREF auction history. Our Fall Classic Golf Tournament, held this past October in Pinehurst, NC was the 2nd highest ever for the foundation. Thank you to everyone who participated in these events.

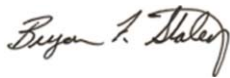


As we venture into the New Year the one thing that is certain is that the face of how solid waste is managed continues to change. New technologies are being developed and existing technologies are being improved. The recycling and organics diversion market segments continue to expand and interest in alternative technologies is high. While EREF has historically funded research to advance the direction the industry is headed in, we have also begun aggregating industry data (a need that is consistently mentioned) to help the industry know where we've been and where we are, which helps us know where we may be going. We will also be supporting the industry via increased educational efforts.

As part of this work, we hope to expand the silent auction component of the charitable auction that will be held at the 2012 Waste Expo in Las Vegas. If you did not participate in 2011, we invite you to consider doing so this year! For those of you interested in the technical side of the industry, in addition to Regional Summits that EREF will offer, the 3rd Global Waste Management Symposium will be held in the fall ([www.wastesymposium.com](http://www.wastesymposium.com)). Plans are currently underway to select a location for our fall golf tournament as well, which will be held at a great destination golf course.

The future of the industry is now, and I invite you to join us in advancing how solid waste is managed. Help guide the foundation to be one of the voices that helps make others aware that this industry is not a separate corporate entity, but is woven into the fabric of our society. Thanks again for your support of the foundation, and I wish you a happy, healthy and successful 2012!

Kind regards,



Bryan F. Staley, Ph.D., P.E.  
EREF President and Chief Executive Officer

## HONORARIUMS & MEMORIALS

EREF honorariums and memorials are the perfect way to celebrate and remember your fellow industry members and loved ones. Visit <http://erefdn.org/index.php/giving/index> for more information.

\*Donations are tax deductible to the extent allowed by law.

*In honor of Republic Services – in particular the team in the Ft. Wayne, Indiana area – for its efforts on waste and recycling programs. – Wastequip*

*In memory of our dad, Don Dick, who was a strong advocate for education and research. – Robert and April Dick*

## Thank You to All Our Sponsors!

### Event Co-Sponsors

Bloody Mary Bar



Putting Contest  
**Curotto-Can**  
THE FUTURE OF AUTOMATED COLLECTION

"Nite Lite"  
Putting Contest



Hole Signs



Breakfast



Welcome Bags



Holes



Golf Favors



Golf Carts



Hole-in-One Insurance  
Goody Bags



Golf Balls



Welcome Reception



Beverage Carts



Driving Range



Coolers



Shirts



Golf Towels



Cigars



Second Place Team (L to R) Dan DeArment (LFG Specialties), Jeff Palutis (IESI/Progressive Waste Solutions), Kris Carlson (Carlson Environmental Consultants), Steve Martin (SHAW Environmental & Infrastructure Group)



Ron McCracken presented 50/50 Raffle winner Scott Dols with his winnings – which he graciously donated back to EREF



(left) Tournament Co-Sponsors Ven Poole (Waste Industries) and Kevin Walbridge (Republic Services)



(right) Junior Thompson prepares for a great day on the golf course



*Jim Long (Veolia Environmental Services) takes his shot in the putting contest.*



*Bob McHugh (Environmental Solutions Group), Rita Ugianskis (WasteExpo/Waste Age), Eric Evans (Environmental Solutions Group), Robert Mecchi (Big Truck Rental), Sean O'Brian (O'Brian Tarping), Bill Wilkerson (Marathon Equipment)*



*Tom Boettler (KRD Trucking), Tom Manzke (KRD Trucking), Jim Cowhey (Land-and-Lakes), Ken Andresen (KRD Trucking), John McGee (KRD Trucking), Steve Zeilstra (KRD Trucking)*



*The networking opportunities offered by the EREF Golf Tournament are unparalleled.*



*Ian Mearns (Comerica), Ron Mittelstaedt (Waste Connections), Eric Hansen (Waste Connections), Michael Schmidt (Comerica)*

*Donate to the 2012 Auction (continued from cover)*

All proceeds from the EREF

Equipment Auction will support EREF's mission to fund and direct scientific research and educational initiatives for waste management practices.

