Dear colleagues, alumni and friends of Parsons Lab,

I write to wish you happy holidays and update you on the news from Parsons. There is much news. But the constant is that we continue the struggle to house the ever-increasing Parsons family. It is expanding to include more graduate students and post docs than ever before. A problem –yes– but also a sign of vitality and growth. Needless to say, it is wonderful.

Construction has returned to Parsons in a big way – actually two big ways. We are building a new BL2 microfluidics lab for Roman Stocker on the second floor and consolidating all the chemistry labs on the fourth floor on one end and on the other, the three microbiology labs. As with all the construction at Parsons, it started off with a big bang. Not really, after all this is Parsons, so it started off with a big flood. One mistake on the second day drained all the chilled water from the entire building. Here we go again.

Every year I mention that our research activity is expanding in volume and encompasses many different areas. This year the above sentence doesn’t do justice to the exciting research that is carried on. The number of papers being published are too numerous to mention. Our young faculty, as our senior faculty, are unstoppable. First a few pieces of news from our young faculty.

Ruben Juanes has enjoyed advising the first PhD graduate in his group, Chris MacMinn, who defended his dissertation 'Migration and trapping of CO2 in saline aquifers'. Chris, who will now start a postdoc in Yale, has been an inspiration (and also set the bar very high) for all the other PhD candidates in Ruben's lab (juanesgroup.mit.edu). Students and postdocs from his lab have continued to publish their share of papers that advance the fundamental understanding of multiphase flow in porous media using theory, simulation, and experiment. Ruben is also the director and principal investigator of a 5-year project that will develop and implement the science of geologic CO2 sequestration in Abu Dhabi. This project, which involves 6 faculty from CEE and EAPS in collaboration with 3 institutions from Abu Dhabi, will start in January 2012. It is MIT's first large-scale effort in geologic CO2 storage, and is conceived as a game-changer that could help shape the future of carbon capture and storage in the Middle East and worldwide.

Jesse Kroll’s group continued research on the chemistry of organic particles in the atmosphere. The room-sized air chemistry chamber in his lab glows with UV light. I placed a $20 bill on the floor but saw no special water-marks. Maybe it was my twenty. Jesse's lab studies are focused on understanding atmospheric oxidation mechanisms, as well as the particle-forming potential of key pollutants (such as evaporated oil from the Deepwater Horizon oil spill). In the summer, several members of the group participated in the "RoMBAS" field campaign in the Colorado Rockies; other studies included emissions characterization of aircraft, diesel engines, and cookstoves. In March, Jesse was awarded an NSF CAREER award. Jesse and part of his group will travel to Hawaii with TREX (more on this program below). The entire group will mount an aerosol mass spectrometer and SO2 monitor on the back of an SUV and track the chemistry of sulfate aerosol particles in Kilauea’s volcanic plume.
An image by doctoral candidate Mack Durham, who works in Roman Stocker's group, won an award in the Gallery of Fluid Motion at the American Physical Society (APS) Division on Fluid Dynamics meeting, held in Baltimore Nov. 20-22. Winners of the Milton van Dyke Award, named after a scientist who was a pioneer in highlighting the aesthetic appeal and scientific usefulness of flow visualization, are selected for their artistic value, scientific content and originality. Durham's image, "Division by Fluid Incision: Biofilm Patch Development in Porous Media," illustrates the fluid mechanics occurring inside bacterial biofilms and was one of three winners selected from 55 entries. Mack Durham, in Roman Stocker's group, won the Raymond Lindeman award, awarded by the Association for the Sciences of Limnology and Oceanography for the best paper in the aquatic sciences by a first author under the age of 35. Durham's paper, co-authored with John Kessler and Roman Stocker, was published in Science in 2009 and describes a new mechanism for the formation of thin phytoplankton layers, dense aggregations of photosynthetic organisms occurring a few meters beneath the ocean's surface in many coastal areas.

