Environmental Science & Technology

Comment

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Top Papers of 2011: Recognizing our Finest

You can tweet all day, but it is hard to distinguish the finest tweets among the noise. After all, there are about 50 million tweets in a single day at Twitter. Coincidentally, that just happens to be the total number of journal articles published in the world since 1665 when *Philosophical Transactions of the Royal Society* was started (http://duncan.hull.name/2010/07/15/fifty-million/.

So which was the best paper ever written? 50 million is far too many to wrap your brain around, and the breadth of the subject matter is seriously daunting (even for brilliant Editors). Not since English scientist Thomas Young (June 13, 1773 − May 10, 1829) has anyone been purported to know everything about everything. "The Ignorance Explosion" holds that each generation grows progressively dumber (J. Lukasiewicz, *Leonardo* 7:1259−163, 1974). It makes sense—we know a vanishingly small proportion of an exponentially increasing body of knowledge.

Fortunately, our problem at *ES&T* is not quite as trans-computational. Last year we published a large (but finite) number of papers, 1500, from about 4500 submissions. Still, it is difficult to say which ones were the best (or even what "best" means in the sense of scientific publications). Since 2006 we have tried to make that task a little easier by naming our *Top Papers of the Year*. We ask each of our Associate Editors to nominate a few papers of enduring quality in each category (Environmental Science, Technology, Policy Analysis, and Feature). Then, members of the *ES&T* Editorial Advisory Board read the approximately 100 nominations and winnow-down the list to the top five or so in each category. I have the Solomon's task of selecting the final Top Papers in each category.

This year, I found the Top Policy Analysis papers particularly interesting. Our winner was by Wäger, Schluep, Müller, and Gloor on the content of mixed plastics from waste electrical and electronic equipment (WEEE) (dx.doi.org/10.1021/es202518n). They asked, "How many hazardous substances can be detected in the plastics of WEEE?" The number of toxic metals and flame retardants to be analyzed is largely determined by the *Restriction on Use of Hazardous Substances*—the RoHS Directive of the European Commission. Wäger et al. showed that most all waste plastics in WEEE have at least one hazardous substance—many have multiple hits. If governments want to limit the export and exposure of such hazards, they need to consider the results of this paper.

Our first runner-up paper in the Policy Analysis category took the question one-step further—although with a bit more speculation and controversy as indicated by the paper's title, "Are Reductions in Industrial Organic Contaminants Emissions in Rich Countries Achieved Partly by Export of Toxic Wastes?" Breivik, Gioia, Chakraborty, Zhang, and Jones provide preliminary evidence of PCBs in locations of Africa and Asia where they were never manufactured, while concentrations in producer (rich) countries decline (dx.doi.org/10.1021/es202320c).

Where do all the chemicals go? Our Top Science Papers of 2011 address this question as well. Heather Stapleton, Duke University, and colleagues had a very simple idea: to identify flame retardants and their concentrations in 101 commonly used baby products (dx.doi.org/10.1021/es2007462). Already making an impact, the paper demonstrated hazardous chemicals in polyurethane foams from infant car seats, changing table pads, pillows, mattresses, and other products. Of course, mere detection in the product does not indicate exposure to the baby; however, the paper represents a necessary first step in understanding whether exposure might occur.

Ubiquitous in all environmental compartments, including people, are the perfluorinated compounds − the subject of our first runner up paper in the category of Top Science Papers. Claudia Müller from EMPA/ETH in Switzerland partnered with a group of Canadian colleagues and corresponding author Derek Muir, Environment Canada. They delineated a fascinating food chain transfer from air-borne contaminants to vegetation, from vegetation to caribou, and eventual biomagnification in wolves (dx.doi.org/10.1021/es201353v).

Distinguished by their novelty and potential practicality were the Top Environmental Technology Papers of 2011. Cates, Cho, and Kim from Georgia Institute of Technology won the Top Technology Paper award for reporting on a new photoactivated material consisting of nano- and microcrystalline yttrium silicate which converts visible light into uvc for generating germicidal activity. Runners-up Agus and Sedlak at UC-Berkeley teamed with Lim and Zhang from PUB, Singapore National Water Agency, to discover compounds causing odor in treated drinking water. What's more, such odor-causing chemicals—like trichloroanisole, geosmin, and vanillin—cannot be destroyed by reverse osmosis, advanced oxidation, or activated carbon alone. Multiple barriers would be required to treat municipal wastewater effluent and render it potable for recharge or reuse.

Through the years, Feature Articles have added spice to *ES&T*, and our 2011 Top Features were no exception. Ron Atlas, University of Louisville, has made a career of bioremediating oil spills. He was instrumental in "biostimulating" bacteria to degrade Exxon Valdez oil in Prince William Sound, Alaska. Terry Hazen, Lawrence Berkeley National Lab, was a scientific leader in response to the BP Deepwater Horizon Spill in the Gulf of Mexico. Together, they created the Top Feature Article of 2011, "Oil Biodegradation and Bioremediation: A Tale of the Two Worst Spills in U.S. History" (dx.doi.org/10.1021/es2013227).

By 2011, "wastewater" is clearly a misnomer. We should no longer think of it as "waste", rather as a resource from which we harvest water, nutrients, and energy. McCarty, Bae, and Kim in a Stanford/INHA University partnership (U.S./South Korea) answered their own question in the runner-up Feature Article, "Domestic wastewater treatment as a net energy producer − can this be achieved?" The answer is YES, and the best

   dx.doi.org/10.1021/es300795m | *Environ. Sci. Technol.* XXXX, XXX, XXX−XXX

approach is probably not microbial fuel cells, but rather conventional anaerobic digestion in tandem with combined heat and power for the community.

