

# China-U.S. Center for Environmental Remediation and Sustainable Development (CERSD)

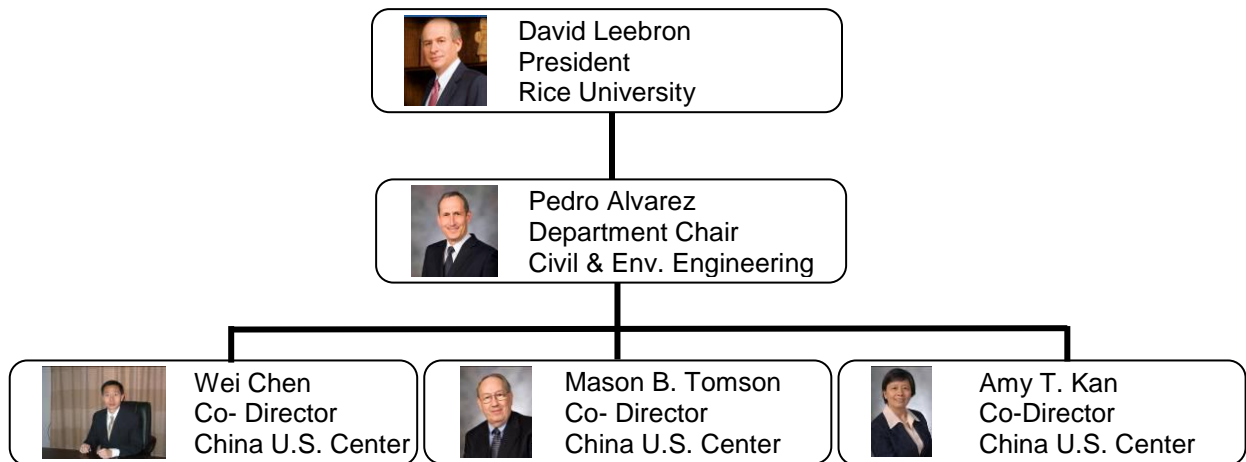
Prepared by: Mason B. Tomson, Amy T. Kan, Wei Chen

October 8, 2013

## Vision & Mission

The overall missions of the Center are to develop innovative and cost-effective solutions for timely and important energy and environmental problems and for sustainable urban development in China and United States, as well as to provide international educational opportunities to prepare students, faculty, and staff in both countries for an increasingly global workplace.

## Organization



Additional faculty involved at Rice University:

Vicki Colvin, C. Herb Ward, Phil Bedient, Qilin Li, Dan Cohan, Jim Blackburn, Rob Griffin, Michael Wong, Andy Barron, Robert Curl, Bruce Weisman, Jun Lou, Steve Lewis, Robert Raphael, Peter Hartley, Krishna Palem, Jianpeng Ma, Ratna Sarkar, Carol Quillen, Gene Levy, Sallie Keller-McNulty, George L. McLendon, Neal Lane Linda Driskill and Mark Wiesner (now at Duke) and faculty at the Jones Business School.

China-U.S. Center for Environmental Remediation and Sustainable Development (CERSD), a partnership between academia, industry, and government is a grassroots collaboration between leading environmental scientists in China and Rice University in Houston. At this time, the sponsoring academic institutions are Nankai University in Tianjin, Chinese Research Academy of Environmental Science in Beijing, and Rice University in Houston. Profs. Wei Chen, Amy Kan and Mason Tomson of Nankai and Rice Universities, respectively serve as co-directors.

## Staff

The Center has 3 Co-Directors and 1 half-time employee.

**Other Resources (e.g., teaching release time, equipment, etc.)**

Since the formation of the China-U.S. Center in 2007, it has been a supporting force in many university and departmental activities. Six cooperative research grants have been funded in China through the NSFC for common projects of interest to Rice and Nankai faculty. The Center has been instrumental in getting the premier hydrology book in the world authored by Prof. Bedient translated into Chinese for use throughout China. Prof. Chen, at Nankai has facilitated this publication. The Center was the force behind creating the “39 Scholars Program” at Rice University by Presidents Leebron and Zihao Rao to permit 39 distinguished scholars from Nankai to obtain their PhD degrees at Rice; their stipends are paid 100% by Nankai and when they finish they are guaranteed a faculty position at Nankai.

Several are already at Rice University in various departments. Faculty in CEE have had the great benefit of having visiting scholars from Nankai spending approximately a year doing PhD research in our labs; they are paid 100% by Nankai and receive their degrees from Nankai. Such joint research, scholarship, and exchange multiplies the effective size of Rice University research programs and productivity through shared scholarship and publications and hence our visibility on an international stage.

The Center faculty and staff have represented Rice and been participants in numerous international meetings, visits, and Chinese Consulate functions. These representations in addition to the student exchange have enhanced the international experience of all the students at Rice and Nankai Universities.

## **Grant Management**

The China-U.S. Center manages the grants of the Center through a portion of one permanent staff member and with the able assistance of the CEE Dept. Administrator. The Center does not act a cost center and does not actively participate in grant management, but acts as a catalyst to individual faculty.

