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Feed the Crop
Not the Soil



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ON THE COVER: Phosphorus, a critical component in fertilizers, is primarily derived from depleting reserves of rock phosphate. This cover's Feature article discusses strategies to manage phosphorus throughout the food chain through public awareness, understanding of chemical dynamics, and increased recovery.

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Feed the Crop Not the Soil: Rethinking Phosphorus Management in the Food Chain

Paul J. A. Withers,* Roger Sylvester-Bradley, Davey L. Jones, John R. Healey, and Peter J. Talboys

Society relies heavily on inorganic phosphorus (P) compounds throughout its food chain. This dependency is not only very inefficient and increasingly costly but is depleting finite global reserves of rock phosphate. It has also left a legacy of P accumulation in soils, sediments and wastes that is leaking into our surface waters and contributing to widespread eutrophication. We argue for a new, more precise but more challenging paradigm in P fertilizer management that seeks to develop more sustainable food chains that maintain P availability to crops and livestock but with reduced amounts of imported mineral P and improved soil function. This new strategy requires greater public awareness of the environmental consequences of dietary choice, better understanding of soil–plant–animal P dynamics, increased recovery of both used P and unutilized legacy soil P, and new innovative technologies to improve fertilizer P recovery. In combination, they are expected to deliver significant economic, environmental, and resource-protection gains, and contribute to future global P stewardship. Society relies heavily on inorganic phosphorus (P) compounds throughout its food chain. This dependency is not only very inefficient and increasingly costly but is depleting finite global reserves of rock phosphate. It has also left a legacy of P accumulation in soils, sediments and wastes that is leaking into our surface waters and contributing to widespread eutrophication. We argue for a new, more precise but more challenging paradigm in P fertilizer management that seeks to develop more sustainable food chains that maintain P availability to crops and livestock but with reduced amounts of imported mineral P and improved soil function. This new strategy requires greater public awareness of the environmental consequences of dietary choice, better understanding of soil–plant–animal P dynamics, increased recovery of both used P and unutilized legacy soil P, and new innovative technologies to improve fertilizer P recovery. In combination, they are expected to deliver significant economic, environmental, and resource-protection gains, and contribute to future global P stewardship.

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Immobilized Synthetic Pathway for Biodegradation of Toxic Recalcitrant Pollutant 1,2,3-Trichloropropane


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Flocculation of *Escherichia coli* Using a Quaternary Ammonium Salt Grafted Carboxymethyl Chitosan Flocculant


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Microwave-Driven Asbestos Treatment and Its Scale-up for Use after Natural Disasters

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Humic Acid Acts as a Natural Antidote of Graphene by Regulating Nanomaterial Translocation and Metabolic Fluxes *in Vivo*

Xiangang Hu, Li Mu, Jia Kang, Kaicheng Lu, Ruiren Zhou, and Qixing Zhou*


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Growth of *Desulfovibrio vulgaris* When Respiring U(VI) and Characterization of Biogenic Uraninite

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Development of a Novel Filter Cartridge System with Electropositive Granule Media to Concentrate Viruses from Large Volumes of Natural Surface Water

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Bioaccumulation of Highly Hydrophobic Organohalogen Flame Retardants from Sediments: Application of Toxicokinetics and Passive Sampling Techniques


Huizhen Li, Baozhong Zhang, Yanli Wei, Fei Wang, Michael J. Lydy, and Jing You*

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Heavy Metal Uptake and Toxicity in the Presence of Titanium Dioxide Nanoparticles: A Factorial Approach Using *Daphnia magna*.

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Speciation of Arsenic in Saliva Samples from a Population of West Bengal, India

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Heightened Biological Uptake of Polybrominated Diphenyl Ethers Relative to Polychlorinated Biphenyls Near-Source Revealed by Sediment and Plankton Profiles along a Coastal Transect in British Columbia


Jean-Pierre W. Desforges, Neil Dangerfield, Patrick D. Shaw, and Peter S. Ross*

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Emission of Isothiazolinones from Water-Based Paints


Michael D. Lundov,* Barbara Kolarik, Rossana Bossi, Lars Gunnarsen, and Jeanne D. Johansen

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Potential Estrogenic Effects of Phosphorus-Containing Flame Retardants

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In Situ Formation of Pyromorphite Is Not Required for the Reduction of in Vivo Pb Relative Bioavailability in Contaminated Soils

Albert L. Juhasz,* Dorota Gancarz, Carina Herde, Stuart McClure, Kirk G. Scheckel, and Euan Smith

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Hydrogen Peroxide Formation in a Surrogate Lung Fluid by Transition Metals and Quinones Present in Particulate Matter

Jessica G. Charrier, Alexander S. McFall, Nicole K. Richards-Henderson, and Cort Anastasio*

