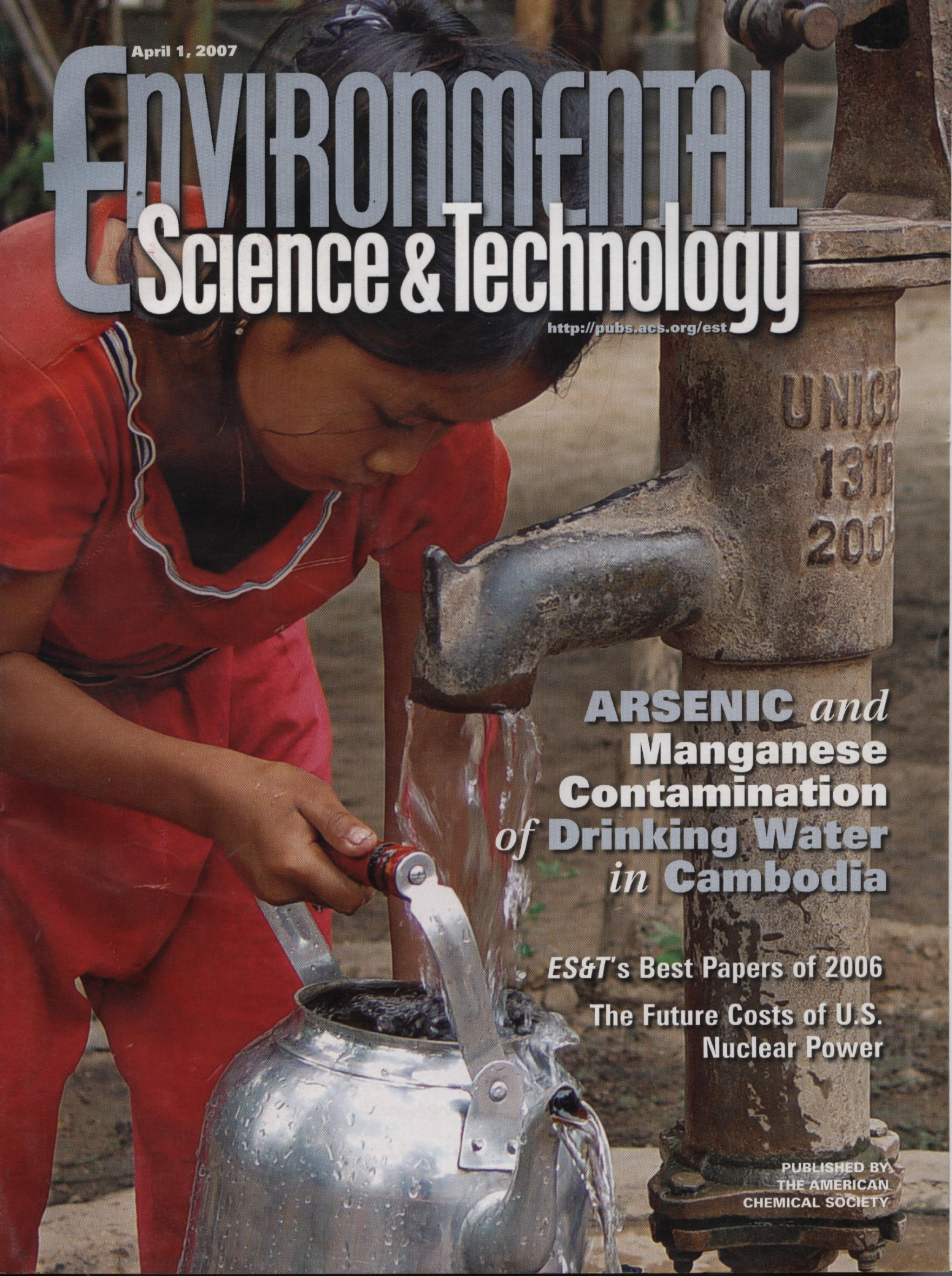


April 1, 2007

ENVIRONMENTAL Science & Technology

<http://pubs.acs.org/est>

A young girl in a red dress is filling a metal pitcher at a hand pump. The pump is a weathered metal structure with the words 'UNICEF 131B 200' visible on its side. Water is flowing from the spout into the pitcher. The background is a blurred outdoor setting.

