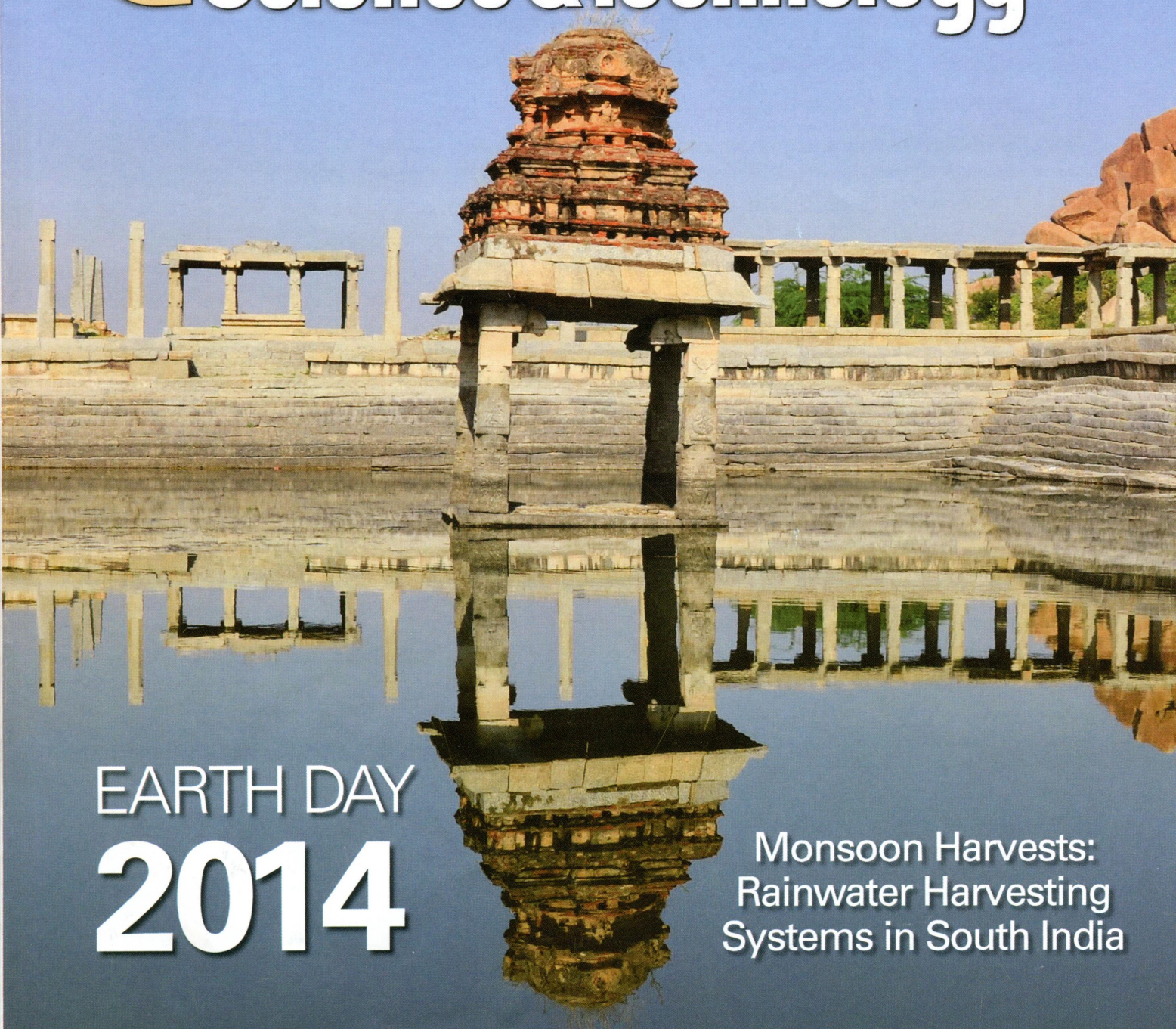


PLU
E54/s

ENVIRONMENTAL Science & Technology

April 15, 2014
Volume 48
Number 8
pubs.acs.org/est



EARTH DAY
2014

Monsoon Harvests:
Rainwater Harvesting
Systems in South India



ACS Publications
MOST TRUSTED. MOST CITED. MOST READ.

www.acs.org

ON THE COVER: Rainwater harvesting is increasingly being recognized as a strategy for alleviating problems of water scarcity. This issue's Feature article discusses the potential benefits and problems associated with the revival of 1000-year-old rainwater harvesting structures in South India and emphasizes the need for a watershed-scale approach in evaluating whether rainwater harvesting systems can indeed increase water availability and contribute to the sustainable use of water resources within a basin.