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Urinary Phthalate Metabolite Associations with Biomarkers of Inflammation and Oxidative Stress Across Pregnancy in Puerto Rico

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Dynamic Modeling of Sublethal Mixture Toxicity in the Nematode *Caenorhabditis elegans*

Tjalling Jager,* Eva María Gudmundsdóttir, and Nina Cedergreen

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Polybrominated Diphenyl Ether Accumulation in an Agricultural Soil Ecosystem Receiving Wastewater Sludge Amendments

Michael O. Gaylor,* Greg L. Mears, Ellen Harvey, Mark J. La Guardia, and Robert C. Hale

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[dx.doi.org/10.1021/es501601w](https://doi.org/10.1021/es501601w)

¹H NMR Metabolomics Reveals Contrasting Response by Male and Female Mussels Exposed to Reduced Seawater pH, Increased Temperature, and a Pathogen

Robert P. Ellis,* John I. Spicer, Jonathan J. Byrne, Ulf Sommer, Mark R. Viant, Daniel A. White, and Steve Widdicombe

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[dx.doi.org/10.1021/es501628k](https://doi.org/10.1021/es501628k)

Acute Embryonic or Juvenile Exposure to Deepwater Horizon Crude Oil Impairs the Swimming Performance of Mahi-Mahi (*Coryphaena hippurus*)

Edward M. Mager,* Andrew J. Esbaugh, John D. Stieglitz, Ronald Hoenig, Charlotte Bodinier, John P. Incardona, Nathaniel L. Scholz, Daniel D. Benetti, and Martin Grosell

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Mechanisms of Selenomethionine Developmental Toxicity and the Impacts of Combined Hypersaline Conditions on Japanese Medaka (*Oryzias latipes*)

Allison Kupscio* and Daniel Schlenk

Energy and the Environment

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Current and Future Greenhouse Gas Emissions Associated with Electricity Generation in China: Implications for Electric Vehicles


Wei Shen,* Weijian Han, and Timothy J. Wallington

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Photoelectrocatalytic Reduction of CO₂ into Chemicals Using Pt-Modified Reduced Graphene Oxide Combined with Pt-Modified TiO₂ Nanotubes

Jun Cheng,* Meng Zhang, Gai Wu, Xin Wang, Junhu Zhou, and Kefa Cen

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High Resolution Carbon Dioxide Emission Gridded Data for China Derived from Point Sources

Jinnan Wang,* Bofeng Cai,* Lixiao Zhang, Dong Cao, Lancui Liu, Ying Zhou, Zhansheng Zhang, and Wenbo Xue

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Determination of Diffusion Profiles in Altered Wellbore Cement Using X-ray Computed Tomography Methods

Harris E. Mason,* Stuart D. C. Walsh, Wyatt L. DuFrane, and Susan A. Carroll

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Metal–Porphyrin: A Potential Catalyst for Direct Decomposition of N₂O by Theoretical Reaction Mechanism Investigation


Phornphimon Maitarad, Supawadee Namuangruk, Dengsong Zhang,* Liji Shi, Hongrui Li, Lei Huang, Bundet Boekfa, and Masahiro Ehara*

- 7111  [dx.doi.org/10.1021/es500191g](https://doi.org/10.1021/es500191g)
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- 7122  [dx.doi.org/10.1021/es500382d](https://doi.org/10.1021/es500382d)
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- 7128  [dx.doi.org/10.1021/es500469q](https://doi.org/10.1021/es500469q)
The Impact of Water Use Fees on Dispatching and Water Requirements for Water-Cooled Power Plants in Texas
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- 7135  [dx.doi.org/10.1021/es500483w](https://doi.org/10.1021/es500483w)
Electrolytic Membrane Extraction Enables Production of Fine Chemicals from Biorefinery Sidestreams
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- 7143  [dx.doi.org/10.1021/es500486j](https://doi.org/10.1021/es500486j)
Particulate PAH Emissions from Residential Biomass Combustion: Time-Resolved Analysis with Aerosol Mass Spectrometry
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- 7151  [dx.doi.org/10.1021/es500720g](https://doi.org/10.1021/es500720g)
Flame Oxidation of Stainless Steel Felt Enhances Anodic Biofilm Formation and Current Output in Bioelectrochemical Systems
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Process Modeling of an Advanced NH₃ Abatement and Recycling Technology in the Ammonia-Based CO₂ Capture Process
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Biogas Upgrading: Optimal Activated Carbon Properties for Siloxane Removal
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Additions and Corrections

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Correction to Household Cleaning Activities As Noningestion Exposure Determinants of Urinary Trihalomethanes
P. Charisiadis, S. S. Andra, K. C. Makris,* M. Christodoulou, C. A. Christophi, S. Kargaki, and E. G. Stephanou