

**ON THE COVER:** The cover of *Environmental Science & Technology's* annual issue recognizing Earth Day features a striking image of Earth's western hemisphere taken by the Sunomi NPP Earth-observing satellite. Credit: NASA/NOAA/GSFC/Suomi NPP/VIIRS/Norman Kuring

## Letters

4257 [dx.doi.org/10.1021/es300858k](https://doi.org/10.1021/es300858k)

**Response to Timoney Critique of Royal Society of Canada Expert Panel on Oil Sands**

Steve E. Hruddy,\* M. Anne Naeth, René Therrien, Glen Van Der Kraak, Pierre Gosselin, André Plourde, and Zhenghe Xu

## Viewpoints

4259 [dx.doi.org/10.1021/es301074u](https://doi.org/10.1021/es301074u)

**Emerging Decontaminants**

Hans Peter H. Arp\*

4261 [dx.doi.org/10.1021/es301062y](https://doi.org/10.1021/es301062y)

**India's Rare Inland Mangroves Deserve Protection**

Pratiksha Patel and Govindasamy Agoramoorthy\*

4263 [dx.doi.org/10.1021/es301226n](https://doi.org/10.1021/es301226n)

**China's Air Pollution Control Calls for Sustainable Strategy for the Use of Coal**

Jinnan Wang, Yu Lei,\* Jintian Yang, and Gang Yan

## Critical Reviews

4265 [dx.doi.org/10.1021/es203470x](https://doi.org/10.1021/es203470x)

**Heavy Metals in Toys and Low-Cost Jewelry: Critical Review of U.S. and Canadian Legislations and Recommendations for Testing**

Mert Guney and Gerald J. Zagury\*



## Policy Analysis

- 4275 **Public Health, Climate, and Economic Impacts of Desulfurizing Jet Fuel**  
Steven R. H. Barrett,\* Steve H. L. Yim, Christopher K. Gilmore, Lee T. Murray, Stephen R. Kuhn, Amos P. K. Tai, Robert M. Yantosca, Daewon W. Byun, Fong Ngan, Xiangshang Li, Jonathan I. Levy, Akshay Ashok, Jamin Koo, Hsin Min Wong, Olivier Dessens, Sathya Balasubramanian, Gregg G. Fleming, Matthew N. Pearson, Christoph Wollersheim, Robert Malina, Saravanan Arunachalam, Francis S. Binkowski, Eric M. Leibensperger, Daniel J. Jacob, James I. Hilleman, and Ian A. Waitz  
dx.doi.org/10.1021/es203325a
- 4283 **Historical Carbon Footprinting and Implications for Sustainability Planning: A Case Study of the Pittsburgh Region**  
Rachel Hoesly,\* Mike Blackhurst, H. Scott Matthews, Jeffrey F. Miller, Amy Maples, Matthew Pettit, Catherine Izard, and Paul Fischbeck  
dx.doi.org/10.1021/es203943q
- 4291 **Public Health Impacts of Combustion Emissions in the United Kingdom**  
Steve H. L. Yim and Steven R. H. Barrett\*  
dx.doi.org/10.1021/es2040416
- Articles**
- 4297 **Characterization of Natural and Affected Environments**  
Occurrence and Potential Sources of Pyrethroid Insecticides in Stream Sediments from Seven U.S. Metropolitan Areas  
Kathryn M. Kuvila,\* Michelle L. Hladik, Christopher G. Ingersoll, Nile E. Kemble, Patrick W. Moran, Daniel L. Calhoun, Lisa H. Nowell, and Robert J. Gilliom  
dx.doi.org/10.1021/es2044882
- 4304 **Status of Metal Contamination in Surface Waters of the Coastal Ocean off Los Angeles, California since the Implementation of the Clean Water Act**  
Emily A. Smail,\* Eric A. Webb, Robert P. Franks, Kenneth W. Bruland, and Sergio A. Sanudo-Wilhelmy  
dx.doi.org/10.1021/es2023913
- 4312 **Fragmentation Analysis of Water-Soluble Atmospheric Organic Matter Using Ultrahigh-Resolution FT-ICR Mass Spectrometry**  
Jeffrey P. LeClair, Jeffrey L. Collett, and Lynn R. Mazzoleni\*  
dx.doi.org/10.1021/es203509b
- 4323 **Three Centuries of Eastern European and Altai Lead Emissions Recorded in a Belukha Ice Core**  
Anja Eichler,\* Leonhard Tobler, Stella Eyrikh, Gabriela Gramlich, Natalia Malygina, Tatyana Papina, and Margit Schwiukowski  
dx.doi.org/10.1021/es2039954