If your company will be exhibiting at WasteExpo 2012, is a member of WASTEC or NSWMA and would like to participate in the Live and/or Silent Auction, please send an e-mail to [events@erefdn.org](mailto:events@erefdn.org) or visit [www.erefdn.org](http://www.erefdn.org) to download the donation forms. •



*Donor companies are entitled to a tax deduction for the full fair market value of their equipment.*



**Environmental Research & Education Foundation**

*Lighting a path to sustainable waste management practices*

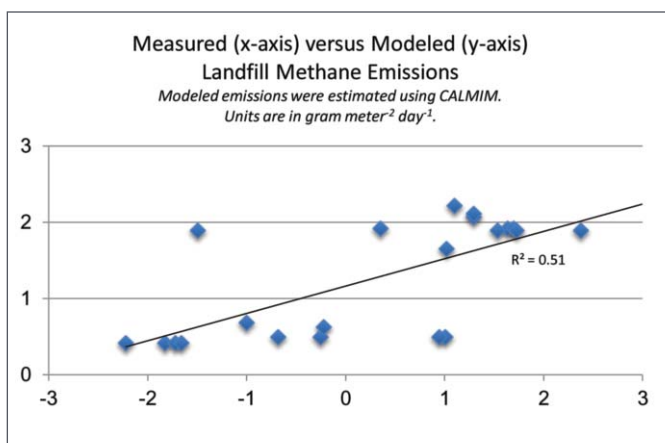
# Project Update

## International Field Validation of a New IPCC Model for Landfill Methane Emissions

Jean. Bogner (UIC) and Kurt Spokas (USDA-ARS)  
University of Illinois-Chicago

Two decades of published field data have confirmed that landfill methane (CH<sub>4</sub>) emissions can vary by more than 7 orders of magnitude, from 0.001 to 1000 grams CH<sub>4</sub> per m<sup>2</sup> surface area per day. Net CH<sub>4</sub> emissions to the atmosphere are controlled by complex and interrelated physical, biochemical and climatic processes. To realistically predict emissions at specific sites, models that use field data can simulate CH<sub>4</sub> transport and microbial CH<sub>4</sub> oxidation rates more accurately, including the effects of short-term soil moisture and temperature changes. Moreover, existing IPCC (Intergovernmental Panel on Climate Change) Tier 1 and Tier II methodologies for estimating national greenhouse gas emissions from landfills do not take into account either (a) the properties of the cover materials nor (b) seasonal variability in microbial CH<sub>4</sub> oxidation, currently allowing only a 10% reduction for oxidation [whereas field variability is 0-100%].

During 2011-2012, EREF is supporting the expansion, improvement, and international field validation of CALMIM (CALifornia Landfill Methane Inventory Model), a new site-specific model for California landfill CH<sub>4</sub> emissions developed during 2007-2010 under the California Energy Commission. This model contains embedded USDA meteorological and soil microclimate models, which have been globally validated at the 0.5° X 0.5° latitude-longitude scale, which makes the CALMIM model applicable to sites outside of California. CALMIM takes into account the thickness and physical properties of daily, intermediate, and final landfill cover materials over a typical annual cycle, including seasonal CH<sub>4</sub> oxidation at 1-in depth and 10-min time increments. The expanded international field validation is being accomplished through collaborations with multiple field research groups in the U.S., Europe, Asia, Australia and Africa. Thus far, the CALMIM model has been used to compare measured to modeled emissions for



sites in the U.S., France and Austria (Figure 1). It is expected that the improvement of the CALMIM model will lead to more accurate estimates of landfill emissions. •

## EREF Releases Targeted Request for Sustainable Solid Waste Research Proposals

In late 2010, the EREF Board of Directors made a decision to ensure research funded in the future reflected EREF's long-term strategic research plan to address all areas of integrated solid waste management, with a strong focus towards research that increased sustainable solid waste management practices. Sustainability, as it relates to solid waste management, is a focus on utilizing waste as a resource. "While EREF has always supported research and educational initiatives in all areas of solid waste, this targeted RFP exemplifies EREF's commitment to funding cutting edge research on next-generation technologies to manage discarded materials," noted Jim Dowland, Waste Management's Vice President of Disposal Operations and chair of the EREF Board's Research Project Committee.

