MIT-AFRICA Initiative

Annual Report 2015
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Overview

“We must realize our full potential as a university with global impact. The humanity we serve stretches across the planet. And it is clear that we must prepare our students to succeed in a global economic environment. So it is extremely important that we continue active engagement with the rest of the world.”

MIT President L. Rafael Reif

As many African countries look towards science, engineering, entrepreneurship and education as pillars of their long-term development strategies, we see exciting spaces for mutually beneficial partnerships with MIT’s world-renowned faculty and students.

The MIT-AFRICA Initiative creates connections between MIT and Africa through education, research and innovation. We act as an umbrella unit for the institute to support and connect partners at MIT and on the continent. To this end, we arrange the monthly MIT-AFRICA Interest Group (MAIG) and have formed the MIT-AFRICA Advisory Committee as strategic planning group for the Initiative.

MIT-AFRICA Programs & Institute Partners

- MIT-AFRICA Internships
- MIT-South Africa Program
- MIT-Empowering the Teachers
- MIT-AFRICA Educator Program
- Global Startup Labs
- MITx
- D-Lab
- J-PAL
- The Legatum Center
- MIT Energy Initiative
- The Martin Trust Center
- Sloan African Business Club
- African Students Association
The Reach of MIT-AFRICA

Below see just some of the connections and collaborations between MIT and the Continent. For an interactive view, please visit our website: misti.mit.edu/mit-africa-initiative
MIT-AFRICA Advisory Committee

In 2015, we formed the MIT-AFRICA Advisory Committee comprising 11 faculty members and 7 staff who have vast experiences, collaborations and connections with the Continent. The goal of the committee is to:

- consider MIT strategy for engagement in Africa
- be a sounding board for new and ongoing programs
- determine useful cross-program efforts
- consider strategies for financial development and
- shape initiatives that will expand the MIT footprint in Africa

Tayo Akinwande
Professor, EECS

Elfatih A. B. Eltahir
Professor, CivE

Julius Akinyemi
Resident Entrepreneur, Media Lab

Ahmed F. Ghoniem
Professor, MechE

Gabriella Yolanda Carolini
Assistant Professor, DUSP

Calestous Juma
Visiting Professor, DUSP
Tavneet Suri
Professor, Sloan

Bernd Widdig
Director, International Affairs

Kofi Taha
Associate Director, D-Lab

Ethan Zuckerman
Director, Center for Civic Media at MIT
MIT-AFRICA Interest Group
In 2014, we created a monthly space for MIT students, faculty, staff, post-docs and alumni to come together and share experiences from their work and lives on the continent. We now have a solid group of 60 attendees and have covered a vast range of topics with keynotes from important speakers, including:

April 2015:
• Keynote: Professor Gabriella Carolini, Department of Urban Studies and Planning, "South-South Cooperation, Sanitation, and Learning in Maputo, Mozambique"
  o Shalom Abate, MIT Junior, "Leading a programming course in Addis Ababa"
  o Nissia Sabri, MIT SDM & Abdelkrim Doufene, Post-Doc, "Launching a startup and engineering boot-camp in Algiers, Algeria"
  o Aurimas Bukauskas, MIT Senior, "Designing a Community library in Limpopo Province in South Africa"

March 2015:
• Keynote: Ethan Zuckerman, Director of the Center for Civic Media at the MIT Media Lab, "The Media Lab and the iHub - Seeking Symmetric Research Collaborations in Nairobi"
  o Joelle Owona & Shaun Githuku (Co-Chairs, MIT Africa Innovate Conference 2015), "MIT Africa Innovate Conference"
  o Lecturer Ernest Mwebaze, Fellow, MIT-Empowering the Teachers fellow “Artificial Intelligence in the Developing Countries”

February 2015:
• Keynote: Professor Evan Lieberman, Political Science Department, “Why Study the Politics of Development in Africa?"
  o Jakob Dahl, MIT Senior & QinQin Yu, MIT Senior, "Setting up an affordable laboratory for a start-up university in Rwanda"
  o Janet Lin, MIT Senior, Juan Hernandez, MIT Senior & Kelly Liu, MIT Junior, 'GTLx in South Africa'
  o Angela Makolo, Fellow, MIT-Empowering the Teachers, “The Status of Computing for Biology/Bioinformatics in Africa”