## **Programs and Activities**

### **Highlights of Achievements to Date**

1. China-U.S. Center for Environmental Remediation and Sustainable Development (Co Directors: Mason Tomson, Amy Kan, Wei Chen): Professor Chen, Distinguished Professor of Environmental Science at Nankai University, is also the Director of the Key laboratory for Environmental Remediation in Taijien. The Center is well established in China as the key international collaboration platform. Over 50 professors and graduate students from Nankai University collaborated with Rice University on scientific research. They made enormous progress in research and scientific papers and also contributed more than 1 million dollars in stipends during the time they worked at Rice. The Center has taken the leadership with Rice University's efforts to establish university-level collaboration with Chongqing Municipal Education Commission; the Three Gorge Dam disaster mitigation with the SSPEED (Severe Storm Prediction, Education and Evacuation Disaster) Center at Rice University; E2I activities on shale gas; joint Rice/Chongqing education outreach and related engineering cooperation relationship.
2. The Center just sponsored a workshop on “Science and Technology to Enable Treatment and Reuse of Shale Water” at Gui Yang, China on September 24, 2013. This workshop is motivated by emerging concerns about shale water related issues that are critical for the sustainable development of shale gas. The US and China are two major countries with large amount of shale gas resources. The objective of the workshop is to bring leading scientists in related areas from both countries to prioritize research directions and to discern opportunities for collaboration. A white paper that summarizes the collective findings from this Workshop is produced. Steering Committee: Pedro Alvarez (Rice), Mason Tomson (Rice), Vicki Colvin (Rice), Guibin Jiang (RCEES), Yanxin Wang (CUG), Wei Chen (Nankai).
3. Prof. and Vice Provost Vicki Colvin presented a keynote speech, entitled “Nanotechnology: Applications and Implications”, at the 7th National Conference on Environmental Chemistry, 7th NCEC on 9/22/2013 in China

4. The Center has received ¥6,000,000 from the International S&T Corporation, Science and Technology Ministry of China to support a new project, "Collaborative study on flexible organic solar cells and supercapacitors based on carbon nano-materials." The grant dates are 01/2011–12/2013 and the principal investigators are Yongsheng Chen, Andy Barron, Wei Chen and Mason Tomson.
5. The center collaborated with Rice Prof. Linda Driskill in a proposal, entitled "Proposal Development for a Study of Emerging Intercultural Academic Genres", which was funded by Humanities Research Center on 2/18/2013
6. The Center sponsored the visit of Prof. Robert Curl to the Chemistry Department at Nankai University and presented a seminar on "The history of carbon"
7. Rice hosted more than 20 exchange students, visiting scholars and graduate students (recipients of the Chinese Student Council Scholarship) from Nankai at Rice University. Several exchange students have graduated from Nankai with doctoral degrees. Among our former participating students, Weichun Yang is currently a faculty member at Central South University in China and Lunliang Zhang serves as the deputy director of the Environmental Protection Bureau of Hebei District, Tianjin.
8. Sinopec, one of three major oil companies in China, joined in Rice's Brine Chemistry Consortium in 2012.
9. Pedro Alvarez, Herb Ward, Michal Rysz, John Fortner and Amy Kan visited China in 2010. We presented papers at Nankai University, the Society of Environmental Toxicology Asia Pacific annual meeting and the Chemistry and Society of Petroleum Engineering Asia meeting. Prof. Ward plans to return to China for additional work on remediation projects.
10. We are on the steering committee of the U.S.-China Oil and Gas Industry Forum. The meeting was attended by a large delegation from China and the primary interests of both countries in collaboration are shale gas and CO<sub>2</sub> capture and sequestration. To follow up, we held a shale gas meeting in Rice's Kyle Morrow Room on November, 4, 2010, to solicit support on shale gas water treatment research. More than 80 people from 25 companies attended the meeting and many of them expressed a strong interest in supporting a shale gas research effort at Rice.
11. Prof. Bedient's textbook, "Ground Water Contamination," has been translated and published in Chinese in 2010.
12. Prof. Alvarez visited China in spring 2011 to nurture institutional relationships with Nankai University in Tianjin; give a keynote address at the International Workshop on Emerging Contaminants hosted by Nanjing University in Nanjing; and lecture at the China University for Geosciences, at Beijing. His visit to Nankai was very fruitful. The current grant from the Chinese NSF to study the fate and transport of antibiotics already yielded two seminal papers.

### **Programs and projects:**

In addition to continued working on collaborative research projects, the Center also works on technology transfer. We applied novel environmental restoration technology developed at Rice, such as the technology to restore soil contaminated by petroleum products and the technology to remediate deposits in polluted rivers and lakes projects in China. For example, we helped to set up a demonstrative soil restoration project in Shengli oil field. We applied the technology developed at Rice to the project of restoration of Daku River in Tianjin. The technology developed at Rice has proven to be effective in these environmental restoration projects in China. The total funding for these projects amounts to about 3 million US dollars. The titles and personnel involved in the projects are listed below.

- "Collaborative study on flexible organic solar cells and supercapacitors based on carbon nano-materials." Ministry of Science and Technology (Program for International S&T Cooperation); ¥6,000,000; 01/2011-12/2013; Yongsheng Chen, Andy Barron, Wei Chen, Mason Tomson and Andy Barron.
- "Collaborative study on sediment quality criteria and in situ remediation technologies." Ministry of Science and Technology (Program for International S&T Cooperation); ¥1,000,000; 01/2009-12/2011; Wei Chen, Lingyan Zhu, Pedro Alvarez and Mason Tomson.

