A recent study conducted by a team of researchers including center members Gail Wasserman, Xinhua Liu, Pam Factor-Litvak, Diane Levy, and Joseph Graziano examined the association between drinking water arsenic and child intelligence in Maine. Several studies have found negative intelligence associations with water arsenic, but the specific components are not consistent. Previous work in Bangladesh has shown arsenic exposure to have an adverse association with nonverbal abilities, verbal comprehension, and working memory in children. In two studies conducted in Mexico, urinary arsenic was negatively related to subtests in an earlier version of the Wechsler Intelligence Scale for Children (WISC). A United States study showed poor verbal learning and memory scores attributable to levels of various metals found in hair. Because of this lack of consistency, different IQ tests, and varying health, nutrition, and education status in Bangladesh, past results are not necessarily generalizable to the US. Also, drinking water arsenic concentration is much higher in Bangladesh compared to the US limiting any efforts to extrapolate findings.

Study participants were recruited through elementary schools in an area of Maine identified to have variable arsenic exposure, with some homes having wells that exceed the current EPA maximum contaminant level (10 µg/L) by an order of magnitude. Exclusion applied to students that had not lived at their present address for at least three years, multiple children in the same home, and children with conditions of known adverse impact on intellectual functioning. Of the possible 1,595 children in grades 3-5, the final sample was 272 with an average of 7.3 years in their homes and an approximately equal number of boys and girls. Participating families received reports on well water, information on mitigation if necessary, $25, and t-shirts. Home visits consisted of collecting water samples, children’s toenail samples, and interviewing the parents for potential covariates such as maternal intelligence, home rearing quality, and socioeconomic status. A few weeks after the home visits, child intelligence was tested with the WISC-IV.

(Continued on Page 3)
Meet Career Development Awardee, Liang Liu, Ph.D.

Dr. Liang Liu received a B.A. in Nutrition Sciences and an M.A. in Molecular Biology from Yangzhou University, China, followed by a Ph.D. in Developmental Biology and Molecular Genetics from Uppsala University, Sweden. Dr. Liu pursued postdoctoral training at the University of Alabama at Birmingham.

As an Associate Research Scientist in the Department of Dermatology at Columbia University, Dr. Liu’s research primarily focuses on epigenetic studies to elucidate the role of epigenetic regulators in epidermal development and homeostasis. He is currently investigating how aberrant genomic DNA and histone methylation occurs upon exposure to solar ultraviolet radiation (UVR) and contributes to UVR-induced skin photocarcinogenesis.

Dr. Liu was selected as one of the awardees of the NIEHS Center career development award here at Columbia. The studies supported by this award will focus on the role of both histone methylation and DNA methylation in UVR-induced skin carcinogenesis. Dr. Liu also received a NIH mentored career development (K01) award from the National Institute of Arthritis and Musculoskeletal and Skin Diseases, which supports his studies on epigenetic regulation of skin development and skin stem cell biology.

Meet Career Development Awardee, Kirstie Stansfield, Ph.D.

Kirstie Stansfield, Ph.D., hails from England and North Carolina. As a graduate student, she studied neuroscience at the University of South Florida in Tampa, FL. Research that Dr. Stansfield conducted as a graduate student led her to an exciting career as a neurotoxicologist studying the effect of developmental exposure to neurotoxins on the brain. She began working with Dr. Tomas Guilarte at Johns Hopkins University, studying the effects of environmental toxins on the brain and relocated to Columbia University’s Mailman School of Public Health four years ago. Since then, she has continued to study the effects of developmental lead exposure on the brain.

Recently, Dr. Stansfield received a pilot grant and a Career Development Award from the NIEHS Center for Environmental Health in Northern Manhattan to examine the effect of developmental lead exposure on drug addiction. This project looks at the effects of pre- and post-natal lead on the brain and, interestingly, likelihood of becoming addicted to drugs.

In other research, Dr. Stansfield is examining molecular mechanisms of neurotoxicology and, specifically, using various assays to investigate the effects of lead exposure on molecular targets in the brain. Given Dr. Stansfield’s background and expertise as a neuroscientist, her perspective on environmental health issues, such as lead exposure, is quite unique.
Linear regression analysis was used to estimate associations between drinking water arsenic and child IQ with and without adjustment for sociodemographic characteristics. The average measure for water arsenic was 9.88 µg/L with almost a third of samples exceeding the EPA Maximum Contaminant Level of 10 µg/L. Compared to children consuming < 5 µg/L of arsenic, children consuming > 5 µg/L showed significant reduction in all index scores (working memory, perceptual reasoning, and verbal comprehension) except processing speed. Arsenic levels of ≥ 5 µg/L were also associated with reductions of 4.5–6.5 points in IQ. Maternal intelligence scores were also inversely associated with arsenic levels although not substantially.