November 2014:
• Keynote: Media Lab’s Entrepreneur-in-Residence, Julius Akinyemi, "Unleashing the Wealth of Nations"
  o Startup Pitch Competition for MIT Startups in Africa
October 2014:
• Keynote: Professor Tavneet Suri, Economic Implications of Ebola in Sierra Leone
  o Tobi Amos, President, African Students Association presenting 'MIT Africa Week'
  o Dhaval Adjodah of the Media Lab, 'Data for Development' in Africa
  o Elizabeth Shanahan of GlobeMED, 'Hope through Health' project in Togo
  o Dr. Howard Heller, Associate Director, MIT Medical, 'Medical, Social and Political Implications of Ebola in Africa'

September 2014:
• Keynote: Visiting DUSP Professor Calestous Juma: a discussion to provide framework and context for the Forum on Science, Technology and Innovation in Africa
  o Fernando Ruiz, MIT Sophomore, 'Building Charcoal Stoves in Uganda'
  o Babatunde Alawode, MIT Graduate Student, 'Impact Labs: Nigeria'

March 2014:
• Keynote: Elfatih A. B. Eltahir, Professor and Associate Department Head, Department of Civil and Environmental Engineering "Hydrology, climate, and health in Africa"
  o D-Lab, International Development & Innovation Network
  o Ggbenga Ige, MIT Sloan MBA, Africa Business Conference

February 2014:
• Keynote: The Honorable George Monyemangene, South African Consul General, "Doing Business in Africa"
  o Dr. Anjali Sastry, Senior Lecturer Sloan, "Collaborating for improvement, innovation, and learning in South Africa"
  o Colette Abah, MIT junior "MIT-Global Startup Labs in South Africa”

December 2014:
• Keynote: Chipo Gift Mubambe, Humphrey Fellow, MIT “Water in Zambia”
  o Daniel Osadebamwen Obaseki, President African Business Club
  o Chidube Ezeozue, Graduate Student, Founder SolarKobo
  o Dr. Patience Orukpe, Fellow, MIT-Empowering the Teachers

October 2013:
• Keynote: Professor Clapperton Mavhunga, “What Does Africa Mean in Technology and Engineering”
  o Xi Wang, Netia McCray, “Workshop 17 Cape Town”
  o Obinna Okwodu, Obinna Ukwuani, "Exposure Robotics"

April 2013:
• Keynote: Professor Calestous Juma, Harvard University, “University Engagement in Africa”
  o African Students Association, President Colette Abah
Highlights of MIT-AFRICA Initiative Managed Programs & Partnerships

MIT-Empowering the Teachers (MIT-ETT)

“The MIT-ETT fellowship is a life changing experience with insights on how to improve my teaching and research. My teaching will now be student-centered with emphasis on problem-solving and hands-on tasks. The program has transformed my philosophy of how to teach. My teaching now must clearly set out the course intended learning outcomes and ensure that hands-on work and design projects are incorporated where possible.”

-Dr. Ibrahim ADEYANJU, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria

“The uniqueness of the MIT-ETT program is derived from the fact that exposure of faculty from Africa to the problem solving approach used in MIT in teaching and research can be translated back to their respective universities. This result will be an increase in the quality of graduates who will be problem solvers and entrepreneurial which will positively impact the economies of their home countries.”

-Dr. Michael Lubwama, Makerere University Kampala, Uganda

The Empowering the Teachers (ETT) program at the Massachusetts Institute of Technology (MIT) strives to foster innovation in science and engineering education in tertiary academic institutions in Africa through an intense engagement with faculty members from African universities.

The overarching goal of ETT is to facilitate the development of young African faculty leadership in science and engineering education who will introduce innovation and creativity into science and engineering curricular. There are two main objectives of the ETT program: to provide young African professors with exposure to cutting-edge pedagogical methods in the highest-rated engineering and science departments in the U.S. and to provide American faculty who have a deep interest in connecting with those in their disciplines in emerging economies a concrete
means of engagement. The ultimate goal is to reform their current curricular using new materials, approaches and methods that exemplify the best of MIT’s practices: problem-solving, student-centered, innovation and bringing knowledge to bear on the world’s greatest challenges.