- “China-U.S. Center for Environmental Remediation and Sustainable Development Joint Laboratory building.” Tianjin Science Technology (key project); ¥200,000; 10/2007–09/2009; Wei Chen, Lingyan Zhu and Mason Tomson.
- “Removal of algal toxins in drinking water and endocrine disruptors research with new nanotechnology.” Ministry of Education (institutions of higher learning to cultivate scientific and technological innovation fund); ¥400,000; 01/2009–12/2011; Wei Chen, Lingyan Zhu, Pedro Alvarez and Mason Tomson.
- “Dual Equilibrium Desorption in Chinese soil.” 01/2009–12/2010; Wei Chen, Lingyan Zhu, Mason Tomson and Herb Ward.
- “Restoration of polluted Daku River.” Tianjin science and technology innovation projects special fund; ¥3,000,000; 10/2008–12/2010; Wei Chen, Lingyan Zhu and Herb Ward.
- “Tianjin Low Carbon Eco City project.” ¥100,000; 01/2009–12/2010; Lingyan Zhu, Danny Reible and Herb Ward.
- “Reactivity of resistant sorbs chemicals in soil.” ¥500,000; 04/2007–03/2010; Lingyan Zhu and Pedro Alvarez.
- “The research project of pollution of antibiotic resistance genes.” Chinese Science Foundation; ¥320,000; 01/2008–12/2010; Yi Luo and Pedro Alvarez.
- “Antibiotic resistance genes in fishing industry.” Tianjin science and technology; ¥100,000; 01/2008–12/2010; Yi Luo, Cai Bao Li and Pedro Alvarez.
- “The effect of Nano-materials on aquatic ecosystems.” Ministry of Education (institutions of higher learning to cultivate scientific and technological innovation fund); ¥60,000; 01/2008–12/2010; Lin Zhu and Pedro Alvarez.
- “The effects of Nano-Fe and Microbiology on TCE (Trichloroethylene) in groundwater research.” Tianjin science and technology; ¥200,000; 07/ 2007–06/2009; Pedro Alvarez, Zhao-Hui Jin and Long Li.
- An application for a State Joint-Research Center sponsored by China’s Ministry of Science and Technology was submitted in the fall of 2011.
- Seven exchange students, Xuejiao Tang (student of Professor Michael Wong); Weichun Yang, Lunliang Zhang and Lilin Wang (students of Professor Mason Tomson); Shujing Li (student of Michael Wong); and Chun Chang (student of Professor Alvarez) completed their one-year visit and returned to Nankai. The Center currently had one exchange scholar; Prof. Chengdong Zhang was here for 6 month and currently has Zongming Xiu at Alvarez’s group.
- Six Chinese Student Council scholarship recipients, Mengyan Li and Jing Wang with Pedro Alvarez, Nan Zhang, Lu Wang Zhang Zhang and Ya Liu with Mason Tomson, and Pei Dong with Jun Lou in Mechanical Engineering, were sponsored by China. Overall, these students have proven to be excellent in their technical field. Numerous peer-reviewed papers have been written jointly or are in the process of being published by these students.

## Space

The Center occupies space at KECK Building 119.

## Publications/Presentations of the Center

1. Yang Y., J. Wang, H. Zhu, Vicki L. Colvin and P.J.J. Alvarez (2013). Impacts of silver nanoparticles on cellular and transcriptional activity of nitrogen cycling bacteria. *Environ. Toxicol. Chem.* 32 (7): 1488–1494.
2. Wang J., Y. Koo, A. Alexander, Y. Yang, S. Westerhof, Q. Zhang, J.L. Schnoor, V.. Colvin, J. Braam, and P.J.J. Alvarez (2013). Phyto-Stimulation of Poplars and Arabidopsis Exposed to Silver Nanoparticles and Ag<sup>+</sup> at Sub-Lethal Concentrations. *Environ. Sci. Technol.* 47 (10): 5442–5449.

3. Wang, L., A.T. Kan., M.B. Tomson "Transport behavior of nanoparticles, aqueous solutions in porous media vs T" ACS 87th Colloid & Surface Science Symposium, UC Riverside, June 23-June 26, 2013
4. Chen, W., J. Fortner, M.B. Tomson(2013) Carbon nanoparticles mobilize hydrophobic organic contaminants in groundwater: Linking aggregation properties and contaminant-mobilizing capabilities" ACS 87th Colloid & Surface Science Symposium, UC Riverside, June 23-June 26, 2013
5. Wang, L., J. Fortner, L. Hou, C. Zhang, A. T. Kan, M. B. Tomson and W. Chen ( 2013) "Contaminant-Mobilizing Capability of Fullerene Nanoparticles (nC60): Effect of Solvent-Exchange Process in nC60 Formation" Environmental Toxicology and Chemistry 25, 32(2): 329–336
6. Yan, C., A. T. Kan., W. Wang., F. Yan., L. Wang and M. B. Tomson(2013) (Rice University); H. Zhu., R. Tomson (Shale Water Research Center) "Boehmite Based Sulphonated Polymer Nanoparticles with Improved Squeeze Performance for Deepwater Scale Control" Presented at the Offshore Technology conference held in Houston, TX, May 6-9, 2013
7. Yan, C., A.T. Kan, W. Wang, F. Yan, L. Wang and M. B. Tomson (2013) "Synthesis of Sorption Study of AlOOH nanoparticle cross-linked polymeric scale inhibitors and their performance in porous media" Presented at SPE International Symposium on Oilfield Chemistry, The Woodlands, Texas on April 8-10, 2013
8. Kan, A.T., N. Zhang., W. Shi., K. Wang., L. Wang., C. Yan., F. Yan and M. B. Tomson(2013). ( Rice University) R. C. Tomson., H. Zhu., S. M.A. Razavi (Shale Water Research Center) "Interrelationship of CO<sub>2</sub>, Weak Acids, Bases, and pH in Scale Prediction and Control" Presented at the SPE International Symposium on Oilfield Chemistry, The Woodlands, Texas on April 8-10, 2013
9. Dai, Z., W. Shi., A. T. Kan., N. Zhang and M. B. Tomson (2013) "Thermodynamic model improvements for common minerals at high temperature, high pressure and high TDS with mixed salts" SPE-164045-MS Presented at SPE International Symposium on Oilfield Chemistry, The Woodlands, Texas on April 8-10, 2013
10. Yang, Yu; Wang, Jing; Zhu, Huiguang; Colvin, Vicki L.; Alvarez, Pedro J. "Relative Susceptibility and Transcriptional Response of Nitrogen Cycling Bacteria to Quantum Dots" Environmental Science & Technology (2012), 46(6), 3433-3441
11. Yang Yu; Wang Jing; Zhu Huiguang; Colvin Vicki L; Alvarez Pedro J "Relative susceptibility and transcriptional response of nitrogen cycling bacteria to quantum dots" Environmental science & technology (2012), 46(6), 3433-41
12. Fan, C., W. Shi, P. Zhang, H. Lu, N. Zhang, S. Work, H. A. Al-Saiari, A. T. Kan and M. B. Tomson (2012) Ultrahigh-Temperature/Ultrahigh-Pressure Scale Control for Deepwater Oil and Gas Production. SPE J. 17 (1): 177-186
13. Shi, W.; A. T. Kan., N. Zhang., M.B. Tomson (2012) "Dissolution of calcite at up to 2500C and 1,450 bar and the presence of mixed salts" Industrial & Engineering Chemistry Research
14. Zhang, L., L. Hou, L. Wang, A. T. Kan, W. Chen, and M. B. Tomson (2012) "Transport of Fullerene Nanoparticles (nC60) in Saturated Sand and Sandy Soil: Controlling Factors and Modeling" Environ Sci Technol. 3;46(13):7230-8