The team was unable to collect information on the quantity of water consumed because US children tend to access water through a wide range of sources. Scheduling home visits when all household members could be present was challenging and affected the ability to assess quality of the home environment for around 11% of the families. It was not possible to characterize arsenic exposure retrospectively across the lifespan because few children had resided in the present home for their entire lives. The data suggests that maternal characteristics may influence exposure levels; more educated mothers may be more likely to avoid exposure. Thus this study has implications for future research on potentially toxic exposures. Categories of exposure at levels higher than 5 µg/L did not differ among themselves suggesting that 5 µg/L may represent an important threshold. The magnitude of association between drinking water arsenic and child IQ raises the possibility that levels ≥ 5 µg/L, which are not uncommon in the United States, pose a threat to child development.


### Predicting child IQ from water As measured from the kitchen tap

<table>
<thead>
<tr>
<th>Contributors</th>
<th>Full Scale Base</th>
<th>Working Memory Base</th>
<th>Perceptual Reasoning Base</th>
<th>Verbal Comprehension Base</th>
<th>Processing Speed Base</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water As≤5 µg/L</td>
<td>-6.09±0.98**</td>
<td>-4.88±2.24*</td>
<td>-4.97±2.14*</td>
<td>-6.22±2.49*</td>
<td>-1.74±2.09</td>
</tr>
<tr>
<td>10&gt;WAs≤25 µg/L</td>
<td>-3.51±1.91</td>
<td>-1.13±2.16</td>
<td>-5.10±2.06*</td>
<td>-1.86±2.39</td>
<td>-1.15±2.01</td>
</tr>
<tr>
<td>WAs&gt;20 µg/L</td>
<td>-2.51±2.29</td>
<td>-5.07±2.59*</td>
<td>-2.29±2.47</td>
<td>-0.82±2.88</td>
<td>0.40±2.42</td>
</tr>
<tr>
<td>Number of other children in home</td>
<td>-0.17±0.79</td>
<td>0.84±0.89</td>
<td>0.36±0.85</td>
<td>-0.72±0.99</td>
<td>-0.84±0.83</td>
</tr>
<tr>
<td>Maternal IQ</td>
<td>0.27±0.07**</td>
<td>0.23±0.05**</td>
<td>0.25±0.06**</td>
<td>0.32±0.10**</td>
<td>-0.04±0.07</td>
</tr>
<tr>
<td>Maternal Ed (&gt; HS)</td>
<td>3.35±1.59**</td>
<td>0.38±1.54</td>
<td>1.42±1.75</td>
<td>7.62±2.04**</td>
<td>3.14±1.72**</td>
</tr>
<tr>
<td>HOME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Missing 6+ items</td>
<td>-5.16±2.54</td>
<td>-3.34±2.87</td>
<td>-7.44±2.74**</td>
<td>-3.96±3.19</td>
<td>-0.70±2.68</td>
</tr>
<tr>
<td>Low scores</td>
<td>-1.96±1.58</td>
<td>-2.21±1.79</td>
<td>-2.45±1.71</td>
<td>0.22±1.99</td>
<td>-1.95±1.67</td>
</tr>
<tr>
<td>School district (compared to “C”)</td>
<td>-1.70±1.71</td>
<td>0.47±1.94</td>
<td>0.22±1.84</td>
<td>-3.26±2.15</td>
<td>-3.71±1.80*</td>
</tr>
<tr>
<td>District “A”</td>
<td>1.29±1.97</td>
<td>-0.57±2.24</td>
<td>1.44±2.13</td>
<td>3.15±2.48</td>
<td>-2.27±2.08</td>
</tr>
<tr>
<td>District “B”</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R²</td>
<td>0.19±0.60%</td>
<td>9.45%</td>
<td>15.37%</td>
<td>19.06%</td>
<td>4.49%</td>
</tr>
<tr>
<td>WAAR²</td>
<td>3.18%</td>
<td>2.48%</td>
<td>2.98%</td>
<td>1.97%</td>
<td>0.37%</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001; ****p < .0001; *p < .10
Recent Center Member Research

“Elevated Blood Harmane Concentrations in Parkinson’s Disease”

Harmane is a potent tremor-producing neurotoxin. Center members Elan D. Louis and Pam Factor-Litvak previously demonstrated elevated blood harmane concentrations [HA] in essential tremor cases. This case-control study aimed to assess whether blood harmane levels were elevated in Parkinson’s disease as well. The average blood HA in Parkinson’s cases was double that of controls and varied by family history with those with a family history of Parkinson’s having the highest concentrations. Blood harmane concentration appears to be elevated in Parkinson’s cases, and the high concentration in familial Parkinson’s suggests genetic involvement. The findings need to be reproduced in additional cohorts to assess generalizability.


