

WALTER J. WEBER, JR., TRIBUTE

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ENVIRONMENTAL Science & Technology

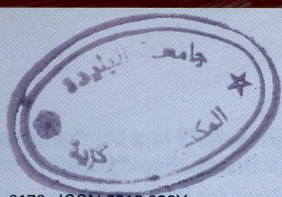
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Walter J. Weber, Jr.'s
Unique LEGACY

Energy Intensity of Computer Manufacturing:
Hybrid Assessment

Controlled Mesocosms for Understanding
Mercury Air–Soil–Plant Exchange

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Feature



434A Walter J. Weber, Jr.'s Unique Legacy

How many researchers can say that they spent more than 40 years at one university? Probably an even smaller number have mentored 72 graduate students and led groundbreaking projects. During his career at the University of Michigan, Weber has earned these distinctions—and is still planning to do more. As part of this Tribute issue, Rachel Petke-wich spoke with Weber, his stu-dents, and his colleagues.

Departments

425A Research Table of Contents

430A Guest Editors

431A Guest Comment

The work of Walter J. Weber, Jr.: Flexible with ideas, rigid on quality

440A Classifieds

Meetings Calendar: An up-to-date listing of environmental conferences and workshops is available free on the Web at <http://pubs.acs.org/est>.

Cover: Dwight Cendrowski photographed Walter J. Weber, Jr., in a lecture hall at the University of Michigan in Ann Arbor.

News

432A Calculating computing's environmental cost

The fact that computer technology is improving so fast has some down-sides, according to the most detailed analysis yet of the toll that PCs take on the environment.

433A National Academy of Engineering taps Rittmann

Rittmann's pioneering work with biofilms landed him a spot in the prestigious academy.

433A News Briefs

Using every drop • Eliminate oil by 2050?



Weber Tribute Research

Activated Carbon Adsorption

■ 5825

Modeling Trichloroethylene Adsorption by Activated Carbon Preloaded with Natural Dissolved Organic Matter Using a Modified IAST Approach

Andrew Wigton and James E. Kilduff

A bisolute model is developed and is verified to predict trichloroethylene adsorption by granular activated carbon pre-loaded with natural dissolved organic matter isolated from sur-face water sources.

■ 5834

Trichloroethylene Adsorption by Fibrous and Granular Activated Carbons: Aqueous-Phase, Gas-Phase, and Water-Vapor Adsorption Studies

Tanju Karanfil and Seyed A. Dastgheib

TCE molecular size and geometry, activated carbon surface hy-drophilicity, pore volume, and pore size distribution in micro-pores control adsorption of TCE at dilute aqueous solutions.

Adsorption to Organic Matter

5842

Black Carbon and Kerogen in Soils and Sediments. 2. Their Roles in Equilibrium Sorption of Less-Polar Organic Pollutants

Baohua Xiao, Zhiqiang Yu, Weilin Huang, Jianzhong Song, and Ping'an Peng

Particulate kerogen and black carbon isolated from soils and sed-iments dominate the overall nonlinear sorption of phenanthrene and naphthalene by bulk soils.

■ 5853

History-Dependent Sorption in Humic Acids and a Lignite in the Context of a Polymer Model for Natural Organic Matter

Yuefeng Lu and Joseph J. Pignatello

Results support a mechanism of hysteresis in organic matter in which sorbing molecules cause matrix deformation that is irre-versible on the time scale of sorption.

■ Supporting Information is available free of charge via the Internet at <http://pubs.acs.org>.

■ 5863

Effects of Competitor and Natural Organic Matter Characteristics on the Equilibrium Sorption of 1, 2-Dichlorobenzene in Soil and Shale

Daeyoung Ju and Thomas M. Young

Competition is associated with voids in NOM structure, and diagenetic alteration of NOM plays a central role in determining competitive sorption characteristics.