Features

4217

[dx.doi.org/10.1021/es4040182](https://doi.org/10.1021/es4040182)

Monsoon Harvests: The Living Legacies of Rainwater Harvesting Systems in South India

Kimberly J. Van Meter, Nandita B. Basu,* Eric Tate, and Joseph Wyckoff

Rainwater harvesting, a “soft path” approach toward water management, is increasingly recognized as a key strategy toward ensuring food security and alleviating problems of water scarcity. Interestingly this “modern” approach has been in use for millennia in numerous older civilizations. This article uses India as a case study to explore the social, economic, and environmental dimensions of agricultural rainwater harvesting ponds, and evaluates the viability of these centuries-old systems under current climate and population pressures. A holistic watershed-scale approach that accounts for trade-offs in water availability and socioeconomic wellbeing is recommended for assessing the sustainability of these systems. Rainwater harvesting, a “soft path” approach toward water management, is increasingly recognized as a key strategy toward ensuring food security and alleviating problems of water scarcity. Interestingly this “modern” approach has been in use for millennia in numerous older civilizations. This article uses India as a case study to explore the social, economic, and environmental dimensions of agricultural rainwater harvesting ponds, and evaluates the viability of these centuries-old systems under current climate and population pressures. A holistic watershed-scale approach that accounts for trade-offs in water availability and socioeconomic wellbeing is recommended for assessing the sustainability of these systems.

Critical Reviews

4226

[dx.doi.org/10.1021/es4052999](https://doi.org/10.1021/es4052999)

Identification and Avoidance of Potential Artifacts and Misinterpretations in Nanomaterial Ecotoxicity Measurements

Elijah J. Petersen,* Theodore B. Henry, Jian Zhao, Robert I. MacCuspie, Teresa L. Kirschling, Marina A. Dobrovol'skaia, Vincent Hackley, Baoshan Xing, and Jason C. White

4247

[dx.doi.org/10.1021/es4055324](https://doi.org/10.1021/es4055324)

Mitigating Nitrous Oxide Emissions from Corn Cropping Systems in the Midwestern U.S.: Potential and Data Gaps

Charlotte Decock*

Policy Analysis

4257

[dx.doi.org/10.1021/es405604g](https://doi.org/10.1021/es405604g)

Long-Term Strategies for Increased Recycling of Automotive Aluminum and Its Alloying Elements

Amund N. Løvik,* Roja Modaresi, and Daniel B. Müller*

Articles

Characterization of Natural and Affected Environments

4266  [dx.doi.org/10.1021/es401770y](https://doi.org/10.1021/es401770y)

Hydroxyl Radical Generation from Environmentally Persistent Free Radicals (EPFRs) in PM_{2.5}

William Gehling, Lavrent Khachatryan, and Barry Dellinger*

4273  [dx.doi.org/10.1021/es5006797](https://doi.org/10.1021/es5006797)

Extreme Carbon Dioxide Concentrations in Acidic Pit Lakes Provoked by Water/Rock Interaction

Javier Sánchez-España,* Bertram Boehrer, and Iñaki Yusta

4282 [dx.doi.org/10.1021/es404883s](https://doi.org/10.1021/es404883s)

Land Use and Conservation Reserve Program Effects on the Persistence of Playa Wetlands in the High Plains

Dale W. Daniel,* Loren M. Smith, David A. Haukos, Lacreacia A. Johnson, and Scott T. McMurry

4289  [dx.doi.org/10.1021/es4050314](https://doi.org/10.1021/es4050314)

Identification and Composition of Emerging Quaternary Ammonium Compounds in Municipal Sewage Sludge in China

Ting Ruan, Shanjun Song, Thanh Wang, Runzeng Liu, Yongfeng Lin, and Guibin Jiang*

4298  [dx.doi.org/10.1021/es405020k](https://doi.org/10.1021/es405020k)


Uranium and Radon in Private Bedrock Well Water in Maine: Geospatial Analysis at Two Scales

Qiang Yang, Paul Smitherman, C. T. Hess, Charles W. Culbertson, Robert G. Marvinney, Andrew E. Smith, and Yan Zheng*

4307  [dx.doi.org/10.1021/es405330x](https://doi.org/10.1021/es405330x)

Characterization of Colloidal Fe from Soils Using Field-Flow Fractionation and Fe K-Edge X-ray Absorption Spectroscopy

Inge C. Regelink, Andreas Voegelin, Liping Weng,* Gerwin F. Koopmans, and Rob N. J. Comans