15. Hwang, C.C., L. Wang, W. Lu, G. Ruan, G.Kini, C. Xiang, E. L. G. Samuel, W. Shi, A. T. Kan, M. S. Wong, M. B. Tomson and J. M. Tour( 2012) "Highly stable carbon nanoparticles designed for downhole hydrocarbon detection" *Energy & Environmental Science* 5, 8304–8309
16. Yang, W., N. Zhao, N. Zhang, W. Chen, A. T. Kan and M. B. Tomson(2012)"Time-dependent adsorption and resistant desorption of arsenic on magnetite nanoparticles: kinetics and modeling" *Desalination and Water Treatment* 44(2012)100-109
17. Wang, L., Y. Huang, A. T. Kan, M. B. Tomson, W. Chen (2012) " Enhanced Transport of 2,2',5,5' -Polychlorinated Biphenyl by Natural Organic Matter (NOM) and Surfactant-Modified Fullerene Nanoparticles (nC60)" *Environmental Science & Technology* 46(10) 5422-5429
18. Yan, C., W. Wang, L. Wang, A.T. Kan and M. B. Tomson.(SPE 155627-2012). "Synthesis and Size Control of Monodispersed Al-sulphonated Polycarboxylic Acid (Al-SPCA) Nanoparticles with Improved Squeeze Performance and Their Transport in Porous Media. Presented at SPE International Oilfield Nanotechnology Conference and Exhibition, Palace Hotel, Noordwijk, Netherlands, 12-14th June 2012
19. Shi, W., H. Lu, N. Zhang, C. Fan, A.T. Kan, and M. B. Tomson (2012) "Modeling the Thermodynamic Properties of Common Minerals at High Temperature, Pressure and Salinity with Complex Ions". Presented at SPE International Conference on Oilfield Scale, Aberdeen, UK. On 30-31, May 2012
20. Alsaiani, H.A., N. Zhang, S. Work, A.T. Kan, and M. B. Tomson (SPE 155127-2012) "A New Correlation to Predict the Stoichiometry of Mixed Scale: Iron-Calcium Carbonate". Presented at SPE International Conference on Oilfield Scale, Aberdeen, UK. On 30-31, May 2012
21. Zhang, N., A.T. Kan, Shi, W. Alsaiani, H. and M. B. Tomson (SPE-155263-2012) "A novel approach to the study of CaCO<sub>3</sub> precipitation kinetics on carbon steel pipe". Presented at SPE International Conference on Oilfield Scale, Aberdeen, UK. On 30-31, May 2012
22. Zhang, N., A.T. Kan, Shi, W. Alsaiani, H. and M. B. Tomson (SPE-155263-2012) "A novel approach to the study of CaCO<sub>3</sub> precipitation kinetics on carbon steel pipe". presented at SPE International Conference on Oilfield Scale, Aberdeen, UK. On 30-31, May 2012
23. Zhang, L., L. Wang, P. Zhang, A. T. Kan, W. Chen and M. B. Tomson (2011). "Facilitated Transport of 2,2',5,5'-Polychlorinated Biphenyl and Phenanthrene by Fullerene Nanoparticles (nC60) through Sandy Soil Columns." *Environ. Sci. Technol.* (2011) 45(4):1341-1348
24. Berlin, J., Yu, J., Lu, W., Walsh, E., Zhang, L., Zhang, P., Chen, W., Kan, A., Wong, M., Tomson, M. and Tour, J. (2011), "Engineered Nanoparticles for Hydrocarbon Detection in Oil-field Rocks," ***Energy & Environmental Science***, 4, 2, 505–509
25. Yi L., L. Xu, M. Rysz, Y. Wang, H. Zhang, and P.J.J. Alvarez (2011). Occurrence and transport of tetracycline, sulfonamide, quinolone and macrolide antibiotics in the Haihe River basin, China. *Environ. Sci. Technol*
26. Ji, L.; Chen, W.; Bi, J.; Zheng, S.; Xu, Z.; Zhu, D.; Alvarez, P. 2010, "Adsorption of Tetracycline on Single-walled and Multi-walled Carbon Nanotubes as Affected by Aqueous Solution Chemistry," ***Environmental Toxicology and Chemistry***, 29, 12, 2713–2719
27. Xiu Z-M, K.B. Gregory, G.V. Lowry, and P.J.J. Alvarez (2010). Effect of bare and coated nano-scale zero-valent iron on tceA and vcrA gene expression in *Dehalococcoides* spp. *Environ. Sci. Technol.* 44: 7647–7651