■ 5871

Influence of Humic Substance Adsorptive Fractionation on Pyrene Partitioning to Dissolved and Mineral-Associated Humic Substances

Jin Hur and Mark A. Schlautman

Possible relationships are investigated between pyrene K_{oc} values for adsorption-fractionated dissolved and mineral-associated humic substances and their corresponding MW_w values.

Physical and Biological Processes Affecting Fate and Transport

■ 5878

Selective Solubilization of Polycyclic Aromatic Hydrocarbons from Multicomponent Nonaqueous-Phase Liquids into Nonionic Surfactant Micelles

Leticia A. Bernardez and Subhasis Ghoshal

The equilibrium solubilization is investigated of naphthalene and phenanthrene from NAPLs that contain varying amounts of these solutes to solutions of different nonionic surfactants.

■ 5888

Photosensitized Degradation of Bisphenol A by Dissolved Organic Matter

Yu-Ping Chin, Penney L. Miller, Lingke Zeng, Kaelin Cawley, and Linda K. Weavers

Dissolved organic matter mediates the phototransformation of bisphenol A in simulated sunlight.

5895

Examination of Darcy's Law for Flow in Porous Media with Variable Porosity

W. G. Gray and C. T. Miller

Darcy's law is examined for flow in variable-porosity media.

■ 5902

Stimulated Microbial Reductive Dechlorination following Surfactant Treatment at the Bachman Road Site

C. Andrew Ramsburg, Linda M. Abriola, Kurt D. Pennell, Frank E. Löffler, Matthew Gamache, Benjamin K. Amos, and Erik A. Petrovskis

Stimulation of indigenous chlororespiring bacteria after surfactant flushing is assessed using pre- and posttreatment monitoring data in conjunction with mathematical modeling of chemical transport.

Particles, Microbial Pathogens, and Water Quality Management

5915

Aquasols: On the Role of Secondary Minima

Melinda W. Hahn, Dean Abadzic, and Charles R. O'Melia

A theory is developed, tested, and validated for the deposition and re-entrainment of colloids in secondary minima during flow through porous media.

■ 5925

Uncertainty Analysis in a Mechanistic Model of Bacterial Regrowth in Distribution Systems

Francis A. DiGiano and Weidong Zhang

Cumulative probability plots depict the uncertainty in predictions of bacteria and chlorine disinfectant concentrations at various locations within a distribution system; concentrations are dependent upon water residence time.

5932

Transport of *Cryptosporidium* Oocysts in Porous Media: Role of Straining and Physicochemical Filtration

Nathalie Tufenkji, Garrett F. Miller, Joseph N. Ryan, Ronald W. Harvey, and Menachem Elimelech

Irregularity of sand grain shape causes physical straining, which plays an important role in the filtration of *Cryptosporidium* oocysts in natural porous media.

Research

Characterization of Natural and Affected Environments

5939

Sugars—Dominant Water-Soluble Organic Compounds in Soils and Characterization as Tracers in Atmospheric Particulate Matter

Bernd R. T. Simoneit, Vladimir O. Elias, Minoru Kobayashi, Kimitaka Kawamura, Ahmed I. Rushdi, Patricia M. Medeiros, Wolfgang F. Rogge, and Borys M. Didyk

The sources, chemistry, and quantitation of saccharides, which can be used as organic tracers and applied in source models, are described.

5950

Characterization of Redox Processes in Shallow Groundwater of Owens Dry Lake, California

Ji-hun Ryu, Randy A. Dahlgren, Suduan Gao, and Kenneth K. Tanji

Various approaches, including the energetics of terminal electron accepting processes, are used to evaluate redox conditions in hypersaline shallow groundwater of Owens Dry Lake.

5958

Preliminary Study of Lake Dissolved Organic Matter in Light of Nanoscale Supramolecular Assembly

Juhani Peuravuori and Kalevi Pihlaja

Looking at the structural problem of natural organic matter from the nanoscale supramolecular assembly point of view will be really viable.