**During their semester at MIT, Fellows do the following:**

- observe instruction in their own disciplines and subjects
- interact with MIT faculty teaching in their own disciplines and subjects
- develop courses based on problem-solving approach inspired by equivalent MIT course
- discuss and explore curricular enrichment and reform through both formal and informal interaction with the MIT community

Professor Akintunde Ibitayo Akinwande (EECS) is the Faculty Director for the program.

**A survey sent out in 2015 identified the following outcomes:**

- **100%** of ETT fellows have changed their teaching approach.
- **72%** of ETT fellows changed their syllabus/curriculum.
- **61%** received a promotion/of these promotions **42%** are now department heads or in a leadership position whereby they can influence policy.
- **54%** changed either teaching policy or the teaching approach throughout their entire university.
- **72%** held events to share MIT knowledge/experience.
- **93%** mentored other colleagues/superiors.

MIT News recently published an article on the program, “**A new leadership cadre for science and engineering.**”
MIT-AFRICA Educator Program

“The goal of the MIT-AFRICA Educator Program is to grow important connections between MIT and African universities while developing life sciences departments.”

-Professor Hazel Sive, MIT-AFRICA Faculty Coordinator

The new MIT-AFRICA Educator Program engages university faculty across Africa in discussion and utilization of MIT-style educational approaches, through a program based at MIT and the home university. Our first course, Life Sciences and Entrepreneurship, interfaces with the important areas of health, biotechnology, agriculture, biofuels and the environment. Associated with these areas is significant potential entrepreneurship, a key goal for many African countries. The program will first launch in July 2016 with ten Tunisian faculty members with the goal to expand to additional countries.
MIT-AFRICA Internships

With just two graduate students sent to South Africa in our 2013 pilot year, we are now sending 52 students to our partners across the Continent, including: South Africa, Rwanda, Ghana, Uganda, Algeria and Nigeria. This makes the MIT-AFRICA Initiative the fastest-growing international internship program at MIT.

**MIT-AFRICA Student Interns by Year**

Students were selected from 24 academic departments:

- Aeronautics and Astronautics
- Architecture
- Biological Engineering
- Biology
- Brain and Cognitive Sciences
- Business
- Chemical Engineering
- Chemistry
- Civil and Environmental Engineering
- Comparative Media Studies
- Computational and Systems Biology
- Economics
- Electrical Engineering and Computer Science
- History
- Linguistics and Philosophy
- Management
- Materials Science and Engineering
- Mathematics
- Mechanical Engineering
- Music and Theater Arts
- Physics
- Political Science
- Science, Technology and Society
- Urban Studies and Planning
Interns also represented **a variety of academic levels:**

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<td>1 Freshman</td>
<td>4 MS candidates</td>
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<td>2 Sophomores</td>
<td>3 PhD candidates</td>
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<td>6 Juniors</td>
<td>1 Sloan fellow</td>
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<td>17 Seniors</td>
<td>1 Postdoc</td>
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<td>7 MBA Candidates</td>
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**Training Sessions**

Seven hands-on, informative training sessions were organized. Students explored personal goals and visions for the internship; how to prepare for internship; how to navigate the specific country’s culture; and cultural differences from the US.

Student learned about places to see in their host country; safety and security; cross-cultural communication; how to navigate the workplace; and how to network.