Historically, roughly 75% of EREF's funding dollars have been allocated to landfill related research. While landfills continue to play an important role in integrated waste management, and will receive the majority of MSW in the near future in the U.S. (and in the majority of other countries), it has been recognized that a sustainable future requires consideration of other end-of-life technologies. Since its inception in 1992, EREF has been one of the primary sources of research for solid waste management and has advanced the field significantly. "We see this targeted RFP as a natural extension of EREF's current research funding program and feel the information gained from this new funding direction will answer critical questions that will continue to propel the industry forward," said Dr. Bryan Staley, EREF's President and Chief Executive Officer.

The RFP requests research proposals on the following key focus areas: waste minimization, recycling, waste conversion to energy and biofuels, and strategies to promote diversion from landfills. In addition to hypothesis-driven research, it is highly desirable that submissions also address economic and operational feasibility, impacts on policy and regulation, and evaluate life cycle impacts. Please visit [www.erefndn.org](http://www.erefndn.org) for more information. •

Figure 1. Preliminary comparison of modeled emissions using CALMIM to measured landfill methane emissions for sites in the U.S., France and Austria. This data includes field measurements for a variety of daily, intermediate and final cover materials.

## BOARD NEWS

### McNeilus, Waste Connections and Big Truck Rental Executives Elected to EREF Board of Directors

The EREF Board of Directors is pleased to announce the election of its newest members:

#### Frank Busicchia

Vice President of Sales  
McNeilus Truck and Manufacturing Co.



Frank Busicchia began his career with Oshkosh Corporation in 1997, as a Regional Sales Manager covering the Northeast United States; which came to include McNeilus Truck & Mfg. products when Oshkosh acquired them in 1998. In 2006 he became the Director of Sales for that region. Frank moved to McNeilus headquarters in Dodge Center, MN when he accepted the Director of National Sales position in 2008. Most recently he was promoted to Vice President of Sales in September of 2010, where he is responsible for all whole goods and aftermarket sales, both domestically and internationally for McNeilus Companies; which also includes Iowa Mold Tooling (IMT), CON-E-CO and London Machinery.

#### James M. Little

Senior Vice President –  
Engineering and Disposal  
Waste Connections, Inc.



James M. Little has been Senior Vice President – Engineering and Disposal of Waste Connections since February 2009. From September 1999 to that date, Jim served as Vice

President – Engineering. Jim held various management positions with Waste Management, Inc. (formerly USA Waste Services, Inc., which acquired Waste Management, Inc. and Chambers Development Co. Inc.) from April 1990 to September 1999, including Regional Environmental Manager and Regional Landfill Manager, and most recently Division Manager in Ohio, where he was responsible for the operations of ten operating companies in the Northern Ohio area. Jim is a certified professional geologist and holds a B.S. degree in Geology from Slippery Rock University.