**ARSENIC and
Manganese
Contamination
of Drinking Water
in Cambodia**

ES&T's Best Papers of 2006

**The Future Costs of U.S.
Nuclear Power**

PUBLISHED BY
THE AMERICAN
CHEMICAL SOCIETY



News and Features

2071 Comment

EPA's research budget

NEWS

2072 More triclosan trouble

Antibacterial products containing triclosan produce a probable carcinogen under common conditions.

2073 Indoor air is a major source of PCBs

New research contradicts the prevailing theory that soil volatilization is the primary source of PCBs in the atmosphere.

2073-2077 News Briefs

A tasty antidote to lead poisoning • Top 10 refinery polluters • Europe tightens CO₂ standards • Toxic substances affect brain similarly • Report: renewables are doable

2074 Another arsenic hot spot

High arsenic concentrations in shallow Cambodian groundwater wells could pose health risks for more than a million people.

2075 Arsenic in U.S. rice varies by region

A market basket study provides more evidence that some rice, particularly that from southern regions, has elevated arsenic levels.

2076 Global methane cycles in flux

The methane rise slows down, but questions remain as to whether such a leveling off will continue.

2077 Risk assessment rebuff for OMB

A National Research Council committee sends the Office of Management and Budget back to the drawing board in its efforts to improve government risk assessments.

2078 Technology Solutions

Closing the phosphorus loop

FEATURE

2080 ES&T's Best Papers of 2006

Barbara Booth, Rihit Chatterjee, Catherine Cooney, Erika Engelhaupt, Naomi Lubick, Anke Schaefer, and Jerald L. Schnoor

The top papers in environmental science, policy, and technology published in the journal in 2006 are highlighted by the staff of *ES&T*. Congratulations to the winners.

Cover: The photo of a Cambodian girl drawing water from a well was taken by Mickey Sampson of Resource Development International, Cambodia.

VIEWPOINT

2088 What History Can Teach Us about the Future Costs of U.S. Nuclear Power

Nathan E. Hultman, Jonathan G. Koomey, and Daniel M. Kammen



Energy security and environmental concerns have led the U.S. and nine other countries to begin developing fourth-generation nuclear reactor technology. Looking back at a 3-decade historical database of delivered costs from 99 individual U.S. nuclear reac-

tors, Hultman et al. discuss the financial risks for new nuclear power to achieve its cost objectives. They argue that past technology development patterns reflect the importance of including high-cost surprises in the planning process.

Research

POLICY ANALYSIS

■ 2095

Photochemical Modeling of Emissions Trading of Highly Reactive Volatile Organic Compounds in Houston, Texas. 1. Reactivity Based Trading and Potential for Ozone Hot Spot Formation

Linlin Wang, Tammy Thompson, Elena C. McDonald-Buller, Alba Webb, and David T. Allen

Adding industrial chlorine emissions to a reactivity-weighted emissions trading program for industrial sources of HRVOCs is unlikely to cause localized increases in ozone concentrations.

2103

Photochemical Modeling of Emissions Trading of Highly Reactive Volatile Organic Compounds in Houston, Texas. 2. Incorporation of Chlorine Emissions

Linlin Wang, Tammy Thompson, Elena C. McDonald-Buller, and David T. Allen

Implementing an emissions-trading program for industrial sources of HRVOCs in Houston is unlikely to cause localized increases in ozone concentrations.

■ 2108

Population Level Impacts of Cooling Water Withdrawals on Harvested Fish Stocks

Stephen C. Newbold and Rich Iovanna

A fish population model is used to estimate potential changes in equilibrium abundances of 15 harvested fish stocks in U.S. coastal areas if cooling-water withdrawals are eliminated.

■ Supporting information is available free at <http://pubs.acs.org/est>.

Online news: Read news first at <http://pubs.acs.org/estnews>.

CHARACTERIZATION OF NATURAL AND AFFECTED ENVIRONMENTS

■ 2115

Emissions of Levoglucosan, Methoxy Phenols, and Organic Acids from Prescribed Burns, Laboratory Combustion of Wildland Fuels, and Residential Wood Combustion

Lynn R. Mazzoleni, Barbara Zielinska, and Hans Moosmüller

PM_{2.5}-associated semi-VOC profiles are presented for a variety of biomass-burning fuels and scenarios, including residential wood combustion and prescribed burning.