Students met with current MIT students from South Africa who shared their personal experiences and a city-specific briefing; Professor Clapperton Mavhunga, who presented “The Image of Africa” and “Innovation Diplomacy in Africa”; Professor Hazel Sive, who shared her insights and also the importance of connections in South Africa and across the Continent. As part of general, non-country-specific preparations sessions, Profs. Susan Silbey, Manduhai Buyandelger, and Heather Paxson presented about cross-cultural understandings and Dr. Heller of MIT Medical and Duane de Four presented about Health and Safety when traveling abroad. All MIT-AFRICA interns met with Julia Reynolds-Cuéllar before their departure to cover all aspects of the previous preparation sessions and answer any final questions.
MIT-AFRICA Host Companies and Institutions

Our list of participating companies and institutions and willing to host MIT student is continually growing and currently includes the following:

**Algeria**

**MIT-AFRICA Entrepreneurship Bootcamp**
We sent two Algerian MIT students to work with Ooredoo (WTA Algeria Telecom) in Algeria to launch an Entrepreneurship Bootcamp, this will continue as a Global Startup Labs Program in subsequent years.

**Ghana**

**Practical Education Network**
We supported two MIT students and their work to design hands-on STEM activities that infuse national standards with hands-on activities and train teachers in how to execute these activities within the structure of traditional education programs.

**Nigeria**

**Impact Labs**
We supported three students who founded a design summer camp for students. Participants gain hands-on experience combining techniques in software and engineering design into real-life technology in health, agriculture and/or sanitation.

**Rwanda**

**The Kepler Tech Lab Project**
We supported three MIT students with the goal to design and teach a low-cost lab class for Kepler, a start-up university on the outskirts of Kigali, Rwanda. The students are designing the experiments with a group of students from Kepler, with the goal of making the content locally-rooted and the materials locally available.

**Johannesburg, South Africa**

**Praekelt Foundation**
We have reinvented MISTI’s Global Teaching Labs program for the South African context by working with our partner Praekelt Foundation the launch GTLx. We sent six MIT students to explore ways that secondary school students in South African can use MITx to prepare for their matriculation onto universities.
Johannesburg, South Africa

University of the Witwatersrand

We sent six MIT students to work in several top research labs at WITS and an additional four MIT students to run a Global Startup Labs program.

Cape Town, South Africa

iXperience

We sent one MIT student to work as a Teaching Assistant for an immersive Ruby on Rails bootcamp.

Cape Town, South Africa

African Institute for Mathematical Science

We sent one MIT student to work in Dr. Bruce Bassett’s Artificial Intelligence Lab.

Johannesburg, South Africa

Deloitte Africa

We sent one MIT student to work with Deloitte Consulting.

Cape Town, South Africa

Formula-D

We sent two MIT students to work on providing innovative concepts and products that make education and knowledge communication effective and affirming, intelligent and adaptable, as well as non-exclusive and accessible to all.

Cape Town, South Africa

South African Astronomical Observatory

We sent two MIT students to work in Dr. David Gilbank’s Lab with focus on Galaxy Evolution and Large Scale structure.
Knife Capital
Cape Town, South Africa
We sent two MIT students to work on engineering growth in scalable, African innovation-driven ventures.

AIMSSEC
Muizenburg, South Africa
We sent two MIT students to work on providing innovative concepts and products that make education and knowledge communication effective and affirming, intelligent and adaptable, as well as non-exclusive and accessible to all.

CAPRISA
Durban, South Africa
We sent two MIT students to work on providing innovative concepts and products that make education and knowledge communication effective and affirming, intelligent and adaptable, as well as non-exclusive and accessible to all.

EMSS
Stellenbousch, South Africa
We sent two MIT students to work on providing innovative concepts and products that make education and knowledge communication effective and affirming, intelligent and adaptable, as well as non-exclusive and accessible to all.

Makerere University
Uganda
We sent two MIT students to work on providing innovative concepts and products that make education and knowledge communication effective and affirming, intelligent and adaptable, as well as non-exclusive and accessible to all.
The philosophy of MIT-South Africa is to create meaningful connections between MIT and South Africa. The greatest currency of MIT to make these connections is our students, through placements in industry, research and educational institutions across South Africa.

Since its formal inception in 2013, MIT-South Africa has recruited, selected, and placed highly qualified and motivated MIT students in internships across South Africa—a country marked by innovation, entrepreneurship, and cutting-edge research, as well as a rich and diverse cultural history. MIT-South Africa has grown in numbers, diversity of opportunities, and depth of the educational process: from just 2 students in the summer of 2013 to 18 students in 2014, to now 37 students currently placed for summer 2015.