- 4331 **Single-Particle SEM-EDX Analysis of Iron-Containing Coarse Particulate Matter in an Urban Environment: Sources and Distribution of Iron within Cleveland, Ohio**  
Andrew P. Ault, Thomas M. Peters,\* Eric J. Sawvel, Gary S. Casuccio, Robert D. Willis, Gary A. Norris, and Vicki H. Grassian\*  
dx.doi.org/10.1021/es204006k

- 4340 **Application of Phylogenetic Microarray Analysis to Discriminate Sources of Fecal Pollution**  
Eric A. Dubinsky, Laleh Esmaili, John R. Hulls, Yiping Cao, John F. Griffith, and Gary L. Andersen\*  
dx.doi.org/10.1021/es2040366

- 4348 **Thioarsenate Transformation by Filamentous Microbial Mats Thriving in an Alkaline, Sulfidic Hot Spring**  
Härtig Cornelia\* and Planer-Friedrich Britta  
dx.doi.org/10.1021/es204277j

- 4357 **Spectral Induced Polarization Signatures of Hydroxide Adsorption and Mineral Precipitation in Porous Media**  
Chi Zhang,\* Lee Slater, George Redden, Yoshiko Fujita, Timothy Johnson, and Don Fox  
dx.doi.org/10.1021/es204404e

- 4365 **Quantitative Assessment of the Sulfuric Acid Contribution to New Particle Growth**  
Bryan R. Bzdek, Christopher A. Zordan, M. Ross Pennington, George W. Luther III, and Murray V. Johnston\*  
dx.doi.org/10.1021/es204556c

- 4374 **Applications of Fluorescence Spectroscopy for Predicting Percent Wastewater in an Urban Stream**  
Jami H. Goldman,\* Stewart A. Rounds, and Joseph A. Needoba  
dx.doi.org/10.1021/es2041114

- 4382 **Dilution and the Elusive Baseline**  
Gene E. Likens\* and Donald C. Buso  
dx.doi.org/10.1021/es3000189

## Environmental Processes

- 4388 **Environmental Controls of Cadmium Desorption during CO<sub>2</sub> Leakage**  
Evan Frye, Chen Bao, Li Li,\* and Seth Blumsack  
dx.doi.org/10.1021/es3005199

- 4396 **Study on Transformation of Natural Organic Matter in Source Water during Chlorination and Its Chlorinated Products using Ultrahigh Resolution Mass Spectrometry**  
Haifeng Zhang, Yahe Zhang, Quan Shi, Jianying Hu, Mengqiao Chu, Jianwei Yu, and Min Yang\*  
dx.doi.org/10.1021/es203587q

4403

**Rapid Magnetic Biomonitoring and Differentiation of Atmospheric Particulate Pollutants at the Roadside and around Two Major Industrial Sites in the U.K.**  
R. Hansard, B. A. Maher,\* and R. P. Kinnersley

dx.doi.org/10.1021/es203275r

4411

**Capillary Forces between Sediment Particles and an Air–Water Interface**  
Nirmalya Chatterjee,\* Sergey Lapin, and Markus Flury

dx.doi.org/10.1021/es2038933

4419

**Molecular Fractionation of Dissolved Organic Matter with Metal Salts**  
Thomas Riedel,\* Harald Blester, and Thorsten Dittmar

dx.doi.org/10.1021/es203901u

4427

**Western Canadian Arctic Ringed Seal Organic Contaminant Trends in Relation to Sea Ice Break-Up**  
A. Gaden, Steve H. Ferguson, L. Harwood, H. Melling, J. Alikamlik, and G. A. Stern\*