■ 5968

Simultaneous Determination of Carbonyls and NO₂ in Exhausts of Heavy-Duty Diesel Trucks and Transit Buses by HPLC following 2,4-Dinitrophenylhydrazine Cartridge Collection

Shida Tang, Lisa Graham, Ling Shen, Xianliang Zhou, and Thomas Lanni

With a chassis dynamometer, exhaust emissions are determined for trucks and transit buses tested under several fuel and after-treatment device combinations and over different driving cycles.

5977

Chemical and Mineralogical Characterization of Blast-Furnace Sludge from an Abandoned Landfill

Tim Mansfeldt and Reiner Dohrmann

Extremely high levels of zinc, lead, and cadmium and high concentrations of dissolved fluoride in landfilled blast-furnace sludge are causing environmental concern.

5985

Physicochemical Characteristics and Biological Activities of Seasonal Atmospheric Particulate Matter Sampling in Two Locations of Paris

Augustin Baulig, Jean-Jacques Poirault, Patrick Ausset, Roel Schins, Tingming Shi, Delphine Baralle, Pascal Dorlhene, Martine Meyer, Roger Lefevre, Armelle Baeza-Squiban, and Francelyne Marano

Paris PM_{2.5} values are compared for their metals and PAH content in relation to their ability to induce oxidative stress and cytokines release by bronchial cells.

5993

European-Scale Modeling of Concentrations and Distribution of Polybrominated Diphenyl Ethers in the Pentabromodiphenyl Ether Product

K. Prevedouros, K. C. Jones, and A. J. Sweetman

Model predictions are compared with ambient measurements to investigate the ability of the model to predict spatial variability and differences among congeners.

6002

Use of Fecal Steroids To Infer the Sources of Fecal Indicator Bacteria in the Lower Santa Ana River Watershed, California: Sewage Is Unlikely a Significant Source

James A. Noblet, Diana L. Young, Eddy Y. Zeng, and Semsî Ensari

Examination of fecal steroids suggests that sewage is not an important source of fecal indicator bacteria in the lower Santa Ana River watershed.

6009

Climate-Induced Episodic Acidification of Streams in Central Ontario

H. Laudon, P. J. Dillon, M. C. Eimers, R. G. Semkin, and D. S. Jeffries

Periods of drought preceding rainstorms cause the most severe acidification episodes in central Ontario streams, particularly in basins that contain wetlands.

Environmental Processes

6016

Pu(V)O₂²⁺ Adsorption and Reduction by Synthetic Magnetite (Fe₃O₄)

Brian A. Powell, Robert A. Fjeld, Daniel I. Kaplan, John T. Coates, and Steven M. Serkiz

The kinetics of Pu(V) adsorption and reduction on magnetite (Fe₃O₄) are examined; they demonstrate the existence of a pathway for plutonium retardation during subsurface transport.

6025

Oxidation of the Cyanobacterial Hepatotoxin Microcystin-LR by Chlorine Dioxide: Reaction Kinetics, Characterization, and Toxicity of Reaction Products

Tomas P. J. Kull, Peter H. Backlund, Krister M. Karlsson, and Jussi A. O. Meriluoto

Microcystin-LR is degraded to dihydroxy isomers, and its protein phosphatase inhibition effect is lost when it is oxidized by chlorine dioxide; however, the reaction rate is modest.

6032

Spectroscopic Characterization of the Uranium Carbonate Andersonite Na₂Ca[UO₂(CO₃)₃] • 6H₂O

Samer Amayri, Thuro Arnold, Tobias Reich, Harald Foerstendorf, Gerhard Geipel, Gert Bernhard, and Andreas Massanek

Uranium carbonate andersonite, Na₂Ca[UO₂(CO₃)₃] • 6H₂O, is synthesized and characterized by time-resolved laser-induced fluorescence spectroscopy, X-ray photoelectron spectroscopy, and Fourier-transform infrared spectroscopy.

Notices to ES&T authors

1. Effective now, titles must be included in the Reference section of *ES&T* research papers.
2. Effective January 1, 2005, all *ES&T* research papers must be submitted via the Web (<https://paragon.acs.org/paragon/index.jsp>). Email submissions or paper copies will not be accepted.