■ 2123

Factors Associated with Sources, Transport, and Fate of Volatile Organic Compounds and Their Mixtures in Aquifers of the United States

Paul J. Squillace and Michael J. Moran

The occurrence of VOCs in groundwater of the U.S. is related to several variables that represent their sources, transport, and fate.

■ 2131

► Atmospheric Methane: Trends and Cycles of Sources and Sinks

M. Aslam Khan Khalil, Christopher L. Butenhoff, and Reinhold A. Rasmussen

Global methane emissions and sinks have probably been constant over the past 20 years, with peaks of 10 ppb occurring every 7–8 years.

2138

In-Cabin Commuter Exposure to Ultrafine Particles on Los Angeles Freeways

Yifang Zhu, Arantzazu Eiguren-Fernandez, William C. Hinds, and Antonio H. Miguel

Measurements of in-cabin and outdoor particle number concentration and size distribution from three vehicles driven in different ventilation conditions on Los Angeles freeways are provided.

■ 2146

► Arsenic and Manganese Contamination of Drinking Water Resources in Cambodia: Coincidence of Risk Areas with Low Relief Topography

Johanna Buschmann, Michael Berg, Caroline Stengel, and Mickey L. Sampson

On the basis of a comprehensive groundwater survey conducted in Cambodia, this study reveals sharply confined risk areas of arsenic and manganese contamination that have not been recognized previously.

■ 2153

► Concentrations and Chiral Signatures of Polychlorinated Biphenyls in Outdoor and Indoor Air and Soil in a Major U.K. Conurbation

Arsalan Jamshidi, Stuart Hunter, Sadegh Hazrati, and Stuart Harrad

Comparison of PCB levels and enantiomer fractions in urban soil and outdoor and indoor air reveals indoor air as the more significant source.

■ 2159

Inland Subsurface Water System Role for Coastal Nitrogen Load Dynamics and Abatement Responses

Georg A. Lindgren, Georgia Destouni, and Amélie Darracq

Simulations of long-term dynamics of N loading from land to sea show that the effects of inland source abatement on coastal N loading may be greatly delayed by slow subsurface N transport and mass-transfer processes.

■ 2165

Coupling Passive Air Sampling with Emission Estimates and Chemical Fate Modeling for Persistent Organic Pollutants (POPs): A Feasibility Study for Northern Europe

Rosalinda Gioja, Andy J. Sweetman, and Kevin C. Jones

Relatively cheap and straightforward tools, namely passive air samplers and fugacity-based models, can be used successfully in combination to “interrogate” national POPs emissions inventory estimates.

■ 2172

Vertical and Temporal Distribution of Persistent Organic Pollutants in Toronto. 1. Organochlorine Pesticides

Elodie Moreau-Guigon, Anne Motelay-Massei, Tom Harner, Karla Pozo, Miriam Diamond, Marc Chevreuil, and Hélène Blanchoud

Passive air samplers deployed on the CN Tower are used to investigate sources of organochlorine pesticides in the urban atmosphere of Toronto.

■ 2178

► Market Basket Survey Shows Elevated Levels of As in South Central U.S. Processed Rice Compared to California: Consequences for Human Dietary Exposure

P. N. Williams, A. Raab, J. Feldmann, and A. A. Meharg

Dietary exposure to inorganic As from elevated levels in rice potentially exceeds the U.S. EPA MCL for U.S. Asians and Hispanics.

■ 2184

Atmospheric Trends and Radiative Forcings of CF₄ and C₂F₆ Inferred from Firn Air

David R. Worton, William T. Sturges, Laila K. Gohar, Keith P. Shine, Patricia Martinerie, David E. Oram, Stephen P. Humphrey, Paul Begley, Lara Gunn, Jean-Marc Barnola, Jakob Schwander, and Robert Mulvaney

The atmospheric trends and radiative forcings of tetrafluoromethane and hexafluoroethane are reconstructed with firn air measurements from both hemispheres.

■ 2190

Reaction of Polycyclic Aromatic Hydrocarbons Adsorbed on Silica in Aqueous Chlorine

Hideyuki Nakamura, Yuzo Tomonaga, Kana Miyata, Mitsuo Uchida, and Yoshiyasu Terao

The reactivity of PAHs adsorbed on silica with aqueous chlorine in the presence or absence of potassium bromide is elucidated.