28. Chen J., Z. Xiu, G. V. Lowry and P.J. J. Alvarez (2010). Effect of natural organic matter on toxicity and reactivity of nano-scale zero-valent iron. *Wat. Res.* 45: 1995-2001
29. Ma J., Z Xiu, A.L. Monier, I. Mamonkina, Y. Zhang, B.P. Stafford, W.G. Rixey, and P.J.J. Alvarez (2011). Aesthetic groundwater quality impacts of a continuous pilot-scale release of an ethanol blend. *Ground Water Monitoring and Remediation*. 31(3):47-54
30. Xiu X, J Ma and PJJ. Alvarez (2011). Differential Effect of Common Ligands and Molecular Oxygen on Antimicrobial Activity of Silver Nanoparticles versus Silver Ions. *Environ. Sci. Technol.* 45 (20): 9003–9008
31. Xiu Z-M, Z-H Jin, T-L Li, S. Mahendra, G.V. Lowry, and P.J.J Alvarez (2010). Effect of nano-scale zero-valent iron particles on a mixed culture dechlorinating trichloroethylene. *Bioresource Technology* 101: 1141–1146
32. Li M., S. Fiorenza, J. Chatham, S. Mahendra, and P.J.J. Alvarez (2010). 1,4-Dioxane biodegradation at low temperatures in Arctic groundwater samples. *Water Research* 44:2894-2900
33. Chen J., Z. Xiu, G. V. Lowry and P.J. J. Alvarez (2010). Effect of natural organic matter on toxicity and reactivity of nano-scale zero-valent iron. *Wat. Res.* 45: 1995-2001
34. Yi L., M. Daqing, M. Rysz, Z. Hongjie, X. Lin, and P.J.J. Alvarez (2010). Trends in antibiotic resistance genes occurrence in the Haihe River, China. *Environ. Sci. Technol.* 44: 7220–7225
35. Yang, W., A. T. Kan, , M. B. Tomson and W. Chen (2010) "pH-Dependent Effect of Zinc on Arsenic Adsorption to Magnetite Nanoparticles." *Water research* 44(19): 5693-5701
36. Electromagnetic interference shielding of graphene/epoxy composites", Jiajie Liang, Yan Wang, Yi Huang, Yanfeng Ma, Zunfeng Liu, Jinming Cai, Chendong Zhang, Hongjun Gao, Yongsheng Chen\*, *Carbon*, 2009, 47, 922-925
37. Chen, W., L. Cong, H. Hu, P. Zhang, J. Li, Z. Feng, A. T. Kan and M. B. Tomson (2008). "Release of adsorbed polycyclic aromatic hydrocarbons under cosolvent treatment: Implications for availability and fate." *Environ. Toxicol. Chem.* 27(1): 112-118
38. Yang, W., L. Duan, N. Zhang, C. Zhang, H. J. Shipley, A. T. Kan, M. B. Tomson and W. Chen (2008). "Resistant desorption of hydrophobic organic contaminants in typical chinese soils: Implications for long-term fate and soil quality standards." *Environ. Toxicol. Chem.* 27(1): 235-242
39. Yang, W., A. T. Kan, W. Chen and M. B. Tomson (2008) "Adsorption and desorption of arsenic on nano-magnetite." *Prepr. Ext. Abstr. ACS Natl. Meet., Am. Chem. Soc., Div. Environ. Chem.* 48(1): 216-219
40. Yang, W., Kan, A., Tomson, M.B., Chen, W. pH-Dependent Effect of Zinc on Arsenic Adsorption to Magnetite Nanoparticles *Water research* (2010) 44, 19, 5693–5701
41. Zhang, L., Farrell, J., Zhang, P., Yang, W., Kan, A.T.; Chen, W., Tomson, M.B. Transport of Carbon and Metal-Oxide Nanoparticles in Soils 13th IACIS International Conference on Surface and Colloid Science and 83rd ACS Colloid and Surface Science Symposium. June 14-June 19, 2009

42. Chen, W.; Cong, L.; Kan, A. T., Tomson, M. B. (2008). Release of adsorbed polycyclic aromatic hydrocarbons under cosolvent treatment: implications for availability and fate. *Environmental Toxicology and Chemistry* 27(1), 112-118 2008
43. Yang, W., Duan, L., Zhang, N., Zhang, C., Shipley, H. J., Kan, A. T., Tomson, M. B. Chen, W. Resistant desorption of hydrophobic organic contaminants in typical Chinese soils: implications for long-term fate and soil quality standards. *Environmental Toxicology and Chemistry* 27(1), 235-248. 2008
44. Zhu X., L. Zhu, Y. Li, Z. Duan, Chen and P. J. J. Alvarez (2007). Developmental Toxicity in Zebrafish Embryos After Exposure to Manufactured Nanomaterials: Buckminsterfullerene Aggregates (nC<sub>60</sub>) and Fullerol. *Environ. Toxicol. Chem.* 26(5):976-979