Eric Alm will be traveling to Hawaii with TREX and will be lecturing the students on the Murderous Methanogens and Their Malevolent Methane. This is only slightly indicative of Eric’s creativity and his proclivity for Science and Nature papers. Eric and his students have presented their recent work on horizontal gene transfer from the environment to the human microbiome. More about this below.

Janelle Thompson will drop in on TREX as she flies in from her research in Singapore. She will be leading the students up to an ombrotrophic bog at 4500 feet where they will examine the transition between oxic and anoxic zones and search for microbes that either eat or make methane.

We are all anxiously awaiting the arrival of our newest faculty, Collette Heald. Collette, an atmospheric modeler, will be arriving in January. Collette works on global atmospheric composition and chemistry, and interactions of these with the biosphere and climate system. She works with both models and observations (observations from ground station, aircraft and satellite platforms) with a strong emphasis on the integration of the two.

Our young faculty are energetic, but our other faculty move so fast we are not entirely certain at any time we know where they are.

Charlie Harvey is spending the year in Singapore so that he has easy access to his new research site in the jungles of Brunei. Among other things he is studying an ombrotrophic peat bog. Charlie loves his new site and tells us “You can’t beat the peat.” He sends us dramatic pictures of building tower sites in the jungle using some rather unusual but practical methods. I will soon see him and plan to greet him as Mr. Kurtz.

Phil Gschwend has been particularly on the move this year. He streaks through the hallways at a mind boggling pace. He has won the 2011 ESCTP project of the year award for his group's work on "Passive Sampling of Contaminated Sediments". The following citation was read and the award was presented to Phil, John MacFarlane, PhD students Elizabeth Follett, Jennifer Apell, and Loretta Fernandez, and their collaborators from ICF International, Kevin Palia, Dean Gouveia, and Steve Reichenbacher, at the recent SERDP-ESTCP symposium in Washington DC: “Dr. Philip Gschwend and colleagues have demonstrated and validated a commercially viable, simple passive sampler that can measure the fraction of the chemical that is of concern.”
Developed under SERDP, the passive samplers utilize an inert low-density polyethylene medium to accumulate organic compounds from contaminated sediment beds. The polyethylene concentrations can be converted to contaminant concentrations that are available to the organisms in this environment. This accurate and robust passive sampling technique can be cost-effectively employed at virtually all DoD contaminated sediment sites to characterize the risk of contaminants entering the food chain. It provides significant savings in manpower, number of days in the field, equipment, and shipping costs as compared to traditional sampling methods. For sites already in the remedial action process, the use of these samplers could significantly reduce the costs of long-term monitoring. Beyond cost reduction, the passive sampling technique can help guide remediation efforts to target the real risk and thus improve the health of the environment at sediment sites across DoD and the nation. “For this work, Dr. Gschwend received a Project-of-the-Year award at the annual Partners in Environmental Technology Technical Symposium & Workshop held November 29–December 1, 2011, in Washington, D.C.

Phil was also recognized with the Maseeh Award for Excellence in Teaching from the CEE Department AND the 2011 Samuel M. Seegal Prize teaching award from the School of Engineering, given to a faculty member who inspires students in pursuing and achieving excellence. Phil wants everyone to know that his son Matthew has taken up the volleyball torch playing on the Lexington High School team, and his wife, Colleen Cavanaugh, has continued making diverse contributions including her service on NASA’s Planetary Protection Committee.

Eric Adams has recently received research support from several oil companies to work on modeling and soft containment systems applied to deepwater oil and gas plumes. In January he will be accompanying three MEng students to Spain on their project to examine the carbon footprint of wastewater treatment plants.

It was another tough year in the DeLong lab, as grad students and post-docs completed grueling field work, first on a cruise in the South Pacific from Chile to Easter Island, and next on the Pacific Ocean north of Hawaii. One of the exciting aspects of the latter cruise was the use of a new robotic sampling and sensing device, that drifts with the currents and automatically collected coherent samples of the same populations over time for later genetic analyses, while at the same time measuring water physics and chemistry. Advancing technologies are letting us do things we couldn’t even have imagined 3 years – says Ed.