dx.doi.org/10.1021/es204127j

4434

**Xylem- and Phloem-Based Transport of CuO Nanoparticles in Maize (*Zea mays* L.)**  
Zhenyu Wang, Xiaoyan Xie, Jian Zhao, Xiaoyun Liu, Wenqiang Feng, Jason C. White, and Baoshan Xing\*

dx.doi.org/10.1021/es204212z

4442

**Transformation of Bisphenol A and Alkylphenols by Ammonia-Oxidizing Bacteria through Nitration**  
Qian Sun, Yan Li, Pei-Hsin Chou, Po-Yi Peng, and Chang-Ping Yu\*

dx.doi.org/10.1021/es204424t

4449

**Mobility of Functionalized Quantum Dots and a Model Polystyrene Nanoparticle in Saturated Quartz Sand and Loamy Sand**  
Ivan R. Quevedo and Nathalie Tufenkij\*

dx.doi.org/10.1021/es2045458

4458

**Aggregation Kinetics and Transport of Single-Walled Carbon Nanotubes at Low Surfactant Concentrations**  
Dermont Bouchard,\* Wei Zhang, Tremaine Powell, and U-sa Rattanaudompol

dx.doi.org/10.1021/es204618v

4466

**Lifetimes of Triplet Dissolved Natural Organic Matter (DOM) and the Effect of NaBH<sub>4</sub> Reduction on Singlet Oxygen Quantum Yields: Implications for DOM Photophysics**  
Charles M. Sharpless\*

dx.doi.org/10.1021/es300217h

4474

**Physicochemical Properties of Alkylammonium Sulfates: Hygroscopicity, Thermostability, and Density**  
Chong Qiu and Renyi Zhang\*

dx.doi.org/10.1021/es3004377

## Environmental Modeling

4481

**Systematic Evaluation of Land Use Regression Models for NO<sub>2</sub>**  
Meng Wang, Rob Beelen, Mariëes Eeftens, Kees Mellefste, Gerard Hoek, and Bert Brunekreef\*

dx.doi.org/10.1021/es204183v

4490

**Persistent Source Influences on the Trailing Edge of a Groundwater Plume, and Natural Attenuation Timeframes: The F-Area Savannah River Site**  
Jiamin Wan,\* Tetsu K. Tokunaga, Wenming Dong, Miles E. Denham, and Susan S. Hubbard

dx.doi.org/10.1021/es204265q

4498

**Network Environ Perspective for Urban Metabolism and Carbon Emissions: A Case Study of Vienna, Austria**  
Shaoqing Chen and Bin Chen\*

dx.doi.org/10.1021/es204662k

4507

**Past, Present, and Future Exceedance of Critical Loads of Acidity for Surface Waters in Finland**  
Maximilian Posch,\* Julian Aherne, Martin Forsius, and Martti Rask

dx.doi.org/10.1021/es300332r

## Environmental Measurements Methods

4515

**Methane Emissions from a Small Wind Shielded Lake Determined by Eddy Covariance, Flux Chambers, Anchored Funnels, and Boundary Model Calculations: A Comparison**  
Carsten J. Schubert,\* Torsten Diem, and Werner Eugster

dx.doi.org/10.1021/es203465x

4523

**In Vivo Phycocyanin Fluorometry as a Potential Rapid Screening Tool for Predicting Elevated Microcystin Concentrations at Eutrophic Lakes**  
Jason W. Marion, Jiyoung Lee,\* J. R. Wilkins III, Stanley Lemeshow, Cheonghoon Lee, Evan J. Waletzko, and Timothy J. Buckley

dx.doi.org/10.1021/es203962u

4532

**Interaction of Silica Nanoparticles with a Flat Silica Surface through Neutron Reflectometry**  
Eunhyea Chung, Sotira Yiacoumi, Candice Halbert, John Anker, Wei Wang, Changwoo Kim, and Costas Tsouris\*

dx.doi.org/10.1021/es203992b

4539

**Rate of Oxygen Isotope Exchange between Selenate and Water**  
Masahori Kaneko\* and Simon R. Poulson

dx.doi.org/10.1021/es204351d

4546 [dx.doi.org/10.1021/es204580f](https://doi.org/10.1021/es204580f)  
**Novel Active Personal Nanoparticle Sampler for the Exposure Assessment of Nanoparticles in Workplaces**  
Chuen-Jinn Tsai,\* Chun-Nan Liu, Shao-Ming Hung, Sheng-Chieh Chen, Shi-Nian Uang, Yung-Sung Cheng, and Yue Zhou