#### Robert J. Mecchi II

Vice President of Business Development  
Big Truck Rental, LLC



Robert has been the Vice President of Business Development for Big Truck Rental, LLC since September 2010. He is the current Chairman of WASTEC Board of Governors and has chaired the association's Statistics Program since 2005. In 2007 he was honored as WASTEC's Member of the Year. Robert is also the Member at Large to become the Co-Chair of the Environmental Industry Association's Future Industry Leaders of America in 2013. Additionally, Robert has served on EREF's Auction Committee since 2008. Prior to Big Truck Rental, Robert was President of Perkins Manufacturing. He holds a Bachelor's degree in Marketing and Communications from Northern Illinois University and a Masters of Business Administration from the Kellogg School of Management, Northwestern University. Robert lives in Illinois with his wife of twenty years Sharlene and their three children Ryan, Dylan and Tera. •

### Save the Date! 2012 Global Waste Management Symposium

September 30 - October 3, 2012  
Arizona Grand Resort  
Phoenix, Arizona

Join Your Peers and Colleagues for 3 Days of Presentations of Research and Case Studies on Waste Management! The GWMS serves as a forum for the presentation of both applied and fundamental research and case studies on waste management. This 3-day event serves the needs of the landfill community within the solid waste and recycling industry and welcomes participants from the



community of designers, facility owners and operators, policymakers, and researchers from the U.S. and abroad.

#### 2012 Technical Committee Co-Chairs:

Bryan Staley, Environmental Research and Education Foundation  
Morton Barlaz, North Carolina State University  
Craig Benson, University of Wisconsin

Visit [www.wastesymposium.com](http://www.wastesymposium.com) for more information. •

# EREF Holds Second Regional Summit with Focus on Landfill Gas to Energy

EREF held its second Regional Summit on Sustainable Solid Waste Practices & Research on September 7-8, 2011 in Raleigh, North Carolina. The Regional Summit featured a special Landfill Gas to Energy session and facility tour.

There were 126 attendees, which exceeded initial estimates. Attendees came from 14 states and multiple areas within the industry, with 21% of attendees from municipalities and regulatory agencies, 22% from industry, 25% consultants and the remaining from academia. The first day of the Summit included presentations providing an overview of research and trends advancing sustainable solid waste management. The second day featured a special session on landfill gas to energy, which highlighted the intersection of research and practice on utilizing landfill gas for beneficial use and included perspectives from industry, academia, consultants and regulatory agencies.

“The EREF Regional Summit provided timely information on current sponsored research,” said attendee Dr. Sam Vigil of California Polytechnic State University. “The size of the Summit allowed for useful networking with other attendees.”

On the second day registrants were treated to a tour of the Black Creek Renewable Energy Facility in Roseboro, North Carolina. Waste Industries, Gregory Poole Equipment Company and Progress Energy teamed up with SCS Energy to build this power plant using landfill gas to generate electricity. Phase 1 of the project included four engines generating 1.6 Mega Watts of power each. As the gas curve increases, six additional engines will be added. Each engine produces sufficient power for 1,000 homes.

“This is very informative and leading edge work for the waste industry,” said Ray Hoffman, an Engineer with Republic Services. “As these projects prepare to move from the lab to the field, it is important for the industry to be able to communicate the benefits and to offer up sites for participation.”



*EREF Regional Summit Presenters Susan Thorneloe (US EPA), Mort Barlaz (NCSU), Debbie Reinhart (UCF) and Paul Imhoff (UD)*



“The Regional Summits were developed as part of an effort to expand EREF’s educational mission,” explains Bryan Staley, EREF President and Chief Executive Officer. “We are working hard to broaden the educational reach to the industry and disseminate the wealth of information developed by the foundation.”

Suitable for executives, managers, technical personnel, regulators and consultants, EREF’s Regional Summits present key solid waste research findings and highlight impacts on practice as well as provide updates on legislative activities/policy as they relate to needed research. ●

### Thank You to Our Sponsors

#### Major Sponsors



#### General Sponsors



*Tour of the Black Creek Renewable Energy Facility in Roseboro, NC*

## Thank You EIA Women’s Council

EREF would like to thank the Environmental Industry Associations (EIA) Women’s Council for featuring EREF in its November Lunch and Learn Webinar Program entitled “Improving Your Refuse Intelligence: How EREF Adds Value to the Solid Waste Industry.” Bryan Staley, EREF’s President and CEO, connected the dots between garbage science and its benefit to the industry. He also reviewed current industry trends and how these trends are shaping and changing the solid waste management paradigm.