Thanks to several trips to his “Monster” or “Million Dollar Baby”, an experimental facility for the study of Wave-Current-Sediment Interaction at prototype scale, in Singapore, Ole once again qualified for Premier Executive standing with United Airlines. The experimental results he has obtained in the facility so far are so encouraging that he behaves like a kid in a candy store.

Penny Chisholm has a lot to do with making Parsons one of the coolest research labs on the planet. A highlight of the year was the visit by GZA (pronounced jizza). GZA (aka The Genius) for those not-in-the-know is one of the founders of the Woo-Tang Clan, a pioneering hip-hop music group. Below is the link to a news report as well as link to the Boston Globe article, photographs and (believe me you) video:

http://cee.mit.edu/node/18141

It might not be as cool, but Penny also received the Darbaker Prize from the Botanical Society of America for her research on Prochlorococcus. She is having a lot of fun studying hundreds of
Prochlorococcus genomes as well as the viruses that infect them. She still immensely enjoys her cabin on Lake Superior in the summer.

Last January, Prof. Nepf enjoyed another TREX adventure with Sheila and Don. At the end of the year Prof. Heidi Nepf underwent emergency surgery to repair a detached retina. She was touched by the outpour of concern from her colleagues, but especially from her students in 1.061.

Dennis McLaughlin is scrambling to keep up with his children, who have both recently graduated. James is working on drug discovery for a local VC firm and Meredith is doing fund raising and publicity for a health project in rural India. Both have lots of good stories. Dennis is working on projects ranging from probabilistic merger of models and observations, to food production limits in China to enhanced oil recovery. We share (and recently graduated) students working on data assimilation. A paper summarizing much of years of work on the topic came out in Tellus—a meteorology journal.

Fatih Eltahir together with his students established a new field site in Ethiopia to study the impact of water reservoirs on vector borne disease transmission. He has been working with epidemiologists to establish the environmental controls on vector borne diseases.

Pete Shanahan continues to teach as a part-time lecturer as well as maintain an environmental engineering and hydrology consulting practice. He will be taking a group of MEng environmental students to Singapore for the fourth January in a row this year.

In May of this year CEE held a symposium at the American Academy of Arts and Sciences in honor of Chiang Mei’s retirement. Arthur Mynett and Rafael Bras chaired the sessions, and invited speakers included Philip Liu ’74, Dick Yue ’80, and Matt Hancock ’05—all Parsons alums and prior students of Chiang’s. The event was a terrific success and continued to the next evening with Chiang and Caroline hosting friends, family, and colleagues on a delightful dinner cruise around Boston Harbor.

Jim Long is still with us watching over our office technology infrastructure and day-to-day Parsons business. He climbed back onstage this fall for the first time in 20 years to help his high school theatre troupe at a reunion benefit. We are pleased to learn that his acting (dis)abilities have not convinced him to reconsider his career path.

Vicki still really enjoys taking care of other people’s money. She continues to lend a listening ear to many graduate students and most importantly is the major source of chocolate, milk or dark, in the building.

Sheila Frankel is leading another TREX to Hawaii and will be staying with the group on top of the actively erupting volcano, Kilauea. Now TREX is Traveling Research Environmental eXperiences. Sheila has led ten of these during the IAP periods past. Dozens of CEE undergrads go on each TREX trip to collect observations in the field and apply it to understand an environmental research problem. It is really popular among students both as a hands-on research experience but also as a way of getting to know each other. Sheila and her husband Don are the creators and champions of this great program. Sheila received the well-deserved MIT Infinite Mile Award from the School of Engineering for her exceptional work at MIT and a CEE Department award for developing the TREX program. This will be the 11th TREX this January.
During the last few months three doctoral students graduated from my group. They are now all gainfully employed in places they really like. The group has been busy with theses, papers and the activities that come at the close of graduate studies. The SMAP (Soil Moisture Active Passive) satellite mission had an eventful year (I am the science lead on the NASA mission). We formally entered the next phase of the project after set of major and multi-day panel reviews on various sub-systems. I can spend all day on the telecons or at reviews if I am not careful. The satellite subsystems and its instruments are partially built and being tested at JPL in Pasadena right now. We are at peak-project meaning the number of engineers working on the project and the burn-rate (dollars, not fuel yet). Launch is October 2014 with at least three years of operation. It is really exciting and it is great to see the project finally coming to fruition after ten years of effort.