■ 2196

Altitudinal Gradients of PBDEs and PCBs in Fish from European High Mountain Lakes

Eva Gallego, Joan O. Grimalt, Mireia Bartrons, Jordi F. Lopez, Lluís Camarero, Jordi Catalan, Evzen Stuchlik, and Rick Battarbee

The concentrations of PBDEs in fish from high mountain lakes follow annual average air temperatures in the Pyrenees but not in the Tatras.

■ 2203

Beach Sand and Sediments are Temporal Sinks and Sources of *Escherichia coli* in Lake Superior

Satoshi Ishii, Dennis L. Hansen, Randall E. Hicks, and Michael J. Sadowsky

Rep-PCR DNA fingerprint analysis indicates that Lake Superior beach sand acts as a temporal sink and source of *E. coli* originating from humans and waterfowl.

■ 2210

PCDD/F Contamination over Time in Japanese Paddy Soils

Nobuyasu Seike, Nobuhisa Kashiwagi, and Takashi Otani

More than 80% of PCDD/Fs released from pentachlorophenol and chlornitrofen have disappeared from Japanese paddy fields over the past 40 years.

■ 2216

Bioaccumulation, Temporal Trend, and Geographical Distribution of Synthetic Musks in the Marine Environment

Haruhiko Nakata, Hiroshi Sasaki, Akira Takemura, Motoi Yoshioka, Shinsuke Tanabe, and Kurunthachalam Kannan

Polycyclic musks are present in aquatic organisms from various trophic levels; HHCb concentrations have increased in Japanese coastal waters since the early 1990s.

■ 2223

Particle Concentration and Characteristics near a Major Freeway with Heavy-Duty Diesel Traffic

Leonidas Ntziachristos, Zhi Ning, Michael D. Geller, and Constantinos Sioutas

The methods developed may be used to decouple the effects of sampling, meteorology, and fleet operation on particle concentrations near traffic.

2231

Surface Irrigation Reduces the Emission of Volatile 1,3-Dichloropropene from Agricultural Soils

D. J. Ashworth and S. R. Yates

Surface irrigation over the first 5 days after soil injection reduces soil-to-air emissions of the agricultural soil fumigant 1,3-D.

■ 2237

Serum Concentrations of 11 Polyfluoroalkyl Compounds in the U.S. Population: Data from the National Health and Nutrition Examination Survey (NHANES) 1999–2000

Antonia M. Calafat, Zsuzsanna Kuklenyik, John A. Reidy, Samuel P. Caudill, Jason S. Tully, and Larry L. Needham

Serum concentrations of 11 polyfluoroalkyl compounds, including PFOS and PFOA, are measured in a representative sample of the U.S. population 12 years of age and older during 1999–2000.

■ 2243

Volatilization of Parathion and Chlorothalonil from a Potato Crop Simulated by the PEARL Model

Minze Leistra and Frederik van den Berg

Volatilization of two pesticides from a crop is simulated with a computation model, and the results are compared with measurements in the field.

2249

Isomers of Dechlorane Plus in Lake Winnipeg and Lake Ontario Food Webs

Gregg T. Tomy, Kerri Pleskach, Nargis Ismail, D. Michael Whittle, Paul A. Helm, Ed Sverko, Donna Zaruk, and Chris H. Marvin

The trophic transfer of the *syn*- and *anti*-isomers of Dechlorane Plus is assessed in the Lake Winnipeg and Lake Ontario (Canada) food webs.

ENVIRONMENTAL PROCESSES

■ 2255

Impact of pH on Cu Accumulation Kinetics in Earthworm Cytosol

Martina G. Vijver, Marijke Koster, and Willie J. G. M. Peijnenburg

The protective effects of H⁺ ions and internal competition processes for binding to biotic ligands strongly impact the toxicological behavior of metals to soil organisms.

2261

Comparative Analysis of Three Tetrachloroethene to Ethene Halorespiring Consortia Suggests Functional Redundancy

Rebecca C. Daprato, Frank E. Löffler, and Joseph B. Hughes

Dechlorinating consortia capable of rapid ethene formation vary in *Dehalococcoides* composition, the presence of archaea, and fermentation pathways.