The EIA Women’s Council fosters the professional development of women in the waste industry while striving to increase their business, financial and leadership skills through education, workshops, mentoring and networking.

### EIA Women’s Council Offers Scholarships

The Women’s Council offers scholarships to students in pursuit of a career in the environmental industry. Three scholarships of \$5,000 will be awarded to deserving students for the 2012-2013 year. Visit [www.eiawomenscouncil.org](http://www.eiawomenscouncil.org) for information on eligibility, selection criteria and the scholarship application form, or contact Peggy Macenas at 800.679.6269. Submission deadline is February 15, 2012. ●



**Lunch N Learn: Improving Your Refuse Intelligence:  
How EREF Adds Value to the Solid Waste Industry**

# New EREF Scholars

**Theodore McMahan**  
Gannon University, MS  
Stearns/SCS Scholar 2011



## Evaluating Torrefaction as a Process to Convert Organic Waste to Energy

Torrefaction is a mild pyrolysis process that improves the fuel properties of solid organic materials such as woods and organic wastes. When heated in an anoxic environment to temperatures between 200 and 400 degrees Celsius, organic material decomposes producing volatile gases. The resulting solid material has an increased energy density and improved physical characteristics and can be utilized as a solid fuel. The major goal of Ted's research is to determine the optimum heating profile to maximize mass and energy yield for each of the selected feedstocks while generating sufficient off-gases to provide the fuel for heating the system. A number of organic waste feedstocks are being investigated, including biosolids and commercial food wastes. Beyond the optimization research for this process, Ted is leading a team of researchers and engineers in developing a prototype reactor which will be able to handle mass quantities of local organic solid waste and convert said waste into valuable solid fuel.

Ted was raised in a small town in Massachusetts, and attended Tufts University for his undergrad where he studied engineering. He took a year off between undergrad and graduate school in order to work in the field, and decided to take his chemistry and lab skills in a different direction than he originally planned and chose to attend graduate school for environmental engineering.

**Dean Straub**  
Purdue University, Ph.D.  
Riethmiller/PTR Scholar 2011



## Non-Destructive Recovery of Polymers from a Waste Stream

Plastics constitute a large part of our everyday usage of materials that end up as waste. Unfortunately, a large number of plastic products contain many different types of plastic polymers and other materials, such as metals, which makes recycling these items difficult. Previous methods have utilized chemical recycling or thermal decomposition to break polymer chains. Unfortunately, this is a very energy-intensive process, due to having to re-assemble these fragments into useable polymers. To find a better way to recycle, a non-destructive separation of complete polymer chains is being pursued. This has the advantage of producing polymers that can then be mixed with virgin material. This also saves energy when compared to other recycling processes, as the polymers do not need to be re-

The four scholars awarded this year were selected from numerous highly qualified finalists. The EREF scholarship program recognizes students with academic excellence, professional involvement and an interest in solid waste management issues at the post-doctoral, doctoral and master's levels. Doctoral/post-doctoral scholarships are given in memory of Francois Fiessinger, P.E., Ph.D., a graduate of Rutgers University, who was a founding director of the foundation; and by EREF. Additional scholarships are made possible by Robert P. Stearns, P.E., DEE of SCS Engineers, former Chairman of EREF; and by Robert J. Riethmiller of PTR Baler and Compactor.

made. This non-destructive recovery process could greatly increase the sustainability of a wide range of consumer and industrial products.

Dean graduated from the Rose-Hulman Institute of Technology, Summa Cum Laude, with a Double Major in Chemical Engineering and Chemistry in 2010. He hopes to utilize his skills, after graduation, in a private sector position. Outside of professional pursuits, Dean enjoys outdoor activities such as fishing and boating, as well as singing and playing the violin.