No doubt the most exciting news for the Parsons Lab this past year is the release of the MIT Environmental Research Council (ERC) report titled “Implementing the MIT Global Environment Initiative”. The report outlines the research priority areas and implementation plan for an initiative at MIT.

There has been an interesting evolution in how research is conducted at MIT. In addition to the research within specialty disciplines and within departmental structures, MIT is evolving to include major research initiatives on problems that do not fit any one department and in fact the solutions to them lies at the integration of basic science, technology and social research from across departments. So far these include human health (cancer specifically; e.g. the new Koch building and center for Integrative Cancer Research) and energy (the MIT Energy Initiative or MITEI that is in its fifth year). Human health and energy are two problems that do not fit in any one department in their entirety but solution to them require research integration across disciplines.

The ERC report argues the same for the environment. The initiative in fact completes the research portfolio because the environment is a limiting factor in many human health and energy problems. The ERC report and its foundations took three years to establish. I served as the ERC chair and both Penny Chisholm and Martin Polz served as faculty members on the Committee.

Clearly the MIT Environment Initiative and the Parsons Lab are intimately linked. The initiative cannot be imagined without the foundations set for it based on the history of environmental research at the Parsons Lab and without the active participation of the Parsons faculty. The Parsons Lab will be a hub for this Institute-wide initiative. I think this will be a milestone in the history of the Parsons Lab and significantly enhance our links with the rest of the Institute. The future is bright and exciting times lie ahead.

You can read the report and its executive summary at:

http://web.mit.edu/provost/reports/1_ERC_ExecutiveSummary.pdf


We also held a day-long forum to introduce the report to the MIT community. A news release about the event on December 15 is at:

President Hockfield opened the Forum with a message and Provost Reif made a presentation and co-chaired the discussion panel at the end of the day. At the Forum, besides presentations by Penny and me on the ERC report, Eric Alm and Phil Gschwend from the Parsons Lab presented two of the four faculty spotlight presentations. Eric spoke about his horizontal gene transfer recent research discoveries and Phil talked about benign-by-design chemical and materials production.

I cannot imagine reporting on a more exciting year at the Parsons Lab. We are bursting at the seams with an expanding family of graduate students, post-docs and visitors. Our faculty numbers are at all-time high. There is diverse basic and applied environmental research at the Parsons Lab. The building continues to flood. I think we can call it the Noah’s Ark.

Last year we sent about three-dozen graduate students (possibly a record number) to conferences using the returns on the Ippen Fund. Students must present a paper based on their theses to be eligible to receive partial travel support. This is very important to the graduate students. I encourage you to support the continuation of this program directed to enrich the education of Parsons graduate students and let a wider audience hear about the history and the present of the Parsons Lab research about the environment. You can help keep the program by donating to it at the giving.mit.edu web site. To find the Ippen Fund at the site search for:

Ipplen Fund # 3464500 - to support graduate and undergraduate travel for those giving papers at conferences on environmental research or traveling to conduct environmental research

If you prefer to enhance the life of graduate students (if you remember, it does not take much to enhance graduate student life from its base level), then you can select the following fund:

Parsons Lab Fund # 3893100 – To enhance the life and education of graduate students

We at Parsons wish you and your families the best of health and joy for the new year and years to come. You have an open invitation to visit.

Sincerely Yours;

Dara Entekhabi
Director, Ralph M. Parsons Laboratory for Environmental Science and Engineering