“Soil Dust Aerosols and Wind as Predictors of Seasonal Meningitis Incidence in Niger”

An NIEHS pilot study awarded to Sylwia Trzaska in 2009 with additional support from the Earth Institute Cross-Cutting Initiative project: “Atmospheric aerosol impacts on health in sub-Saharan Africa,” a NASA feasibility study, and other international funding, was recently published in EHP. The lead authors included Carlos Garcia-Perez and Ron Miller from NASA Goddard Institute for Space Studies in New York, and Sylwia Trzaska and Madeleine Thomson from the International Research Institute for Climate and Society at Lamont Doherty Earth Observatory, among other researchers. Epidemics of meningococcal meningitis are concentrated during the dry season in sub-Saharan Africa, which is characterized by ground level dry and dusty winds. The study examined if climate-based statistical forecasting could predict seasonal incidence of meningitis in Niger at both national and district levels. Using modeling and 20 years of data on meningitis incidence, the researchers were able to find a correlation between climate conditions and new cases of meningitis which was stronger on the national level than the district level, with zonal wind having the greatest impact. Models of this form could provide an early-season alert that wind, dust, and other conditions are potentially conducive to an epidemic.

On June 20th, 2014, the annual NIEHS Center Retreat/External Advisory Meeting took place at The Faculty House on the main Columbia campus at 116th Street from 9am-4pm. It was an exciting day, bringing together over 45 Center members, Facility Core Directors, lab managers and technicians, students, interns, and postdocs from various departments and schools at Columbia and WE ACT to learn about each other’s research and get to know each other better during breaks and at lunch. In addition, five external advisors and two stakeholder advisory board members attended the meeting. The Retreat began with Director Regina Santella giving an overview of the NIEHS budget, agency initiatives, funding opportunities and the current focus areas for NIEHS including children’s environmental health, climate change, developmental origins of health and disease, indoor air pollution and cook stoves and electronic waste. As for Center news, Claudia Thompson has now replaced Les Reinlib as the P30 EHS Core Centers Project Officer. She hopes to visit all of the Centers in the next year. We will keep you posted on when Claudia is visiting the Columbia Center. The last piece of news is that the NIEHS asked Columbia and NYU to co-host the spring 2016 annual Core Centers Meeting in NYC. This will give both Centers a chance to showcase their environmental research work as well as highlight community engagement in various neighborhoods in NYC. More details to come...

The Retreat highlighted some of the research being conducted in our various working groups including epigenetics, environmental exposures across the life course, environmental determinants of neurological disease, and climate and health. We heard presentations from post-doctoral scientist Megan Niedzwiecki, EHS doctoral student Kate Weinberger, pilot awardees Kirstie Stansfield and Gina Lovasi, and Center members Ricky Perera and Pat Kinney. As has been our Center tradition, we invited external advisor Gerd Pfeifer, a cancer biologist from the Beckman Research Institute at the City of Hope in Duarte, CA, to give the keynote talk on: “The epigenome in cancer tissues.” In addition, Ogonnaya Dotson Newman, the Environmental Health Director at WE ACT for Environmental Justice, gave an informative update on ongoing and new projects that WE ACT is engaged in; she gave examples of how the community shapes Center research as well as how Center research informs the community. Finally, our Facility Core Directors updated everyone on new equipment capabilities in the Cores, including a new High Precision Robotic Weighing System for the Exposure Assessment Core, housed at LDEO, and a new Perkin-Elmer NEXION-300D inductively coupled Mass Spectrometer for the Trace Metals Core, to be housed in the EHS labs. There were many excellent questions from the general audience and the external advisors throughout the day. The Retreat ended with a closed session with the external advisors and Executive Committee to review the pilot proposal applications.

Thanks to all who participated in this wonderful event!
Congratulations to Our 2014 Pilot Awardees!

Mitchell S.V. Elkind, MD, MS, Professor of Neurology and Epidemiology; Co-Investigators: Pat Kinney, ScD and Xinhua Liu, PhD, Gregory Wellenius, ScD, Brown University, Joel Kaufman, MD, MPH, University of Washington; “Traffic pollution and cerebrovascular disease in the Northern Manhattan Study.” Award: $25K.

Abstract: Stroke is the leading cause of long-term disability and the fourth leading cause of death in the US. Air pollution from traffic and other sources may be an important risk factor for and precipitant of adverse cardiovascular and cerebrovascular health effects. There are few published large-scale studies specifically on the effects of traffic pollution on cerebrovascular endpoints. Clinical stroke is a devastating disease but it only represents the most severe consequence of cerebrovascular disease; emerging evidence consistently demonstrate that subclinical cerebrovascular disease, manifested as white matter hyperintensities and silent infarcts on brain magnetic resonance imaging (MRI), is associated with cognitive decline, dementia, and functional impairment. This pilot will explore the effects of long-term exposure to traffic pollution on subclinical markers of cerebrovascular disease, including silent brain infarcts, brain atrophy, and white matter hyperintensities detected on brain MRI, in the Northern Manhattan Study (NOMAS), a large (n=3500), longstanding, multi-ethnic, prospective cohort study.