## Remediation and Control Technologies

4553 [dx.doi.org/10.1021/es2021999](https://doi.org/10.1021/es2021999)  
**Removing Heavy Metals in Water: The Interaction of Cactus Muclilage and Arsenate (As (V))**  
Dawn I. Fox, Thomas Pichler, Daniel H. Yeh, and Norma A. Alcantar\*

4560 [dx.doi.org/10.1021/es202431h](https://doi.org/10.1021/es202431h)  
**Structure and Properties of Noncrystalline Nano-Al(OH)<sub>3</sub> Reclaimed from Carbonized Residual Wastewater Treatment Sludge**  
Jinlong Zou, Ying Dai, Chungui Tian, Kai Pan, Baojiang Jiang, Lei Wang, Wei Zhou, Guohui Tian, Xue Wang, Zipeng Xing, and Honggang Fu\*

4567 [dx.doi.org/10.1021/es300002w](https://doi.org/10.1021/es300002w)  
**Blended Fertilizers as Draw Solutions for Fertilizer-Drawn Forward Osmosis Desalination**  
Sherub Phuntsho, Ho Kyong Shon,\* Tahir Majeed, Ibrahim El Saliby, Saravanamuthu Vigneswaran, Jaya Kandasamy, Seungkwon Hong, and Sangyoun Lee

4576 [dx.doi.org/10.1021/es203876e](https://doi.org/10.1021/es203876e)  
**Highly Active and Stable Ni–Fe Bimetal Prepared by Ball Milling for Catalytic Hydrodechlorination of 4-Chlorophenol**  
Fuyuan Xu, Shubo Deng,\* Jie Xu, Wang Zhang, Min Wu, Bin Wang, Jun Huang, and Gang Yu

4583 [dx.doi.org/10.1021/es204105h](https://doi.org/10.1021/es204105h)  
**High Rate Nitrogen Removal in an Alum Sludge-Based Intermittent Aeration Constructed Wetland**  
Yuansheng Hu, Yaqian Zhao,\* Xiaohong Zhao, and Jeyakumar L. G. Kumar

4591 [dx.doi.org/10.1021/es204289c](https://doi.org/10.1021/es204289c)  
**Alkaline Earth Metal Cation Exchange: Effect of Mobile Counterion and Dissolved Organic Matter**  
Katrina Indarawati and Treavor H. Boyer\*

4599 [dx.doi.org/10.1021/es2042977](https://doi.org/10.1021/es2042977)  
**Visible-Light-Driven Photocatalytic Inactivation of *E. coli* K-12 by Bismuth Vanadate Nanotubes: Bactericidal Performance and Mechanism**  
WanJun Wang, Ying Yu,\* Taicheng An, Gulying Li, Ho Yin Yip, Jimmy C. Yu, and Po Keung Wong\*

4607 [dx.doi.org/10.1021/es300020e](https://doi.org/10.1021/es300020e)  
**Evaluating the Effects of Bioremediation on Genotoxicity of Polycyclic Aromatic Hydrocarbon-Contaminated Soil Using Genetically Engineered, Higher Eukaryotic Cell Lines**  
Jing Hu, Jun Nakamura,\* Stephen D. Richardson, and Michael D. Aitken\*

## Ecotoxicology and Human Environmental Health

4614 [dx.doi.org/10.1021/es203622v](https://doi.org/10.1021/es203622v)  
**Exposure to Toxic Metals and Persistent Organic Pollutants in Inuit Children Attending Childcare Centers in Nunavik, Canada**  
Huguette Turgeon O'Brien,\* Rosanne Blanchet, Doris Gagné, Julie Lauzière, Carole Vézina, Émilie Vaissière, Pierre Ayotte, and Serge Déry