4317  [dx.doi.org/10.1021/es4053895](https://doi.org/10.1021/es4053895)

Rare Earth Element Distributions and Trends in Natural Waters with a Focus on Groundwater









Clinton W. Noack, David A. Dzombak, and Athanasios K. Karamalidis*

4327  [dx.doi.org/10.1021/es405533d](https://doi.org/10.1021/es405533d)

2013 Southeast Asian Smoke Haze: Fractionation of Particulate-Bound Elements and Associated Health Risk

Raghu Betha, Sailesh N. Behera, and Rajasekhara Balasubramanian*

Environmental Processes

- 4336  [dx.doi.org/10.1021/es500393z](https://doi.org/10.1021/es500393z)
The Fate of Atmospherically Derived Pb in Central European Catchments: Insights from Spatial and Temporal Pollution Gradients and Pb Isotope Ratios
Leona Bohdalikova, Martin Novak,* Marketa Stepanova, Daniela Fottova, Vladislav Chrastny, Jitka Mikova, and Ales A. Kubena
- 4344  [dx.doi.org/10.1021/es403941h](https://doi.org/10.1021/es403941h)
Isothermal Microcalorimetry Provides New Insight into Terrestrial Carbon Cycling
Anke M. Herrmann,* Elsa Coucheney, and Naoise Nunan
- 4353  [dx.doi.org/10.1021/es404265d](https://doi.org/10.1021/es404265d)
Kinetics and Threshold Level of 2,3,4,5-Tetrachlorobiphenyl Dechlorination by an Organohalide Respiring Bacterium
Nathalie J. Lombard, Upal Ghosh, Birthe V. Kjellerup, and Kevin R. Sowers*
- 4361  [dx.doi.org/10.1021/es404347h](https://doi.org/10.1021/es404347h)
Kinetics of PCDD/Fs Formation from Non-Wood Pulp Bleaching with Chlorine
Xueli Wang, Haijun Zhang, Yuwen Ni, Qinqin Du, Xueping Zhang, and Jiping Chen*
- 4368  [dx.doi.org/10.1021/es404793u](https://doi.org/10.1021/es404793u)
Co-Transport of Polycyclic Aromatic Hydrocarbons by Motile Microorganisms Leads to Enhanced Mass Transfer under Diffusive Conditions
Dorothea Gilbert, Hans H. Jakobsen, Anne Winding, and Philipp Mayer*
- 4376  [dx.doi.org/10.1021/es404931g](https://doi.org/10.1021/es404931g)
Evidence of Translocation and Physiological Impacts of Foliar Applied CeO₂ Nanoparticles on Cucumber (*Cucumis sativus*) Plants
Jie Hong, Jose R. Peralta-Videa, Cyren Rico, Shivendra Sahi, Marian N. Viveros, Jane Bartonjo, Lijuan Zhao, and Jorge L. Gardea-Torresdey*
- 4386  [dx.doi.org/10.1021/es405032d](https://doi.org/10.1021/es405032d)
Effects of Carbon Dioxide on the Mobilization of Metals from Aquifers
Katerina Terzi, Christos A. Aggelopoulos, Ioannis Bountas, and Christos D. Tsakiroglou*
- 4395  [dx.doi.org/10.1021/es405119q](https://doi.org/10.1021/es405119q)
Water Chemistry Impacts on Arsenic Mobilization from Arsenopyrite Dissolution and Secondary Mineral Precipitation: Implications for Managed Aquifer Recharge
Chelsea W. Neil, Y. Jeffrey Yang, Don Schupp, and Young-Shin Jun*

4406 

dx.doi.org/10.1021/es405471u

Release Kinetics of Multiwalled Carbon Nanotubes Deposited on Silica Surfaces: Quartz Crystal Microbalance with Dissipation (QCM-D) Measurements and Modeling
Peng Yi and Kai Loon Chen*

4414 

dx.doi.org/10.1021/es405496b

Effects of Molecular Composition of Natural Organic Matter on Ferric Iron Complexation at Circumneutral pH
Manabu Fujii,* Akira Imaoka, Chihiro Yoshimura, and T. D. Waite

4425 

dx.doi.org/10.1021/es4056005

Fine-Scale in Situ Measurement of Riverbed Nitrate Production and Consumption in an Armored Permeable Riverbed
Katrina Lansdown,* Catherine M. Heppell, Matteo Dossena, Sami Ullah, A. Louise Heathwaite, Andrew Binley, Hao Zhang, and Mark Trimmer*