6037

Stability of Cyanogen Chloride in the Presence of Free Chlorine and Monochloramine

Chongzheng Na and Terese M. Olson

A mechanistic study of cyanogen chloride stability under disinfection conditions shows that it is catalytically hydrolyzed by hypochlorite ions yet is relatively stable while in chloramine solutions.

6044

Application of Controlled Mesocosms for Understanding Mercury Air–Soil–Plant Exchange

M. S. Gustin, J. A. Ericksen, D. E. Schorran, D. W. Johnson, S. E. Lindberg, and J. S. Coleman

Whole-system mercury flux measured using large mesocosms is found to decline with leaf-out as plants assimilate from the air, and foliage shades the soil.

■ 6051

Cd and Zn Uptake Kinetics in *Daphnia magna* in Relation to Cd Exposure History

Rui Guan and Wen-Xiong Wang

Cadmium pre-exposure history has an important influence on the biokinetics and potential toxicity of cadmium and zinc to a cladoceran *Daphnia magna*.

■ 6059

Effects of Phosphate on Uranium(VI) Adsorption to Goethite-Coated Sand

Tao Cheng, Mark O. Barnett, Eric E. Roden, and Jinling Zhuang

The presence of aqueous phosphate increases U(VI) adsorption to goethite-coated sand in the acidic pH range, whereas it decreases U(VI) adsorption in the alkaline pH range.

6066

Colloid Formation at Waste Plume Fronts

Jiamin Wan, Tetsu K. Tokunaga, Eduardo Saiz, Joern T. Larsen, Zuoping Zheng, and Rex A. Couture

Most of the mobile colloid inventory during infiltration of saline waste solution is found at the plume front.

6074

Arsenic Sequestration by Ferric Iron Plaque on Cattail Roots

Nicole Keon Blute, Daniel J. Brabander, Harold F. Hemond, Stephen R. Sutton, Matthew G. Neville, and Mark L. Rivers

This study reports the micrometer-scale spatial distribution of arsenic species in iron-rich cattail root plaques and the implications for reduced pore-water concentrations.

6078

NO and NO₂ Emission Ratios Measured from In-Use Commercial Aircraft during Taxi and Takeoff

Scott C. Herndon, Joanne H. Shorter, Mark S. Zahniser, David D. Nelson, Jr., John Jayne, Robert C. Brown, Richard C. Miake-Lye, Ian Waitz, Phillip Silva, Thomas Lanni, Ken Demerjian, and Charles E. Kolb

■ Supporting Information is available free of charge via the Internet at <http://pubs.acs.org>.

For three unambiguously identified aircraft of different engine types, measured emission ratios are compared with the ICAO database; values agree within expected engine-to-engine variability and aging effects.

6085

Chronic Effects of Dietary Selenium on Juvenile Sacramento Splittail (*Pogonichthys macrolepidotus*)

Swee J. Teh, Xin Deng, Dong-Fang Deng, Foo-Ching Teh, Silas S. O. Hung, Teresa W.-M. Fan, Jee Liu, and Richard M. Higashi

Chronic effects of dietary selenium on the California native fish species Sacramento splittail (*Pogonichthys macrolepidotus*) are discussed.

Environmental Modeling

6094

Quantification of Variability and Uncertainty for Air Toxic Emission Inventories with Censored Emission Factor Data

H. Christopher Frey and Yuchao Zhao

With Houston used as an example, probabilistic emission inventories are developed for urban air toxic emissions of benzene, formaldehyde, chromium, and arsenic.

Environmental Measurements Methods

6101

Phosphorus Compounds in Sequential Extracts of Animal Manures: Chemical Speciation and a Novel Fractionation Procedure

Benjamin L. Turner and April B. Leytem

Nuclear magnetic resonance spectroscopy reveals that the chemical speciation of phosphorus in animal manures is among the greatest threats to water quality in developed countries.

