

The Best of the Best in 2014!

Manuscripts submitted to *ES&T Letters* undergo rigorous reviews by the associate editors and multiple reviewers, and even after the manuscripts have passed the technical review stage, we accept only studies that merit urgent publication. The quality of the papers we publish, and the importance of these papers, are therefore both very high. Among these outstanding papers, a few seemed to shine a bit brighter than the others. This year, and in our inaugural year for awards, we have identified five of these studies as “best papers”. At *ES&T Letters*, we do not select our best papers from specific topical categories, and we do not rank these papers in any order (other than listing them alphabetically by first author). We also have no fixed number of papers that will receive this extra level of recognition. The papers chosen from publications in 2014 span a variety of important topics, ranging from green energy to pollutants in water and air, with important implications for scientists and engineers, as well as our understanding and relation to our environment.

We are all concerned about the release of CO₂ into the atmosphere, but the paper “Harvesting Energy from CO₂ Emissions” by H. V. M. Hamelers, O. Schaetzle, J. M. Paz-García, P. M. Biesheuvel, and C. J. N. Buisman showed that even from a problem there is something to be gained. They proposed a unique process to use emissions for power generation (2014, *1*, 31–35, DOI: 10.1021/ez4000059). They described how absorption and dissolution of CO₂ into water creates ions that are used to charge porous electrodes. They estimated energy efficiencies of 24% using water and up to 32% with a different electrolyte. While these findings could be important as a method for increasing energy production, we found the study to be a remarkable demonstration of exceptional creativity in turning a problem into an opportunity.

The development of antibiotics is among the most important advances that have improved human health and quality of life. We are now seeing, however, the emergence of bacteria resistant to several different antibiotics, posing a threat to global human health. For the study reported in “Proliferation of Multidrug-Resistant New Delhi Metallo- β -lactamase Genes in Municipal Wastewater Treatment Plants in Northern China” by Yi Luo, Fengxia Yang, Jacques Mathieu, Daqing Mao, Qing Wang, and P. J. J. Alvarez (2014, *1*, 26–30, DOI: 10.1021/ez400152e), the authors tracked the occurrence of specific genes tied to antibiotic resistance of bacteria through processes in a wastewater treatment plant, finding that they passed through the plant and into the plant effluent. The study was amazing relative to technical challenges for monitoring these genes in the wastewater, and the findings are a good reminder of our wastewater challenges.

The water–energy nexus has been high on everyone’s list of important research frontiers, and the past few years have seen the emergence of shale gas as a game-changing component in both energy production and water use. Identifying chemicals in flowback water, and developing methods to treat this water, are major environmental challenges. In the paper “Matrix Complications in the Determination of Radium Levels in

Hydraulic Fracturing Flowback Water from Marcellus Shale”, the authors (Andrew W. Nelson, Dustin May, Andrew W. Knight, Eric S. Eitrheim, Marinea Mehrhoff, Robert Shannon, Robert Litman, and Michael K. Schultz) (2014, *1*, 204–208, DOI: 10.1021/ez5000379) addressed challenges in using EPA methods for determining levels of radium in drinking water for flowback water. They concluded that nondestructive approaches were the best among different methods. They also found that large sample dilutions to reduce high salt concentrations could allow the use of wet chemical techniques, but they required careful consideration of detection limits. The study reinforced the challenges of working with highly saline solutions produced by gas and oil production systems.

Many researchers are focused on the development of water treatment membranes that have high water permeability, but the development of nonfouling membranes is perhaps an even greater challenge. In the paper “Thin-Film Composite Polyamide Membranes Functionalized with Biocidal Graphene Oxide Nanosheets” by François Perreault, Marissa E. Tousley, and Menachem Elimelech (2014, *1*, 71–76, DOI: 10.1021/ez4001356), the authors showed how amides could be used to irreversibly couple carboxyl groups of graphene oxide and the polyamide active layer of the membrane. The resulting membrane surface had improved antibacterial resistance inactivating 65% of the bacteria on the surface after just 1 h. A reduction in bacterial adhesion and contamination of the membranes, along with improved antifouling approaches for other materials in water, is important for increasing the lifetime and reducing energy consumption of membranes used for water treatment.

Particles in air affect our health and have implications for global climate change. In the paper “Light Absorption by Charge Transfer Complexes in Brown Carbon Aerosols” by Sabrina M. Phillips and Geoffrey D. Smith (2014, *1*, 382–386, DOI: 10.1021/ez500263j), the authors showed that charge transfer complexes in aerosols are important for light absorption because of interactions between alcohol and carbonyl moieties. They further speculated that these complexes could be responsible for a significant fraction of aerosol direct radiative forcing. Their findings may lead to significant improvements in our understanding of chemical reactions on aerosols and their effects on climate change. This publication is an example that *ES&T Letters* is fast becoming an important new venue for publications related to atmospheric chemistry.

It is a pleasure and honor to receive and publish such high-quality and important papers in *ES&T Letters*. While we have identified a few particularly outstanding papers this year, there are many other excellent papers that were published in the journal this year. We look forward to receiving and publishing the next round of “best papers” in 2015.

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Notes

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