Letter from the Editor

As students, staff, and affiliates of MIT, we know the importance of an education; the brilliance and innovation alive within the Institute are strikingly noticeable. Many students have even taken their education one step further by thinking about how to bring it to other people who may not have been so lucky. Such students are involved with tutoring and teaching classes, giving to book-donating organizations like MIT Aspire, or creating a curriculum for a community in a developing country. Ultimately, education became the topic for our very first themed issue because it is a popular area of interest for both our staff and our readers.

A couple of this issue’s articles are about classes you might take to learn more about international development. Some are about projects that are focused on education. In addition, we’re featuring multiple contributing authors in this issue because, in light of the education theme, the very students who worked on these projects can then directly teach us about their experiences through their writing.

We hope you enjoy – and learn much.

Sincerely,

Bina

Attention writers!
** We are currently inviting all students with an interest in writing, editing, or international development to join our team! No experience necessary.

Email Komaza-official@mit.edu for more information. **

Table of Contents

4  IDG@MIT
Hands-on development research

5  Chirp Chirp,
Carbon Monoxide!
Solutions for carbon monoxide poisoning

6  Energy Education at the Ghana Fab Lab
Innovations at the Ghana Fabrication Lab

8  How (and Why) to Go to College
Helping Indian female high school students

10 The Business of Health Care Delivery
Tales from Kenya

12 Engineering a Solution
A global focus from the fall 2.009 class

13 Adventures with Sinchi Runa (Strong People)
Water testing, but so much more

Cover: Taping solar panels for the Ghana Fab Lab.
Photo credit: Anna Waldman-Brown / Edward Burnell

5: The team of Chirp Chirp, Carbon Monoxide! in Turkey.
6: The Ghana Fab Lab educates a woman on light.
8: Kadod High School students discuss strategy at halftime of a Kho Kho game, which is played in wet mud and involves a lot of sliding.
14: Lily Xu with month-old Nikol, named after Nicole Koulisis ’09
Democrazies, formalization of land markets, and crimes against humanity? Where you could find faculty studying topics as complex and diverse as judicial power in international situations of chronic violence.

Ever wished you could get class credit traveling to Peru, Amsterdam, and Brazil? Longed for a chance to meet and work with graduate students and faculty doing research in the developing world.

With ongoing research conducted across six continents, the International Development Group (IDG) in the Department of Urban Studies and Planning (DUSP) stands at the forefront of development research. The IDG takes a hands-on approach to its research. Its faculty hails from a range of backgrounds, bringing diverse inspirations for entering the field.

Professor Diane Davis, whose research primarily revolves around the relationship between security and urban spaces, is actively involved in the Urban Resilience in Situations of Chronic Violence project, researching how institutions respond to political and economic violence. Professor Balakrishnan Rajagopal – having researched and observed the complex interplay between government, politics, and the economic violence. Students doing research with the IDG generally acquire some funding through the Public Service Center. Many of these projects involve opportunities for travel abroad, as do some classes in DUSP, including but not limited to 11.025 (D-Lab: Development) and 11.027 (City to City).

IDG offers students the opportunity to study the current nature of work and employment, both nationally and internationally. Students interested in human rights can get involved in Rajagopal’s PHRJ, researching the role of development in the realization of human rights.

In Situations of Chronic Violence projects in which the seven core IDG faculty members are involved. Undergraduates can get involved with the IDG by declaring a major in DUSP and joining the IDG as one of the four specializations offered by the department. Alternately, interested undergrads could join ongoing research in the department as a UROP. The Sloan Institute for Work and Employment Research offers students the opportunity to study the current nature of work and employment, both nationally and internationally. Students interested in human rights can get involved in Rajagopal’s PHRJ, researching the role of development in the realization of human rights.

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Infrastructure improvement projects involve opportunities for travel abroad, as do some classes in DUSP, including but not limited to 11.025 (D-Lab: Development) and 11.027 (City to City).

Historically, the undergraduate presence in the IDG has been small. However, the group is seeking to attract more undergrads interested in international development. IDG faculty member Annette Kim says that the group hopes to take advantage of the immense popularity of the D-Lab classes to recruit potential students to DUSP.

Chirp Chirp, Carbon Monoxide!