**Richa Karanjekar**  
University of Texas at Arlington, Ph.D.  
EREF Scholar 2011



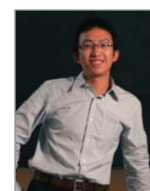
## An Improved Model for Estimating Methane Generation Rates from Landfills Based on Waste Composition, Rainfall and Ambient Temperature

Landfills are the third largest human-related source of methane in the U.S., accounting for 17 percent of all methane emissions. Accurately estimating methane emissions from landfills is important to assess its potential of generating greenhouse gases (GHG), as well as to assess if tapping the landfill's power generation potential is economically viable. Previous studies have shown that methane generation from landfills depends on waste composition, moisture content, temperature, pH and particle size. The goal of this research is to develop a model, for predicting methane generation rates from landfills worldwide, which can be used by any country to

estimate methane potential of its landfills, regardless of waste composition or climate. The improved model, "Capturing Landfill Emissions for Energy Needs (CLEEN)," will allow methane generation to be estimated for any landfill with basic information about waste composition, annual rainfall and ambient temperature. Richa is currently studying the methane generation from laboratory scale simulated landfill reactors. These reactors are installed at varying levels of rainfall, temperature and waste composition using a statistical incomplete block design. Based on the laboratory scale data, a comprehensive regression equation for predicting methane generation rate constant (k) will be developed and will be incorporated in the CLEEN model. Finally, the prediction efficiency of CLEEN model will be compared against the current landfill methane generation models.

Richa's research interests include landfill gas modeling and climate change. She received a bachelor's degree in Civil Engineering from the University of Pune, India and she obtained a master's in Environmental Engineering from University of Mumbai, India. Her bachelor's and master's thesis focused on removal of heavy metals from industrial wastewater. After completing her master's degree, Richa worked as a proposal and design engineer for 3 years in a multinational company in India. She enjoys reading, painting and traveling in her spare time.

**Dianjun Ren**  
*University of Virginia, Ph.D.*  
EREF Scholar 2011



### **Effect of AG Nanoparticles on Microbe Populations Found in Landfill and Ag-NP Transport through Liners**

The primary goal of Dianjun's research is to identify silver nanoparticle (AgNP) transport and fate in a landfill, to determine whether the antimicrobial capability of AgNPs will deactivate the beneficial bacterial group responsible for degradation of municipal solid waste. Silver nanoparticles are a new class of cost-effective antimicrobial agents that have been widely used in recent years. However, materials that contain AgNPs are subject to deterioration, which has the potential to release AgNPs from the manufactured materials. In this form, the AgNPs have the ability to detrimentally impact the environment. As the use of AgNPs increases, the risk of AgNPs released into the environment increases. In a landfill, there is concern silver nanoparticles may transport through the earthen liner and contaminate groundwater. It is expected that the interaction between nanoparticles and transport environment would have a direct influence on transport behavior through landfill liner systems

Dianjun received a bachelor degree and master degree in environmental engineering from Hohai University and Tongji University in China, respectively. During that time, he had a wonderful opportunity to work with nano materials (titanium dioxide) and its application in wastewater treatment. Dianjun is an avid photographer and tennis player. ●

## INTERNSHIP PROGRAM

# EREF Intern Update

In its last newsletter, EREF introduced its internship program, developed as part of the foundation's effort to expand its educational mission. EREF is pleased to introduce its newest intern:

### **Ryan Duckett**

Ryan is a junior at North Carolina State University, majoring in Environmental Engineering and minoring in Environmental Science. He decided to focus his studies on the environment largely because of his interest in the outdoors. For his senior project in high



school, he collected used ink cartridges and electronics as a fundraiser for a greenhouse energy efficiency project. They ended up being worth close to \$450, which made him realize the monetary value of this thing we call "waste." Ryan also loves picking up litter, utilizing other people's "trash" and the idea of minimizing/reusing solid waste in general. He is on the NCSU club cross country and track team and is in the University Scholars program.

Ryan is working on a project at EREF that is analyzing zero waste trends and policies that aims to standardize the definition of what zero waste means and how the term is different than zero landfill concepts. ●