We celebrate the Top Papers in ES&T for 2011. Who will win in 2012?

FEATURE

Top Paper. Atlas, Ronald M.; Hazen, Terry C. Oil Biodegradation and Bioremediation: A Tale of the Two Worst Spills in U.S. History. *Environ. Sci. Technol.* **2011**, *45* (16), 6709−6715 (DOI: 10.1021/es2013227).

First Runner-Up. McCarty, Perry L.; Bae, Jaeho; Kim, Jeonghwan. Domestic Wastewater Treatment as a Net Energy Producer−Can This be Achieved? *Environ. Sci. Technol.* **2011**, *45* (17), 7100−7106 (DOI: 10.1021/es2014264).

Second Runner-Up. McKone, T. E.; Nazaroff, W. W.; Berck, P.; Auffhammer, M.; Lipman, T.; Torn, M. S.; Masanet, E.; Lobscheid, A.; Santero, N.; Mishra, U.; Barrett, A.; Bomberg, M.; Fingerman, K.; Scown, C.; Strogen, B.; Horvath, A. Grand Challenges for Life-Cycle Assessment of Biofuels. *Environ. Sci. Technol.* **2011**, *45* (5), 1751−1756 (DOI: 10.1021/es103579c).

ENVIRONMENTAL SCIENCE

Top Paper. Stapleton, Heather M.; Klosterhaus, Susan; Keller, Alex; Ferguson, P. Lee; van Bergen, Saskia; Cooper, Ellen; Webster, Thomas F.; Blum, Arlene. Identification of Flame Retardants in Polyurethane Foam Collected from Baby Products. *Environ. Sci. Technol.* **2011**, *45* (12), 5323−5331 (DOI: 10.1021/es2007462).

First Runner-Up. Müller, Claudia E.; De Silva, Amila O.; Small, Jeff; Williamson, Mary; Wang, Xiaowa; Morris, Adam; Katz, Sharon; Gamberg, Mary; Muir, Derek C. G. Biomagnification of Perfluorinated Compounds in a Remote Terrestrial Food Chain: Lichen−Caribou−Wolf. *Environ. Sci. Technol.* **2011**, *45* (20), 8665−8673 (DOI: 10.1021/es201353v).

Second Runner-Up. Judy, Jonathan D.; Unrine, Jason M.; Bertsch, Paul M. Evidence for Biomagnification of Gold Nanoparticles within a Terrestrial Food Chain. *Environ. Sci. Technol.* **2011**, *45* (2), 776−781 (DOI: 10.1021/es103031a).

Third Runner-Up. Browne, Mark Anthony; Crump, Phillip; Niven, Stewart J.; Teuten, Emma; Tonkin, Andrew; Galloway, Tamara; Thompson, Richard. Accumulation of Microplastic on Shorelines Woldwide: Sources and Sinks*Environ. Sci. Technol.* **2011**, *45* (21), 9175−9179 (DOI: 10.1021/es201811s).

ENVIRONMENTAL TECHNOLOGY

Top paper. Cates, Ezra L.; Cho, Min; Kim, Jae-Hong. Converting Visible Light into UVC: Microbial Inactivation by Pr^{3+}-Activated Upconversion Materials. *Environ. Sci. Technol.* **2011**, *45* (8), 3680−3686 (DOI: 10.1021/es200196c).

First Runner-Up. Agus, Eva; Lim, Mong Hoo; Zhang, Lifeng; Sedlak, David L. Odorous Compounds in Municipal Wastewater Effluent and Potable Water Reuse Systems. *Environ. Sci. Technol.* **2011**, *45* (21), 9347−9355 (DOI: 10.1021/es202594z).

Second Runner-Up. Freeman, John L.; Bañuelos, Gary S. Selection of Salt and Boron Tolerant Selenium Hyperaccumulator Stanleya pinnata Genotypes and Characterization of Se Phytoremediation from Agricultural Drainage Sediments. *Environ. Sci. Technol.* **2011**, *45* (22), 9703−9710 (DOI: 10.1021/es201600f).

ENVIRONMENTAL POLICY

Top Paper.

Wäger, Patrick A.; Schluep, Mathias; Müller, Esther; Gloor, Rolf. RoHS regulated Substances in Mixed Plastics from Waste Electrical and Electronic Equipment. *Environ. Sci. Technol.* **2012**, *46* (2), 628−635 (DOI: 10.1021/es202518n).

First Runner-Up.

Breivik, Knut; Gioia, Rosalinda; Chakraborty, Paromita; Zhang, Gan; Jones, Kevin C. Are Reductions in Industrial Organic Contaminants Emissions in Rich Countries Achieved Partly by Export of Toxic Wastes? *Environ. Sci. Technol.* **2011**, *45* (21), 9154−9160 (DOI: 10.1021/es202320c).

Second Runner-Up.

Levis, James W.; Barlaz, Morton A. Is Biodegradability a Desirable Attribute for Discarded Solid Waste? Perspectives from a National Landfill Greenhouse Gas Inventory Model. *Environ. Sci. Technol.* **2011**, *45* (13), 5470−5476 (DOI: 10.1021/es200721s).

Jerald L. Schnoor, Editor-in-Chief

AUTHOR INFORMATION

Notes

The authors declare no competing financial interest.