4624 [dx.doi.org/10.1021/es204415a](https://doi.org/10.1021/es204415a)  
**Urinary Concentrations of Benzophenone-type UV Filters in U.S. Women and Their Association with Endometriosis**  
Tatsuya Kunisue, Zhen Chen, Germaine M. Buck Louis, Rajeshwari Sundaram, Mary L. Hediger, Liping Sun, and Kurunthachalam Kannan\*

4633 [dx.doi.org/10.1021/es2046074](https://doi.org/10.1021/es2046074)  
**Assessment of the Binding of Hydroxylated Polybrominated Diphenyl Ethers to Thyroid Hormone Transport Proteins Using a Site-Specific Fluorescence Probe**  
Xiao M. Ren and Liang-Hong Guo\*

4641 [dx.doi.org/10.1021/es300581p](https://doi.org/10.1021/es300581p)  
**MERGANSEr: An Empirical Model To Predict Fish and Loon Mercury in New England Lakes**  
James B. Shanley,\* Richard Moore, Richard A. Smith, Eric K. Miller, Allison Simcox, Neil Kamman, Diane Nacci, Keith Robinson, John M. Johnston, Melissa M. Hughes, Craig Johnston, David Evers, Kate Williams, John Graham, and Susannah King

## Energy and the Environment

4649 [dx.doi.org/10.1021/es203553e](https://doi.org/10.1021/es203553e)  
**Effects of Well Spacing on Geological Storage Site Distribution Costs and Surface Footprint**  
Jordan Eccles,\* Lincoln F. Pratson, and Munish Kumar Chandel

4657 [dx.doi.org/10.1021/es300143q](https://doi.org/10.1021/es300143q)  
**Fate of Hazardous Air Pollutants in Oxygen-Fired Coal Combustion with Different Flue Gas Recycling**  
Ye Zhuang\* and John H. Pavlish

4666 [dx.doi.org/10.1021/es300144m](https://doi.org/10.1021/es300144m)  
**Retene Emission from Residential Solid Fuels in China and Evaluation of Retene as a Unique Marker for Soft Wood Combustion**  
Guofeng Shen, Shu Tao,\* Siye Wei, Yanyan Zhang, Rong Wang, Bin Wang, Wei Li, Huizhong Shen, Ye Huang, Yifeng Yang, Wei Wang, Xilong Wang, and Staci L. Massey Simonich

Adverse Impact of Feed Channel Spacers on the Performance of Pressure Retarded Osmosis  
Yu Chang Kim and Menachem Elimelech\*

## Additions and Corrections

4682 **Correction to Significance of Xenobiotic Metabolism for Bioaccumulation Kinetics of Organic Chemicals in *Gammarus pulex***  
Roman Ashauer,\* Anita Hintermeister, Isabel O'Connor, Maline Elumelu, Juliane Hollender, and Beate I. Escher

dx.doi.org/10.1021/es301072j

4683 **Correction to "Efficient Dechlorination of Carbon tetrachloride by Hydrophobic Green Rust Intercalated with Dodecanoate Anions"**  
Karina B. Ayala-Luis,\* Nicola G. A. Cooper, Christian Bender Koch, and Hans Christian B. Hansen

dx.doi.org/10.1021/es301121a

4684 **Correction to Evaluating Rare Earth Element Availability: A Case with Revolutionary Demand from Clean Technologies**  
Elisa Alonso, Andrew M. Sherman, Timothy J. Wallington, Mark P. Everson, Frank R. Field, Richard Roth, and Randolph E. Kirchain\*

dx.doi.org/10.1021/es3011354

## Response to Timoney Critique of Royal Society of Canada Expert Panel on Oil Sands

Dr. Timoney's critique<sup>1</sup> of our December 2010 Royal Society of Canada (RSC) expert panel report<sup>2</sup> reviewing the environmental impacts of Canada's oil sands industry is inaccurate and misleading. We made clear that this is a massive industrial development that causes some major local and a few regional environmental impacts. We criticized the industry and governments for various actions and inactions, as well as opponents of the industry for making unsubstantiated claims. We did so to provide Canadians with an accurate and balanced assessment of publicly available and relevant evidence concerning this industry. We were not conducting an academic literature review.