### **Students/Scholars sponsored by China Center**

	Student Name	Adviser	Year		Current position
1	Xiaoyan Kuo	Mark Wiesner	2005-2006	Visiting Scholar	
2	Alison Harris	Wei Chen	2007 summer	Visiting student to Nankai	
3	Weichun Chen(Yang)	Mason Tomson	2007-2008	Exchange student	Faculty member at Central South University in China
4	Zongming Xiu	Pedro Alveraz	2007-	Exchange student	
5	Xuejiao Tang	Michael Wong	2007-2008	Exchange student	
6	Nan Zhang	Mason Tomson	2008-2013	Grad Student	Statoil
7	Mengyan Li	Pedro Alveraz	2008-	Grad Student	
8	Luliang Zhang	Mason Tomson	2008-2010	Exchange student	Deputy Director of Environmental Protection Bureau of Hebei District, Tianjin
9	Lilin Wang	Mason Tomson	2009-2010	Exchange Student	
10	Shujing Li	Michael Wong	2009-2010	Exchange Student	
11	Lu Wang	Mason Tomson	2010-	Grad Student	
12	Zhang Cheng Dong	Pedro Alveraz	2011	Visiting scholar	
13	Zhang Zhang	Mason Tomson	2011-	Grad Student	
14	Ya Liu,	Mason Tomson	2012-	Grad Student	



15	Xu Wang	BCB	2011-	Grad Student	
16	Yao Cui	Chemistry	2011-	Grad Student	
17	Pei Dong	MEMS-Jun Lou	2008-	Grad Student	
18	Jing Wang	Pedro Alveraz	2010-	Grad Student	
19	Mingjie Liu	MEMS-Boris Yakobson	2010-	Grad Student	
20	Fanglu Sun	National Relationship	2010-	Grad Student	

## Chronicle of the Center

- 9/25/2013 Prof Pedro Alvarez visited the College of Environmental Science and Engineering at Nankai University
- 09/24/2013 The center sponsored a workshop on “Science and Technology to Enable Treatment and Reuse of Shale Water” at Gui Yang, China on September 24, 2013. Steering Committee: Pedro Alvarez (Rice), Mason Tomson (Rice), Vicki Colvin (Rice), Guibin Jiang (RCEES), Yanxin Wang (CUG), Wei Chen (Nankai). Pedro Alvarez presented “Biofouling and its Control: Insights from Nanotechnology” at the workshop
- 9/22/2013 Prof. and Vice Provost Vicki Colvin present a keynote speech, entitled “Nanotechnology: Applications and Implications”, at the 7th National Conference on Environmental Chemistry, 7th NCEC in China
- 09/11/2013 The Center Co-Directors, Drs. Mason Tomson and Amy Kan met with Sunny Liu, Drs. Phill Bedient, Nick Fan at Rice University to discuss possible collaboration between Rice University and Chongqing University
- 2/18/2013 The center collaborated with Rice Prof. Linda Driskill in a proposal, entitled “Proposal Development for a Study of Emerging Intercultural Academic Genres”, which was funded by Humanities Research Center
- 10/11/2012 The Center hosted Vice President Zhang from Nankai University to attend Rice Centennial celebration
- 09/22/2012 Dr. Herb Wards gave a keynote lecture at the Eco-City Forum in Tianjin
- 09/08/2012 Mike Williams from Rice News interviewed Drs. Mason Tomson, Wei Chen and Herb Ward about the outstanding formal Student, Wei Chen, Co director of China-US Center
- 08/09/2012 The Center Director, Mason Tomson signed a Memorandum between China-US Center and Chongqing Normal University, China to jointly establish an alliance to engage activities including research, teaching, training educational personnel, and outreach.
- 4/16/2012 The Center sponsored the visit of Prof. Robert Curl to the Chemistry Department at Nankai University and presented a seminar on “The history of carbon”
- 01/20/2012 Sinopec, one of three major oil companies in China, joins in Rice’s Brine Chemistry Consortium in 2012.

12/16/2011	The Center facilitated President's office to establish partnership between Coca-Cola Japan and Rice University
11/11/2011	The center sponsored the visit of Prof. Michael Wong to Nankai University and presented a seminar on "The Chemistry of Cleaning Water Using Nanoparticles of Gold and Palladium".
07/11/2011	The Center hosted a Nankai University Delegation meeting at Duncan Hall. Provost George L. McLendon welcomed the delegations; Professors Robert Curl, Bruce Weisman, Michael Wong, and Jun Lou from Rice and Prof. Yongshen Chen from Nankai gave speeches. President Leebron hosted lunch at Wiess President House.
06/27/2011	The Center Co-Director, Amy Kan, Presented "Scale Prediction for Oil and Gas Production" at Shèngli(Sinopec) Oil Company, in Dongying, Shandong, China.
02/25/2011	Professor Alvarez visited China to nurture institutional relationships with Nankai University in Tianjin; give a keynote address at the International Workshop on Emerging Contaminants hosted by Nanjing University in Nanjing; and lecture at the China University for Geosciences, at Beijing. His visit to Nankai was very fruitful. The current grant from the Chinese NSF to study the fate and transport of antibiotics already yielded two seminal papers. And Professor Chengdong Zhang will come to his lab for six months to research the potential biotransformation of C <sub>60</sub> and CNTs
11/04/2010	We held a shale gas meeting at Kyle Morrow Room, Rice University to solicit support on shale gas water treatment research. More than eighty people from 25 companies attended the meeting and many of them expressed strong interest to support a shale gas research effort at Rice.
09/14/2010	We were on the steering committee of the U.S.-China Oil and Gas Industry Forum to organize a meeting at Fort Worth, TX. The meeting was attended by a large delegation from China and the primary interests of both countries in collaboration are shale gas and CO <sub>2</sub> capture and sequestration.
09/24/2010	The Center Director, Mason Tomson was the invited speaker at "Environmental Transport and Impact of Nanoparticles" at University of Texas San Antonio.
08/10/2010	The Center Co-Director, Wei Chen had received support for a new project: "Collaborative study on flexible organic solar cells and supercapacitors based on carbon nano-materials", ¥ 6,000,000, supported by International S&T Corporation, Science and Technology Ministry of China 01/2011 – 12/2013 and the PIs are Yongsheng Chen, Wei Chen, and Mason Tomson.
06/08/2010	The Center Co-Director Amy Kan presented "Scale Prediction for Oil and Gas Production" at CPS/SPE International Oil & Gas Conference and Exhibition in Beijing, China.
06/04/2010	The Center Co-Director Amy Kan presented "Facilitated transport of hydrophobic organic contaminants by carbon nanoparticles" at Asia/Pacific Chapter of the Society of Environmental Toxicology and Chemistry 2010 Conference (SETACAP) at Guangzhou, China.
06/15/2010	Prof. Bedient's textbook "Ground Water Contamination", has been translated and published in Chinese.