4435 


dx.doi.org/10.1021/es405694z

Biotransformation of Benzotriazoles: Insights from Transformation Product Identification and Compound-Specific Isotope Analysis
Sebastian Huntscha, Thomas B. Hofstetter, Emma L. Schymanski, Stephanie Spahr, and Juliane Hollender*

Environmental Modeling

4444  dx.doi.org/10.1021/es4051988


Feeding Nine Billion People Sustainably: Conserving Land and Water through Shifting Diets and Changes in Technologies
Nathaniel P. Springer* and Faye Duchin

4452 

dx.doi.org/10.1021/es405390e

Large Scale Air Pollution Estimation Method Combining Land Use Regression and Chemical Transport Modeling in a Geostatistical Framework
Yasuyuki Akita,* Jose M. Baldasano, Rob Beelen, Marta Cirach, Kees de Hoogh, Gerard Hoek, Mark Nieuwenhuijsen, Marc L. Serre, and Audrey de Nazelle

Environmental Measurements Methods

4460  dx.doi.org/10.1021/es404980x

Analysis of the Mo Speciation in the JEB Tailings Management Facility at McClean Lake, Saskatchewan
John R. Hayes, Andrew P. Grosvenor,* John Rowson, Kebbi Hughes, Ryan A. Frey, and Joel Reid

4468 

dx.doi.org/10.1021/es4057032

A Novel Brominated Triazine-based Flame Retardant (TTBP-TAZ) in Plastic Consumer Products and Indoor Dust
Ana Ballesteros-Gómez,* Jacob de Boer, and Pim E. G. Leonards

4475



[dx.doi.org/10.1021/es405809r](https://doi.org/10.1021/es405809r)

Improved Method for Measuring and Characterizing Phthalate Emissions from Building Materials and Its Application to Exposure Assessment
Yirui Liang and Ying Xu*

4485



[dx.doi.org/10.1021/es404850f](https://doi.org/10.1021/es404850f)

Diffusional Gradients in Thin Films Technique Provide Robust Prediction of Metal Bioavailability and Toxicity in Estuarine Sediments
Elvio D. Amato, Stuart L. Simpson, Chad V. Jarolimek, and Dianne F. Jolley*

Remediation and Control Technologies

4495



[dx.doi.org/10.1021/es403732s](https://doi.org/10.1021/es403732s)

Degradation Mechanism of Cyanobacterial Toxin Cylindrospermopsin by Hydroxyl Radicals in Homogeneous UV/H₂O₂ Process
Xuexiang He, Geshan Zhang, Armah A. de la Cruz, Kevin E. O'Shea, and Dionysios D. Dionysiou*

4505



[dx.doi.org/10.1021/es404009k](https://doi.org/10.1021/es404009k)

Nitrite Reduction by Biogenic Hydroxycarbonate Green Rusts: Evidence for Hydroxy-nitrite Green Rust Formation as an Intermediate Reaction Product
Delphine Guerbois, Georges Ona-Nguema,* Guillaume Morin, Mustapha Abdelmoula, Anni M. Laverman, Jean-Marie Mouchel, Kevin Barthelemy, Fabien Maillot, and Jessica Brest

4515



[dx.doi.org/10.1021/es405602a](https://doi.org/10.1021/es405602a)

Deactivation Mechanism of Potassium on the V₂O₅/CeO₂ Catalysts for SCR Reaction: Acidity, Reducibility and Adsorbed-NO_x
Yue Peng, Junhua Li,* Xu Huang, Xiang Li, Wenkang Su, Xiaoxu Sun, Dezhi Wang, and Jiming Hao

Sustainability Engineering and Green Chemistry

4521



[dx.doi.org/10.1021/es404994t](https://doi.org/10.1021/es404994t)

Water Accounting and Vulnerability Evaluation (WAVE): Considering Atmospheric Evaporation Recycling and the Risk of Freshwater Depletion in Water Footprinting
Markus Berger,* Ruud van der Ent, Stephanie Eisner, Vanessa Bach, and Matthias Finkbeiner

4529



[dx.doi.org/10.1021/es405338k](https://doi.org/10.1021/es405338k)

Prospective Life Cycle Assessment of Graphene Production by Ultrasonication and Chemical Reduction
Rickard Arvidsson,* Duncan Kushnir, Björn A. Sandén, and Sverker Molander


4537



[dx.doi.org/10.1021/es405644u](https://doi.org/10.1021/es405644u)


Highly Permeable Double-Skinned Forward Osmosis Membranes for Anti-Fouling in the Emulsified Oil–Water Separation Process
Phuoc H. H. Duong, Tai-Shung Chung,* Shawn Wei, and Lana Irish