6109

Comparison of Seven Protocols To Identify Fecal Contamination Sources Using *Escherichia coli*

Donald M. Stoeckel, Melvin V. Mathes, Kenneth E. Hyer, Charles Hagedorn, Howard Kator, Jerzy Lukasik, Tara L. O'Brien, Terry W. Fenger, Mansour Samadpour, Kriston M. Strickler, and Bruce A. Wiggins

Seven protocols for microbial source tracking are shown to limit reproducibility, accuracy, and robustness; hence, the reliability of sample-level interpretation is frequently compromised.

Remediation and Control Technologies

6118

Decomposition of Environmentally Persistent Perfluorooctanoic Acid in Water by Photochemical Approaches

Hisao Hori, Etsuko Hayakawa, Hisahiro Einaga, Shuzo Kutsuna, Kazuhide Koike, Takashi Ibusuki, Hiroshi Kiatagawa, and Ryuichi Arakawa

PFOA can be effectively decomposed to F^- and CO_2 at room temperature through the use of a heteropolyacid photocatalyst, and no trace of harmful species such as CF_4 is produced.

6125

Degradation of Methylparathion in Aqueous Solution by Electrochemical Oxidation

Apostolos Vlyssides, Elli Maria Barampouti, Sofia Mai, and Dimitris Arapoglou

A proposed mechanism for the electrochemical degradation of methylparathion is presented in which oxalic, formic, and acetic acids and tetraphosphorus trisulfide are recognized as final products.

6132

Particles in Filter Effluent: The Roles of Deposition and Detachment

Jakyum Kim and John E. Tobiason

Model system results suggest that detachment plays a significant role in the origin of filter effluent particles in full-scale water treatment systems.

6139

Immobilized *N*-Methyl-*D*-Glucamine as an Arsenate-Selective Resin

Laurent Dambies, Richard Salinaro, and Spiro D. Alexandratos

Immobilization of *N*-methyl-*D*-glucamine on cross-linked beads yields a highly selective sorbent for arsenate ions; the ligand structure, ionic form, and cross-link density are critical variables.

6147

Uptake of Weathered DDT in Vascular Plants: Potential for Phytoremediation

Alissa I. Lunney, Barbara A. Zeeb, and Kenneth J. Reimer

The ability of five plant varieties to mobilize and translocate DDT is compared, and the potential is discussed for their application in phytoremediation.

6155

Infectivity Studies of Both Ash and Air Emissions from Simulated Incineration of Scrapie-Contaminated Tissues

Paul Brown, Edward H. Rau, Paul Lemieux, Bruce K. Johnson, Alfred E. Bacote, and D. Carleton Gajdusek

Exposure of scrapie-infected brain tissue to 600 and 1000 °C for 15 min yields minimal infectivity in the ashed sample at 600 °C, no infectivity at 1000 °C, and no infectivity in vented gas at either temperature.

6161

Establishing and Elucidating Reduction as the Removal Mechanism of Cr(VI) by Reclaimed Limestone Residual RLR (Modified Steel Slag)

Charles E. Ochola and Horace K. Moo-Young

A novel treatment method by reclaimed limestone residual for Cr(VI) in solution is presented, and the removal mechanisms are discussed.

Sustainability Engineering and Green Chemistry

6166

Energy Intensity of Computer Manufacturing: Hybrid Assessment Combining Process and Economic Input-Output Methods

Eric Williams

A high energy intensity of manufacturing, combined with rapid computer turnover, results in a high annual life-cycle energy burden that is dominated by production rather than operation.

Correspondence/Rebuttal

6175

Comment on "Modeling Maximum Adsorption Capacities of Soot and Soot-like Materials for PAHs and PCBs"

John C. Fetzer

6176

Response to Comment on "Modeling Maximum Adsorption Capacities of Soot and Soot-like Materials for PAHs and PCBs"

Paul C. M. van Noort, Michiel T. O. Jonker, and Albert A. Koelmans

Supporting Information is available free of charge via the Internet at <http://pubs.acs.org>.

This issue contains a news story about this research.