In summer 2010, Christie Lin traveled to Istanbul, Turkey to develop a program empowering high school students to address a need in their underprivileged communities. Sponsored by the MIT Public Service Center and the Tau Beta Pi scholarship, the project was inspired by two students who wanted reduce carbon monoxide poisoning and sought help from an MIT student to lead the project. The team of seven high school students and Christie developed two types of solutions: a public awareness campaign and engineering innovations for low-cost carbon monoxide detectors.

Merhaba! Günaydın!

Every morning, I woke up to a group of bright students with wide smiles, eager to apply their knowledge and see their ideas take form in their community. We spent many hours together brainstorming innovative engineering solutions to a silent killer: carbon monoxide. I created an outlet for young minds to learn more about engineering and apply their interest in science and engineering to address a community concern.

Carbon monoxide poisoning occurs when indoor furnaces and heaters leak due to poor combustion. These furnaces are predominantly used in underserved communities of Turkey that do not have access to safer heating technologies. Statistics claim that about 10,000 people in Turkey have been poisoned in the last 5 years, and about 200 of these have lost their lives.

During my summer trip in Istanbul, I stuffed the short few weeks we had together with inspirational guest visitors, hands-on experiments, and a visit to the national Turkish research laboratory to give these future leaders knowledge to quench their curiosity. The students and I developed two types of possible solutions, engineering and education, to provide both the knowledge to understand the hazard and concrete ways to mitigate it.

On the engineering side, we developed an innovative low-cost carbon monoxide detector that was integrated with a clock. A clock is an easily marketable product, so this safety device has multiple uses and could gain a broader market. Carbon monoxide is difficult to detect, so we also explored chemical engineering methods, such as mass defect, as new means of inexpensive detection.

On the education side, we produced a carbon monoxide poisoning public awareness campaign. Most of the Turkish population is unaware of this danger, and the Turkish Department of Health does not focus on this hazard. We developed easy-to-understand educational brochures and pamphlets for distribution in target communities, as well as a training program to teach the young Turkish generation to avoid and handle carbon monoxide poisoning in their homes. We also created a short 20-second animated video for education purposes.

Two Turkish newspapers and a television show brought our work to the attention of the public. Our team hopes our work will save many lives from carbon monoxide poisoning in Turkey and around the world. For more information, please contact ch.lin@mit.edu or visit chirpchipcarbonmonoxide.blogspot.com.
Energy Education at the Ghana Fab Lab

by ANNA WALDMAN-BROWN and EDWARD “NED” BURNELL

What happens when you bring a high school class, a box of electronics, and a cooler full of fried rice to a mud hut village on the western coast of Ghana? We had no idea, so we decided to test the results empirically.

Thanks to funding through MIT’s Public Service Center, we spent July and August 2010 developing a hands-on alternative energy curriculum at the Takoradi Technical Institute (TTI) Fabrication Lab in Ghana. The Fab Lab is an educational laboratory network for “ordinary people to not just learn about science and engineering but actually design machines and make measurements that are relevant to improving the quality of their lives.” Started at the Media Lab’s Center for Bits and Atoms, the lab now has satellite locations around the world—all equipped with the same high-end machine tools and extensive collection of circuitry components to encourage international collaborations.

During Ned’s D-Lab trip to Ghana in January 2010, his group stopped by the TTI to teach classes on energy generation. Azasoo Emmanuel, the Fab Lab manager, was thrilled to have MIT student teachers who shared his enthusiasm for hands-on science education—and invited Ned back to help integrate more practical science into the high school curriculum.

Several months later, surrounded by iguanas and coconut palms, Ned, Mr. Emmanuel, and Anna sought a way to put these goals into practice. We devised a curriculum to teach our high school students about designing and implementing small-scale renewable energy technology—an urgent need in rural Ghana. We hoped to both give our students practical experience and help integrate the Fab Lab into the school and the broader community.

But first, we had to dispel the prevailing belief that science takes place on the blackboard. We had to create a classroom where students would look for questions instead of copying down the answers. We taught daily classes and hands-on science labs to a multidisciplinary group of sixteen TTI students—including two cooking students and several prospective auto mechanics.