■ 2270

Importance of Dissolved Neutral Mercury Sulfides for Methyl Mercury Production in Contaminated Sediments

Andreas Drott, Lars Lambertsson, Erik Björn, and Ulf Skjällberg

Dissolved, neutral Hg sulfides in pore water and availability of energy-rich organic matter determine production and accumulation of methyl mercury in contaminated sediments.

■ 2277

The Copper-Mobilizing-Potential of Dissolved Organic Matter in Soils Varies 10-Fold Depending on Soil Incubation and Extraction Procedures

Fien Amery, Fien Degryse, Wim Degeling, Erik Smolders, and Roel Merckx

A new method to measure Cu affinity of DOM in soils at environmentally relevant Cu²⁺ activities reveals differences in DOM quality between soil extraction methods and soil incubation procedures.

■ 2282

Role of Sediment Resuspension in the Remobilization of Particulate-Phase Metals from Coastal Sediments

Linda H. Kalnejais, William R. Martin, Richard P. Signell, and Michael H. Bothner

The release of particulate-phase metals from coastal sediments is investigated with a combination of erosion chamber experiments, geochemical measurements, and hydrodynamic modeling.

■ 2289

Efflorescence Transitions of Ammonium Sulfate Particles Coated with Secondary Organic Aerosol

Satoshi Takahama, Ravi K. Pathak, and Spyros N. Pandis

The ability of secondary organic aerosol compounds to change the relative humidity at which ammonium sulfate particles crystallize in the atmosphere is investigated.

2296

Wavelength Dependence of the Photochemical Reduction of Iron in Arctic Seawater

Luis M. Laglera and Constant M. G. van den Berg

Iron in cold, high-latitude waters is found to be rapidly photochemically oxidized and chemically reoxidized by photochemically produced reactants.

■ 2303

Growth and Yields of Dechlorinators, Acetogens, and Methanogens during Reductive Dechlorination of Chlorinated Ethenes and Dihaloelimination of 1,2-Dichloroethane

Melanie Duhamel and Elizabeth A. Edwards

The population dynamics of a dechlorinating mixed microbial culture were studied using quantitative PCR to determine cell yields and to reveal factors that limit *Dehalococcoides* growth.

■ 2311

Hydrogen Thresholds and Steady-State Concentrations Associated with Microbial Arsenate Respiration

Supporting information is available free at <http://pubs.acs.org/est>.
▶ This issue contains a news story about this research.

Axel C. Heimann, Christian Blodau, Dieke Postma, Flemming Larsen, Pham H. Viet, Pham Q. Nhan, Søren Jessen, Mai T. Duc, Nguyen T. M. Hue, and Rasmus Jakobsen

Microbial As(V)-respirers have a competitive advantage over several other anaerobic respirers through their ability to thrive at low H₂ levels.

2318

Growth of *Dehalococcoides* Strains with Chlorophenols as Electron Acceptors

Lorenz Adrian, Sigrid K. Hansen, Jennifer M. Fung, Helmut Görtsch, and Stephen H. Zinder

Anaerobic transformation of all highly chlorinated phenols by pure *Dehalococcoides* strains is described, and growth is demonstrated with an automated direct cell-counting procedure.

2324

Absorption of Pathogenic Prion Protein to Quartz Sand

Xin Ma, Craig H. Benson, Debbie McKenzie, Judd M. Aiken, and Joel A. Pedersen

Interaction of pathogenic prion protein with quartz surfaces depends strongly on solution conditions; maximum adsorption occurs at pH ~4.6, near the apparent isoelectric point determined for prion-protein aggregates.

2331

Watershed Processing of Atmospheric Polychlorinated Biphenyl Inputs

Amy A. Rowe, Lisa A. Totten, Gregory J. Cavallo, and John R. Yagcic

Atmospheric deposition of PCBs to subwatersheds of the Delaware River is near equilibrium, with ~3% of the deposited mass passing through the watersheds.

2338

Stability of Metal-Glutathione Complexes during Oxidation by Hydrogen Peroxide and Cu(II)-Catalysis

Heileen Hsu-Kim

Complexation by Hg and Ag protects glutathione from oxidants for days; Cd, Zn, and Pb slow oxidation but do not prevent it.