06/20/2010	Professor Herb Ward from Department of Civil and Environmental Engineering and Center Co-Director Amy Kan visited China. Presented paper at Nankai University, "Chlorinated Solvent Pollution in Soil and Groundwater: History, Regulations and Remediation in US," Prof. Ward plan to return to China for additional work on remediation projects.
02/27/2010	Professor Pedro Alvarez (Department of Civil and Environmental Engineering), Michal Rysz and John Fortner from Rice University visited China in 2010. Presented papers at Nankai University, "Antibiotic Resistance: An Emerging Environmental Pollution Problem," "Engineered Nanomaterials in the Environment: Buckminsterfullerene (C60) as a Model Compound in Aqueous Systems," "Environmental Remediation Projects: GSI Environmental Inc" Prof. Alvarez is invited to Nankai and Nanjiang University in spring 2011.
01/21/2010	The Center hosted a Workshop for Nankai University Delegation. Dr. Vickie Colvin is the keynote speaker. Dean Sallie Keller welcomed the delegations; Professors Herb Ward, Mason Tomson, Andy Barron, Michael Wong, Jim Blackburn, Qilin Li, Nick Fang from Rice and Wade Adams from Smalley Institute of Nanotechnology gave speeches. Ping Sun Leebron and Chinese Consuls hosted lunch and dinner.
01/05/2010	Professor Pedro J. Alvarez, Chair of Civil and Environmental Engineering at Rice University visited College of Environmental Science & Engineering, Kunming University of Science & Technology at China at the end of January. Dr. Alvarez also collaborates with Dean Chen Jiawei from School of the Earth Sciences and Resources at China University of Geosciences at Beijing. Dean Chen is currently a visiting scholar in Alvarez's lab.
12/09/2009	The Center hosted Prof. Tan Zhu's delegation from City of Tianjin, China at Rice University for two days' meeting with Ping Sun Leebron, Dean Sallie Keller, Chinese consuls, Dr. Kepple, director of Environmental Programming from City of Houston, City attorney, Paulette Wolfson and professors from CEVE department.
10/17/2009	Jamie Padgett, CEE, Rice University, was one of about 30 U.S. delegates from academia, industry and government attending the National Academy of Engineering China-America Frontiers of Engineering Symposium in Changsha, China. This is the first China-America Frontiers of Engineering symposium, and it is a great honor for a young faculty member to be invited to attend. Congratulations!
08/03/2009	More Rice grads in China: Renewable Energy: A Reality Check in Rural China. Young engineer, Abby Watrous, takes on a global challenge: Clean and sustainable energy, one village at a time. Abby Watrous was one of Rice University 3 original EWB students. EWB is Engineers without Border that our Center CO-Director Mason Tomson and Center Administrator Bob Dawson are involved in.
07/23/2009	Professors Pedro Alvarez, Mason Tomson and Qilin Li met with delegations from Tsinghua University to discuss possible international collaboration.
07/16/2009	Mason Tomson, Chunfang Fan., Luliang Zhang and Nan Zhang gave an overview of the China-U.S. Center for Tongji University Delegations at President's Study at Rice University.
05/15/2009	A proposal totaling one million RMB for two years on "Sediment Environmental Quality Standards and in-situ Remediation" has been approved by the Chinese Ministry of Science and Technology.