According to Timoney, we were not sufficiently critical of this industry. We respectfully disagree. Because of length limitations on our response and Timoney's reliance on a detailed critique cited in his Viewpoint<sup>3</sup>, we cannot respond here to everything. However, in the spirit of our commitment, as a volunteer public service to Canadians under the sole sponsorship of Canada's national academy, we will be posting a detailed response on the RSC Web site.<sup>4</sup>

The first rule of harshly criticizing other scientists should be not to make your own inaccurate statements. Timoney starts and finishes his Viewpoint<sup>3</sup> with misleading assertions. He claims, without any citation, that the extraction and processing of bitumen from Alberta's oil sands "has become the world's largest energy project" and he closes by stating that this development has "global environmental and public health relevance." Current oil sands production is about 1.8% of current world oil production,<sup>5,6</sup> and contributes less than 0.1% of the world's total greenhouse gas emissions,<sup>5</sup> thus neither of Timoney's claims of global relevance have any quantitative foundation. The environmental impacts of Canada's oil sands industry, particularly for water quantity and quality issues that he reviewed, are entirely local and regional issues.

The failure to deal accurately with quantitative assessment of environmental issues underlies some of the many misunderstandings that Timoney conveys. Specifically, the distinction we would expect all informed readers of *ES&T* to understand is that mere detection of target contaminants in environmental media does not constitute an adverse environmental impact. Furthermore, as noted in our report, any conclusion about an adverse impact occurring requires validation of pathways for the environmental contaminants under suspicion to reach the impacted organism.

Timoney cites a prominent 2010 paper<sup>6</sup> for his Web site critique of our assessment of water quality. This paper<sup>6</sup> made an important contribution to the public debate about Athabasca River water quality by demonstrating that a number of priority metals that may arise from oil sands were found at higher concentrations in the river downstream from industrial operations compared with upstream. However, this paper also reported that all nine trace metals studied, which had a Guideline for Canadian Drinking Water Quality (GCDWQ), were substantially below the GCDWQ in the river downstream;

ranging from 0.3% of highest value relative to the GCDWQ for zinc to 23% for lead, with a median of 3% for antimony. There are no GCDWQ for the remaining trace metals sampled (silver, beryllium, nickel, or thallium). We find no basis in this evidence, or other congruent monitoring results, to predict human health impacts in communities located further downstream.

Timoney never mentions reviewing our chapter on public health, nor is he scientifically qualified to do so, yet he claimed that we were not justified to dismiss "downstream public health concerns" [emphasis added]. We made no such dismissal, but we recommended additional studies to focus specifically on human health exposures to downstream residents, while advising that the considerable monitoring data do not support the prominent media claims that oil sands contaminants are causing human cancers downstream. Moreover, we identified several public health impacts related to the pressures of a booming economy and recommended government responses.

Timoney was misleading to claim our report was out of date because we did not cite some 2010 publications. We made a written request to 58 stakeholders for submission of evidence by December 31, 2009, extended to January 31, 2010 to provide a basis for our review. Our 440 page report, citing over 650 references, was completed in draft form in August 2010 and ultimately released, after peer review, in December 2010, all of which Timoney knew. We did include some important late publications<sup>7</sup> but we do not claim to have reviewed everything published in 2010 and certainly not after August 2010 when we completed our draft. There had to be some deadline for acquiring new evidence.

Timoney describes our consideration of in-streamflow needs as "out of date and superficial", in part, for not including "a federal scientific evaluation"<sup>8</sup> published in September 2010.

Timoney is wrong to claim that we "did not consider the current water management framework." We reviewed the phase 1 framework published in 2007. Timoney misleads readers by claiming that we should have reviewed the phase 2 framework that has not been implemented yet. Regardless, we are entirely justified in our conclusions: "Water use demands do not threaten the viability of the Athabasca River system if the Water Management Framework developed to protect in-stream flow needs is fully implemented and enforced. Concerns expressed about water withdrawals during low flow conditions in the Athabasca River (typically in winter) can be addressed effectively by implementing additional industrial off-stream storage to capture water during high flow in spring."

Lastly we address Timoney's claim that our panel lacked expertise in "environmental chemistry, hydrology, sedimentology, surficial materials, statistics and wildlife ecology." This is also

Received: March 20, 2012

Accepted: March 20, 2012

Published: April 3, 2012