2343

Monod Kinetics for Aerobic Biodegradation of Petroleum Hydrocarbons in Unsaturated Soil Microcosms

David W. Ostendorf, Theodore H. Schoenberg, Erich S. Hinlein, and Sharon C. Long

Monod kinetics with endogenous decay are applied to a blend of aromatics and alkanes, and a finite difference model is used to recalibrate a soil microcosm data set.

2350

Metabolism of BTEX and Naphtha Compounds to Methane in Oil Sands Tailings

Tariq Siddique, Phillip M. Fedorak, Michael D. MacKinnon, and Julia M. Foght

Short chain *n*-alkanes and BTEX compounds in naphtha support methane production in oil sands tailings.

2357

Controlled OH Radical Production via Ozone-Alkene Reactions for Use in Aerosol Aging Studies

Andrew T. Lambe, Jieyuan Zhang, Amy M. Sage, and Neil M. Donahue

We describe a high-flux, NO_x- and UV-free OH source with ozone-alkene reactions, revealing efficient OH uptake on paraffin particles with aerosol mass spectrometry data.

2364

Source-Dependent Variation in Hydroxyl Radical Production by Airborne Particulate Matter

Marjan Alaghmand and Neil V. Blough

Hydroxyl radical formation by a broad spectrum of airborne particles is examined with a new, highly sensitive technique.

2371

Accumulation, Whole-Body Depletion, and Debromination of Decabromodiphenyl Ether in Male Sprague-Dawley Rats Following Dietary Exposure

Janice K. Huwe and David J. Smith

In rats, BDE-209 minimally bioconcentrates, has a whole-body half-life of 9 days, and reductively debrominates to more persistent PBDEs to a minor extent.

2378

Did Smoke from the Kuwait Oil Well Fires Affect Iranian Archaeological Heritage?

Alessandra Bonazza, Cristina Sabbioni, Nadia Ghedini, Bernardo Hermosin, Valme Jurado, Juan Miguel Gonzalez, and Cesareo Saiz-Jimenez

The causes of the pollution at archaeological sites in southern Iran, assumed to be an effect of the Persian Gulf oil fires, are investigated.

2387

Formation of Chloroform and Other Chlorinated Byproducts by Chlorination of Triclosan-Containing Antibacterial Products

E. Matthew Fiss, Krista L. Rule, and Peter J. Vikesland

The triclosan present in antimicrobial soaps readily reacts with free chlorine to produce chlorinated products of possible health concern.

2395

Equilibrium Distribution of Polysulfide Ions in Aqueous Solutions at Different Temperatures by Rapid Single Phase Derivatization

Alexey Kamysny, Jr., Jenny Gun, Dan Rizkov, Tamara Voitsekovski, and Ovidia Lev

The temperature-dependent equilibrium distribution of polysulfides in aqueous solutions is unraveled by single-phase derivatization and HPLC analysis.

2401

Microbial and Chemical Assessment of Regions within New Orleans, LA Impacted by Hurricane Katrina

Kellogg J. Schwab, Kristen E. Gibson, D'Ann L. Williams, Kathryn M. Kulbicki, C. Paul Lo, Jana N. Mihalic, Patrick N. Breysse, Frank C. Currier, and Alison S. Geyh

Water, air, and soil samples are investigated for microorganisms, fungi, and heavy metals, respectively, in regions of New Orleans after Hurricane Katrina.

2407

Arctic Vegetation Damage by Winter-Generated Coal Mining Pollution Released upon Thawing

Bo Elberling, Jens Sondergaard, Louise A. Jensen, Lea B. Schmidt, Birger U. Hansen, Gert Asmund, Tonci Balić-Zunić, Jørgen Hollesen, Susanne Hanson, Per-Erik Jansson, and Thomas Friberg

Warm coal-mining waste produces acid mine drainage throughout the Arctic winter, but weathering products are released as a flush, killing plants downstream.

ENVIRONMENTAL MODELING

2414

Chemical Indices and Methods of Multivariate Statistics as a Tool for Odor Classification

Ingo T. Mahlke, Peter H. Thiesen, and Bernd Niemeyer

Malodorous volatile compounds are quantitatively described by chemical indices, and consecutive cluster analysis leads