04/29/2009	Jensen Shen from the Greater Houston Partnership and Pedro Alvarez, Mason Tomson, and Mark Davis from Rice University met with delegations from Shandong, Chin and discuss possible international collaboration.
03/16/2009	Dean Keller-McNulty from Rice University visited President Rao of Nankai University to discuss ways to further strengthen the relationship between Rice and Naikai University. Center Co-Director, Wei Chen and Amy Kan coordinated this meeting
03/03/2009	The Center Co-Director Mason Tomson was an invited speaker at Remediation Technology Summit: Nano-Technologies and the Environment at Atlanta, GA.
01/31/2009	The Center Co-director, Wei Chen, applied for establishing an international collaboration research laboratory at Nankai University with long term support from the Ministry of Science and Technology.
01/31/2009	Dr. Dongqiang Zhu of Nanjing University, the Center Co Directors, Wei Chen, Amy Kan, and Mason Tomson submitted a joint proposal to both NSF and NSFC under the International Collaboration in Chemistry between US Investigators and their Counterparts Abroad (ICC) program in NSF.
11/07/2008	A proposal on "Field Demonstration of a Water Treatment System in Sino-Singapore Tianjin Echo-City, Tianjin, China" was submitted to the Shell Center for Sustainability on behalf of the Center.
11/07/2008	Dr. Nick Fang from Rice University took a trip to the People's Republic of China as a member of the U.S. Environmental Services Delegation organized by W.J. International Environmental Services, Inc. in November in Beijing, China. The mission of the delegation is to introduce some U.S. environmental protection technologies and strategies to China. The leader of the team was Mrs.. Barbara Finazzo, the USEPA Region 2 Director.
10/25/2008	President Rao of Nankai University met Professor Neal Lane from Rice University in China, a meeting coordinated by the Center Co-Director, Wei Chen President Rao and Prof. Lane discussed how to strengthen the existing relationship between the two universities, and the possibility of a joint-effort in dealing with global warming. Prof. Lane invited President Rao to attend a workshop at Rice in late April 2009.
09/18/2008	A proposal on "Sediment Environmental Quality Standard and in-situ Remediation" has been submitted to the Chinese Ministry of Science and Technology for funding. The proposal totals one million RMB for two years
09/10/2008	The Center Co Directors, Mason Tomson and Amy Kan met with the Thailand delegates to discuss international collaboration and biofuel industry in Thailand.
07/10/2008	President Leebron was conferred an Honorary Doctorate by Nankai University, in recognition of the extraordinarily close relationship between the two universities. President Leebron was only the 7 <sup>th</sup> person in Nankai's 90-year history to receive this honor. He graciously acknowledged repeatedly the China US Center in address to the faculty and students of Nankai Universities
04/03/08	Remarks by U.S. Secretary of Treasury, Henry M. Paulson, Jr. at the Chinese Academy of Sciences, Beijing, China. : Meeting the Challenge: A Partnership on Energy and the Environment

04/01/2008	Wei Chen, Center Co-Director, made a key-note presentation about the Center research and activities at the first joint “Chinese and American Environmental Technology Collaboration Conference” in Beijing. The meeting was sponsored jointly by the U.S. EPA and the Ministry of Science and Technology of China.
03/21/2008	Co-Directors, Mason Tomson and Amy Kan received a plaque and an appointment as an Honorary Professor at Nankai University
03/20/2008	China-US Forum of Environmental Remediation and Sustainable Development. Tianjin, China. 中美环境修复与可持续发展战略研讨会暨南开大学中美环境修复与可持续发展中心挂牌仪式
03/20/2008	Professor from Rice University, Phil Bedient’s hydrology text is being translated into Chinese as a part of the Center activities and was featured at the Tianjin meeting.
03/17/2008	Professors from Rice University, Pedro Alvarez, Herb Ward, Mason Tomson, Daniel Cohan, Qilin Li and Amy Kan attended a workshop at Hong Kong University and gave lectures at Xinghua University in Shenzhen (Houston’s Sister City in China)
02/20/2008	Nankai President, Zihao Rao, visited Rice University. The Center hosts an information section at the Duncan Hall with speakers from Chemical Engineering, EESI, Civil and Environmental Engineering and the Smalley Institute to give an overview of Rice research.
01/30/2008	Chinese Consulate General Office in Houston recommended the Center as a cooperative partner with the Ministry of Science and Technology to participate in a 10 year collaboration plan between U.S. and China on Energy and Environmental research. This will be resolved in 2009.
12/13/2007	The Third Cabinet-Level Meeting of the U.S.-China Strategic Economic Dialogue at Beijing China
11/30/2007	Aerojet became a corporate member
09/17/2007	Three PhD exchange students from Nankai University came to study at Rice University
09/15/2007	Professor Wei Chen’s 863 priority project “Oil contaminated soil remediation and ecological restoration demonstration project in the oilfield” was funded by Chinese Ministry of Science and Technology
09/10/2007	Dr. Amy Kan and Wei Chen were the invited speakers at IRI Industrial Research Institute China Forum, Beijing, China
06/04/2007	Chinese government released a climate Change policy
06/03-06/07	Professor Mason Tomson and Pedro Alveraz present two papers at International Water Association 4th IWA Leading-Edge conference on Water & Wastewater Technologies, Singapore
03/16/2007	Shell Oil Company becomes the first official corporate member

04/15/2007	Chinese Research Academy of Environmental Sciences (CRAES), SEPA Department of Soil Pollution Control becomes a partner
04/15/2007	Professor Mason Tomson, Wei Chen and Amy Kan submit two papers to Environmental Toxicology and Chemistry Journal. Special issue-China
03/17-31/07	China-Rice Advanced Leadership Forum
02/26/2007	China-U.S. Center for Environmental Remediation and Sustainable Development inaugural meeting. Speakers: President Leebron, Mayor Bill White, Consul General of China, Jinzhou Hua, industrial representatives, government officials from Tianjin, China, and faculties from Rice and Nankai Universities
2006	Tianjin University President Gong visited Rice University, interested in Center collaboration
2005	Six Rice CEE faculty visited Nankai; 13 white papers on common needs for research were written; Memorandum of Understanding was signed by President Hou Zixin and President Leebron on 6/29/2005; President Leebron visited Nankai and Tianjin University; Students and faculties exchange
2004	Rice University announced intent to establish a China-US Center