For our first lab, we all made copper-zinc ion-exchange batteries: galvanized nails covered in salted towelettes and copper foil. Instead of showing our students how to troubleshoot malfunctioning batteries, we instructed them to experiment with different techniques—“for the sake of science.” This allowed us to answer questions as they arose with more questions in return, and to demonstrate the excitement of scientific inquiry by successfully wiring our batteries and lighting LEDs.

After several weeks of experimenting with different means of energy generation, we encouraged our students to look for real-world challenges to solve themselves. We watched William Mkambala’s TED talk on building a windmill using found materials in Malawi, and spoke briefly on the merits of using the Internet as a project resource. To our surprise, the students stayed in the Fab Lab until 9pm that night scouring the Internet for their own windmill design. Our impromptu lessons on Wikipedia and Instructables were actually among the most valuable. The students were astonished at how much information could be found—and how much of it was misleading or irrelevant to their projects.

We then moved on to solar energy, and the Fab Lab network manager Sherry Lasiter bought and shipped us 1000 off-spec solar cells and several boxes of circuitry. The engineering students designed an LED lamp, and the electrical engineering students figured out how to make it run off a cellphone battery. Fancied up by photovoltaics, one student designed his own miniature solar panel using conductive tape and a cardboard box.

Since our arrival in Ghana, we had been planning a field trip with Mr. Emmanuel. Borrowing from the D-Lab curriculum, we hoped to take our students out to a rural village where they could put their knowledge into action and devise their own means for generating electricity “in the field.” Since the school rarely sent bussloads of students into the jungle, this planning stage went on for several weeks. We cancelled our first field trip because the bus was otherwise occupied, and further postponed our second attempt due to some misunderstanding with school administrators.

When it finally came time to board the bus—the two hours after our intended departure time, because the fried rice lunch took longer to cook than anticipated—we suddenly realized we had no idea what we were doing. We had spent far more time re-planning the trip than actually figuring out what was happening. We scurried between the lab and the parking lot, parking anything that could potentially be useful: extra LEDs, demo solar panels, alligator clips, multimeters, and plastic bottle wind turbines. Most of these belonged to our students’ projects, which had been completed that morning while the rice was cooking. We tried to give the students a pep talk on the bumpy road to the village: “If no one shows up and your inventions all fail anyway, just remember it’s for the sake of science.”

We arrived to find the chief and several elders gathered around an ancient mango tree. They waited patiently as we brought out the box of electronics and introduced ourselves. We shook hands, addressing the elders in traditional Fanti fashion as “our fathers.” By the time we had finished our introductions, a few dozen villagers had gathered to see the excitement.

Instead of presenting all at once, our class broke off into separate groups to talk with one or two villagers at a time. But how could a group of high schoolers—including two cooking students—explain exothermic reactions to a handful of elderly, illiterate grandmothers? Sitting on logs under the mango tree with Mr. Emmanuel, we grew increasingly anxious: we had anticipated a formal meeting with the village elders, but our students had other ideas. We were both forced to watch on the sidelines—all useful conventions had failed. “If no one shows up and your inventions all fail anyway, just remember it’s for the sake of science.”

By the time we got back to the bus, our students were already discussing how to build some large-scale solar panels for the entire village. And a few weeks later, this is exactly what they did. They designed, made, and installed two 30W solar modules. Directly, these can charge cell phones and, indirectly, can light lanterns—which normally use expensive disposable batteries—by taking the phone’s battery out and using that instead.

Inspired by our students’ excitement about helping their communities, the two of us are forming an IDEAS team for next term. We will design a practical energy education curriculum for developing countries, with the aim of getting more student-made solar panels out in the world. Please send me an email (annawb@mit.edu) if you’d like to get involved!
Over the past decade, India has enjoyed tremendous economic growth which has generated countless opportunities in the fields of science and technology. The majority of these opportunities, however, have been reserved for graduates of private schools in urban areas. By and large, rural India has been left behind.

“People in these villages are in such remote areas and are so closed off from the world that it’s hard for them to imagine anything other than the community they live in,” explains Apeksha Dave ’13, a member of MIT’s student group International Development Consulting (IDC).