Ecotoxicology and Human Environmental Health

4546  [dx.doi.org/10.1021/es4042258](https://doi.org/10.1021/es4042258)
Differential Effects and Potential Adverse Outcomes of Ionic Silver and Silver Nanoparticles in Vivo and in Vitro
Natalia Garcia-Reyero,* Alan J. Kennedy, B. Lynn Escalon, Tanwir Habib, Jennifer G. Laird, Arun Rawat, Steven Wiseman, Markus Hecker, Nancy Denslow, Jeffery A. Steevens, and Edward J. Perkins

4556 [dx.doi.org/10.1021/es404534y](https://doi.org/10.1021/es404534y)
Evaluation of Environmental Contamination and Estimated Exposure Doses after Residents Return Home in Kawauchi Village, Fukushima Prefecture
Yasuyuki Taira, Naomi Hayashida, Makiko Orita, Hitoshi Yamaguchi, Juichi Ide, Yuukou Endo, Shunichi Yamashita, and Noboru Takamura*


4564  [dx.doi.org/10.1021/es500649v](https://doi.org/10.1021/es500649v)
Development and Practical Application of Petroleum and Dispersant Interspecies Correlation Models for Aquatic Species
Adriana C. Bejarano* and Mace G. Barron

4573  [dx.doi.org/10.1021/es405039w](https://doi.org/10.1021/es405039w)
Interactive Effects of Silver Nanoparticles and Phosphorus on Phytoplankton Growth in Natural Waters
Pranab Das, Chris D. Metcalfe, and Marguerite A. Xenopoulos*


4581 [dx.doi.org/10.1021/es500067e](https://doi.org/10.1021/es500067e)
Rapid and Sensitive Screening of 17 β -Estradiol Estrogenicity Using Fourier Transform Infrared Imaging Spectroscopy (FT-IRIS)
Candice M. Johnson, Nancy Pleshko, Mohan Achary, and Rominder P. S. Suri*

Energy and the Environment

4588  [dx.doi.org/10.1021/es405820j](https://doi.org/10.1021/es405820j)
Geographic, Technologic, and Economic Analysis of Using Reclaimed Water for Thermoelectric Power Plant Cooling
Ashlynn S. Stillwell* and Michael E. Webber

4596  [dx.doi.org/10.1021/es405168b](https://doi.org/10.1021/es405168b)
Co-precipitation of Radium with Barium and Strontium Sulfate and Its Impact on the Fate of Radium during Treatment of Produced Water from Unconventional Gas Extraction
Tieyuan Zhang, Kelvin Gregory, Richard W. Hammack, and Radisav D. Vidic*

4604  [dx.doi.org/10.1021/es405293u](https://doi.org/10.1021/es405293u)
Framework for the Mapping of the Monthly Average Daily Solar Radiation Using an Advanced Case-Based Reasoning and a Geostatistical Technique
Minhyun Lee, Choongwan Koo, Taehoon Hong,* and Hyo Seon Park

4613 

[dx.doi.org/10.1021/es4055274](https://doi.org/10.1021/es4055274)

Air Quality and Climate Impacts of Alternative Bus Technologies in Greater London

Uven Chong, Steve H. L. Yim, Steven R. H. Barrett, and Adam M. Boies*

4623 

[dx.doi.org/10.1021/es500667s](https://doi.org/10.1021/es500667s)

Catalysis of CO₂ Absorption in Aqueous Solution by Inorganic Oxoanions and their Application to Post Combustion Capture

Duong T. Phan,* Marcel Maeder, Robert C. Burns, and Graeme Puxty

Correspondence

4630

[dx.doi.org/10.1021/es501061n](https://doi.org/10.1021/es501061n)

Comment on Electrolytic Manipulation of Persulfate Reactivity by Iron Electrodes for TCE Degradation in Groundwater

Jing Zou, Jun Ma,* and Jianqiao Zhang

4632

[dx.doi.org/10.1021/es501323n](https://doi.org/10.1021/es501323n)

Response to Comment on "Electrolytic Manipulation of Persulfate Reactivity by Iron Electrodes for TCE Degradation in Groundwater"

Songhu Yuan* and Peng Liao

Additions and Corrections

4634

[dx.doi.org/10.1021/es501418w](https://doi.org/10.1021/es501418w)

Correction to Systematic and Quantitative Investigation of the Mechanism of Carbon Nanotubes' Toxicity toward Algae

Zhifeng Long, Jing Ji, Kun Yang, Daohui Lin,* and Fengchang Wu*