Kyung Hwa Jung, PhD, Associate Research Scientist, Division of Pulmonary, Allergy and Critical Care of Medicine, Department of Medicine; Co-Investigators: Rachel Miller, MD and Matt Perzanowski, PhD; “New York City Commuters’ Peak Exposure to Black Carbon in-Transit and Associated Cardiovascular and Respiratory Health Effects.” Award: $25K.

Abstract: Exposure to traffic emission may trigger adverse cardiovascular and respiratory health outcomes. This is especially true for commuters taking public transportation or driving a car for a relatively long time, given the greater-than-average levels of black carbon (BC), a marker of traffic-related particles, found inside buses, metro and cars and other forms of public transportation. Manhattan workers have the highest rate of extreme commuting (90 minutes each way to work on a regular basis) and 75% of all commuters to Manhattan take public transportation. There has been very limited epidemiologic research on the health effects of short-term exposure to traffic emissions during a commute. This pilot will use personal monitoring to measure BC exposure over 24 hr and quantify the contribution of commuting activities, determine whether exposure differs by mode of transport and whether short term (peak) exposure or 24 hr exposure is associated with elevated blood pressure, greater airway inflammation (measured by fractional exhaled nitric oxide), and greater peak expiratory flow variability.
Darby Jack, PhD, Environmental Health Sciences; Co-Investigators: Steve Chillrud, PhD, LDEO, and Pat Kinney, ScD, EHS; “Potential inhaled dose of particulates, biking and cardiovascular indicators.” Award: $25K.

Abstract: The primary goal of the proposed pilot is to establish the feasibility of procedures for measuring short term air pollution exposures and acute cardiovascular outcomes in urban cyclists. Biking is an increasingly important transportation mode in American cities, and municipal bike promotion policies make it likely that this trend will continue. However, it may cause increased exposure to air pollution. The use of recently developed tools to assess exposures to traffic-related pollutants while cycling will be assessed in a pilot study of the effects of air pollution exposure on important cardiovascular health indicators, including blood pressure and heart rate variability. Air pollution exposures are of particular concern for urban athletes because they exercise in close proximity to traffic where pollution concentrations are high, and because respiration rates increase by a factor of 5 or more during vigorous exercise. Recent, low-burden personal real time particulate matter monitors, with on-board accelerometers for estimating respiration rates, open the way for reliable estimation of real-time doses while riding bicycles.
## Upcoming Fall Seminars and Meetings

**September 18:** **Dina L. López**, PhD, Professor and Chair, Department of Geological Sciences, University of Ohio, Athens, OH; “Investigating the Role of Agrochemicals, Arsenic, and Ambient Temperature in Chronic Kidney Disease of Unknown Etiology in El Salvador”; 722 W. 168th Street, Allan Rosenfield Bldg., 11th floor, Rm. 1101 (EHS Conference Room), **12:00-1:00pm**.

**October 16:** **Gary W. Miller**, PhD, Professor of Environmental Health, Emory University, Atlanta, GA; “Pesticides, PCBs, and Parkinson’s disease: a story of storage”; 722 W. 168th Street, Allan Rosenfield Bldg., 11th floor, Rm. 1101 (EHS Classroom), **12:00-1:00pm**.

**November 6:** **Linda Weiss**, PhD, Director, Center for Evaluation and Applied Research, NY Academy of Medicine and **Ray Lopez**, MA, Director, Environmental Health Program, Little Sisters of the Assumption Family Health Service, Inc. NY; "Reducing indoor environmental triggers for childhood asthma in public housing: Implementation and outcomes from an East Harlem community health worker program"; 722 W. 168th Street, Allan Rosenfield Bldg., 11th floor, Rm. 1101 (EHS Conference Room), **12:00-1:00pm**.

## SAVE THE DATE:

### Center Meeting

**Thursday, October 30th**

722 W. 168th Street, Allan Rosenfield Bldg., 11th floor, Rm. 1101 (EHS Conference Room)

**12:00-2:00pm**

Lunch will be served!

## Health and Housing Action Summit

**Creating Affordable Healthy Housing through Advocacy, Organizing and Research**

**November 21 - 22**

Co-sponsored by WE ACT and the Milano School of International Affairs, Management, and Urban Policy at The New School, 66 W. 12th Street, NY, NY.

More details to come.