The IDC’s mission is “to harness the business knowledge and engineering talent of MIT students to improve the efficiency and sustainability of international development efforts by offering consulting services to non-governmental organizations (NGOs).” Last year, IDC partnered with the Nanubhai Education Foundation to address the lack of knowledge about college applications.

Based in the US, the Nanubhai Education Foundation helps advance education in under-funded public schools in rural India. Students can then attain skills needed to take advantage of India’s vast economic opportunities. The foundation believes that “India’s changes won’t just take place at a national level; they will start in each classroom, spreading from motivated individuals, to families, to entire communities.”

Last summer, Apeksha, IDC’s Director of Strategy, and David Sae ’13 travelled to Kadod, India to reach out to schools in the area and to research ways to increase female applicants for higher education. By talking with local people, the pair gained a better understanding of the core of the problem. The team was surprised to find that high school teachers themselves did not have adequate knowledge to assist their students in this process. Furthermore, the vast majority in rural areas do not have access to the internet, which makes information on colleges and application processes virtually inaccessible.

The team’s current answer to these problems is two-fold. Firstly, they plan to distribute a guidebook on everything a rural student could hope to know about entering a career in technology. It includes first-hand accounts from doctors and engineers who have worked their way up from rural roots as well as information on scholarships and quotas for lower-caste students. Secondly, the team hopes to implement a mentorship and guidance program between high school girls and local professionals. The goal of this, notes Apeksha, is “to get girls actual exposure to what it would be like if they could study and work in these fields.” These activities comprise a pilot program that the team hopes will be up and running next year.

Through her research, Apeksha was moved by the aspirations and motivation of the students she met in Kadod. “We thought they just didn’t want to enter science and technology, which turned out not to be true. These girls want to become doctors and engineers. The problem is they don’t know how. They want a better life, but they don’t know how to go about doing that. Their ability to dream beyond their circumstances is remarkable. As an MIT student, I find this inspiring, to say the least.”

In India, as in many parts of the world, far fewer girls than boys attain higher education in science and engineering. One of the greatest challenges is the lack of information available to students about the application process, the requirements for acceptance, and the benefits of attending university.

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How (And Why) to Go to College
by BRIANNA JONES

In India, as in many parts of the world, far fewer girls than boys attain higher education in science and engineering. One of the greatest challenges is the lack of information available to students about the application process, the requirements for acceptance, and the benefits of attending university.
The Muthaiga Pediatric Clinic was having trouble dealing with the number of patients coming through its doors. Appointments were backing up and children (and their parents) were spending too long waiting to see a clinician or to have their paperwork processed. These issues are common among US clinics, but increasingly they are being addressed by best practice management. By analyzing the flow of patients through the clinic and collecting data on how staff and resources are utilized, third-year HST Biomedical Enterprise student Joshua Gottlieb and his teammates were able to make specific recommendations to help the clinic improve its patient rotation.

The twist in this story is that the Muthaiga Clinic isn’t in the US: it’s located in Nairobi, Kenya. Joshua’s work was carried out through G-Lab Global Health Delivery (GHD), a Sloan course started in 2008. The course teaches students how systems thinking and business management skills can be applied to improve health care delivery in the developing world. “I started with the hypothesis that you can use all your business skills in [the health care delivery] context and that hypothesis has largely been borne out,” says lead course instructor Anjali Sastry, Senior Lecturer in Sloan.

Over two years, G-Lab GHD involved 100 students working with organizations across Africa. This year, two newly developed courses take the place of G-Lab GHD: Fall 2010’s Global Health Delivery and Management, and Spring 2011’s Global Health Delivery Lab.

Global Health Delivery and Management is a classroom course that introduces students to the issues involved in providing health care in resource-limited settings, with particular focus on business models that can be used to alleviate bottlenecks in health care systems. Learning from successful case studies is a key part of the course. “We’re always inspired by organizations that have figured out how to make things work with a particular community in a particular place,” says Anjali. “The challenge is to figure out how their successes can be replicated.”

Spring’s Global Health Delivery Lab offers students an opportunity to apply these lessons from successful organizations to a specific problem, by pairing teams of four students with community partners. The partner can be any organization that provides health care in a resource-limited setting, including clinics, hospitals and community programs. Students will initiate communication with their partner organization in January, and work will begin in earnest at the start of the spring semester. Teams will have six weeks on campus before undertaking a two-week placement on site during March. Joshua identifies the on-site experience as the most valuable part of the course. “You’re only there for a couple weeks, so you really have to be focused on the things you want to get done,” he says.

Anjali’s broader goal is to use the lessons learned through the course projects to evaluate the implications for health care delivery policy and resource allocation. She explains, “We would like to have a dialogue between people who work in specific locations or with specific technologies and those who think about the larger scale, to work on issues of how you scale up context-specific successes to the broader scale.”

The course is open to graduate students in all departments. For more information on the program, go to: http://global-health.mit.edu/home/.

Opposite: Joshua Gottlieb (far right) with his G-Lab GHD team and staff of the Muthaiga Pediatric Clinic, Nairobi.
Top: Another G-Lab GHD team, hiking in Kenya.
Bottom: Joshua (middle) with his team mates, at work in the Muthaiga Pediatric Clinic.
Engineering a Solution

by EMILY SUTER

Band saws sing as thin sheets of aluminum are pushed across their sharp, undulating teeth. Across the room, lathes whir and a drill press purrs in a gentle hum of productivity. Behind colorful protective glasses, students eagerly chop metal, mill parts, and cut foam to their specifications. As on any typical weekday, Pappalardo Lab, in the basement of building 3, is alive with excitement and creativity.

Meanwhile, in the Red Team area, a chorus of oohhhs and ahhhs arises as a white powdery substance is scraped from the sides of a complicated metal contraption. “It works!” someone exclaims, as others jump up and down to celebrate their success.

Long hours of design and modeling have finally paid off.

The Red Team represents one of eight teams participating this semester in the mechanical engineering capstone class 2.009: Product Engineering Processes. At the beginning of the semester, each team was tasked with designing and manufacturing a product that fit the theme of “Food.” With biweekly checkpoints and design reviews, the class guides students through the entire product development process, including brainstorming, product mock-up, and CAD modeling phases. User testing, marketability and design innovation are also integral parts of the class, requiring students to obtain user feedback and perform comprehensive market research as their product evolves.

Given the broad theme, the class has given rise to an eclectic mix of potential products. Sushi robots provide a more tech-savvy flavor that can expand to more places,” explains Moji. While they hope that the product will land them a perfect grade, true gratification would be seeing this have an actual impact on people’s lives.

“Completely mechanical, users first move the pedals of an old bike, which turns an inner metal basin. Simultaneously, a nozzle connected to a container of milk sprays a fine mist of milk onto the surface of the inner basin. A fire lit under the apparatus provides the heat to dry the milk, which then becomes a powder that is then removed from the walls of the basin.”

However, the Red Team has taken a more global approach as they design a new technology to help people in developing countries. “Our product is a milk dryer for small-scale farmers,” team member Moji Jimoh ’11 describes, “which would enable them to preserve the milk that they cannot sell in one day.”

Currently, unsold milk spoils due to a lack of refrigeration, causing farmers to lose money and valuable product. With a new means of drying their milk, these farmers can decrease their losses. They can also expand their business, as the dried milk can be more easily transported and therefore reach a larger customer base.

Completely mechanical, users first move the pedals of an old bike, which turns an inner metal basin. Simultaneously, a nozzle connected to a container of milk sprays a fine mist of milk onto the surface of the inner basin. A fire lit under the apparatus provides the heat to dry the milk, which then becomes a powder that is then removed from the walls of the basin.

Throughout the design process, the team met many challenges. First of all, the milk mist had to be fine enough to create a powder when dried. Speed control of the inner basin was discovered to be critical, as too fast or too slow would not allow for optimal heat and drying conditions. Finally, the whole machine had to be able to be produced cheaply enough for a small farmer in a developing country, but robust enough for a rural setting.

Through many iterations and trial runs, the team has managed to work through many of these problems to create what they believe to be an extremely useful product. “This class kind of takes over your life, but in a good way,” says Moji, with a smile. “It’s been a lot of fun to see it really take shape.”

Though this project is technically being done in conjunction with 2.009, the team hopes to see this product go further than the final design review at the end of the semester. They’ve established many customer contacts to obtain feedback on their design and hope to utilize these to actually bring the product to market. “Currently we’re working with someone in Guyana, but we hope that it can expand to more places,” explains Moji. While they hope that the product will land them a perfect grade, true gratification would be seeing this have an actual impact on people’s lives.

Adventures with Sinchi Runa (Strong People)

by LILY XU and SABA MOHSIN

MIT students, Lily Xu ’12 and Saba Mohsin’11, spent two months during the summer of 2010 in Santa Ana, an indigenous community in the Amazon of Ecuador. The project was to install nearly two dozen rainwater collection tanks on individual family homes and to assess the water quality of existing tanks through water tests and health surveys. In 2006, MIT alumna Kendra Johnson began the project in Santa Ana. Lily and Saba returned to continue her work and expand it to the neighboring communities of Jatari, Chipchayacu and Encañada.

“completely mechanical, users first move the pedals of an old bike, which turns an inner metal basin. Simultaneously, a nozzle connected to a container of milk sprays a fine mist of milk onto the surface of the inner basin. A fire lit under the apparatus provides the heat to dry the milk, which then becomes a powder that is then removed from the walls of the basin.”
All punja (Good morning). We awaken in the morning to an inundation of rain, the cackling of parrots, and screaming girls running around on the floor boards above our mosquito-netted bed. Once the rain lets up, the girls scamper down from the floor boards by sliding down the notched wooden frame of the house, squealing with delight, “Mama says to come and eat breakfast!” Samira, one of the twins, pokes her head into the room and won’t leave until we show signs of life.

After greedily climbing out from under our canopy, we go outside to a gigantic blue rainwater collection tank filled with last night’s rainfall. The sky has since transformed into an ocean of bright and clear blue from last night’s deluge. We brush our teeth beneath the water tank as the chickens roam the backyard for corn kernels and the cats settle down next to the fire knowing where food scraps would soon be tossed. Our host mother, Leticia, serves us breakfast she prepared for the winning team to enjoy. In practice, the soda is passed around to the neighbors and laughing at Lily’s story Kichwa word we have become stronger women for it. We realized just how little we understood about our own values and capacities and have made the indigenas the strongest, most selfless individuals we may ever meet.

[Image 905x36 to 1127x239]

Making shoes for the team.

All chicha (Good afternoon). After a 2 km walk filled with banter and stories, we finally arrive at the last house, which belongs to Sadia, on the road leading out of Santa Ana and have to conduct the last of our health surveys. Sadia sits by an open fire, meticulously painting ceramic bowls with strands of hair while five kids and two dogs run loose around the house. Sadia tells us her full name and how often her children get the flu or bouts of diarrhea, Sadia tells us her full name and how often her children get the flu or bouts of diarrhea, and hollers, “Mama says to come and eat breakfast!” She is unaware that not all the meals of the day share the same name. We hurry in to a warm plate of chicken and potato stew followed by more rice, lentils and a slice of the family’s one treasured avocado. Knowing that a very intense match is about to take place, we inhale our food and grab Sacha as we run back to the pitch and are placed on a team. The ensuing mayhem involves bloody toes, chasing soccer balls into enormous puddles, and using every derogatory Kichwa word we have been taught by the town’s schoolgoers. “Fart!” and “Butt!” are not uncommonly heard as the ball whizzes by me and into the opposing team’s goal. The deciding goal means the losing team buys a 2.5 l bottle of soda for the winning team to enjoy. In practice, the soda is passed around to everyone that played and some final tubers are shared as everyone retreats into their homes and heads to sleep. Tomorrow promises to be just as busy as today and even 8 hours of sleep just aren’t enough.

Sixty days of cooking meals together, sharing shoes and washing our clothes on the same rock in the Pastaza River have made the indigenas of Santa Ana a strangely wonderful part of our lives. Our experience was both frustrating and incredible, but the transformation we underwent in those two months alone was incredible. We learned to be patient in a way that we previously thought ourselves incapable of being. Long talks under the stars helped us rec-gognize our own values and capacities and have become stronger women for it.
We are currently inviting all students with an interest in writing, editing, or international development to join our team! No experience necessary.

Email Komaza-official@mit.edu for more information. **