In addition to these important student connections, we focus on partnerships between South African universities, industry and government. One partnership of note is the newly created MIT-WITS Alliance. This Alliance was created thanks to visionary leadership at the University of the Witwatersrand. As a cornerstone of this Alliance, we are thrilled to share that WITS is now the first African MITx partner. WITS will now generate content for the groundbreaking online educational MITx platform. Each year at WITS we also hold MIT-Global Startup Labs to promote a culture of entrepreneurship and in summer 2015, we plan to send research interns to work with WITS faculty. We aim for this Alliance to continue to grow significantly in future years.
We have also reinvented the MISTI Global Teaching Labs program for the South African context by working with our partner Praekelt Foundation to launch GTLx. We sent six MIT students to explore ways that secondary school students in South African can use MITx to prepare for their matriculation onto universities.

Looking forward, MIT-South Africa aims to:

- increase the number of student-interns placed in South Africa to 40+
- develop more cohesiveness between the educational components before, during and after the internship
- set up a dedicated MIT-South Africa/Africa Fund to enable collaborations between South African/African scientists
- create an Africa-focused course for students interested in learning more about the continent
- raise expendable and endowment funds to enable the program to grow further and to run in perpetuity

“My experiences in South Africa have given added nuance to my understanding of its social issues and gave me the chance to hone the problem-solving skills I learned at MIT.”

Brandon Wright, Graduating Senior, University of Cape Town, CERECAM

“I definitely made the most out of my stay in South Africa. I travelled to incredible places, had some of the most amazing food I’ve ever eaten, experienced a unique culture, and met some fantastic people. I was able to see a culture completely different from my own in every way and I was so impressed by the amount of pride people had in their culture and their company. Coming from a very urbanized city, it was very refreshing to experience so much outdoor activity, from hiking to zip lining to shark cage diving. I feel like I really got to experience all that Stellenbosch and Cape Town had to offer. I will always keep these memories with me and I can’t wait to be back in the future!”

Emily Tsang, Junior, EMSS

PROGRAM PARTNERS
MIT-AFRICA & MIT-South Africa Student Experiences

GTLx

Host: Praekelt Foundation

GTLx South Africa Team: Ishwarya Ananthabhotla, Graduating Senior, EECS; Leyatt Betre, Junior, Physics; Juan Hernandez, Graduating Senior, EECS; Janet Lin, Graduating Senior, Chemical Engineering; Kelly Liu, Junior, EECS; Jennie Zheng, Graduating Senior, Materials Science

Project: The majority of South African students discontinue their education without completing secondary school. Those that do graduate and go on to university face an often prohibitively difficult transition. The combination of cultural and language barriers, the heightened level of academic rigor, and insufficient training in critical thinking and problem solving skills creates a challenging environment for first among first course in the form of a supplemental introductory physics curriculum offered on the edX platform. We created a sample of an online course specifically tailored to the curriculum of first year physics at Wits University. The course will be kept open and public for learners of any background. To broaden the impact of the course and to increase its accessibility, the material is hosted on a mobile platform that was inspired by Praekelt’s Universal Core.

Research

Carol Liu, Graduating Senior, Biology

Host: Sydney Brenner Institute for Molecular Biology

Ragon-Imes Fellowship Recipient

Project: My work mainly revolved around the AWI-GEN project, a study on how various biological, genetic, lifestyle and behavioral factors are influencing the recent surge in CVDs among African populations. Identifying risk factors is the first step towards targeted prevention programs and personalized health care that are necessary to reduce the trend of increasing CVDs in Africa. The sample size for the entire study included 12,000 Africans, half-male and half-female between the ages of 40-60, across 4 countries and 6 test sites. All 6 test sites are at different stages of the data acquisition process and during the first portion of my internship, I worked in teams that supported the work in two test sites.

"Interning in Johannesburg was one of the most eye-opening experiences in my undergrad career. I developed technical skills in statistical software and data analysis but also absorbed so much on the cultural, social and political dynamics and challenges in South Africa."
Amy Zhang, Senior, Biology  
Host: WITS University  
Project: In the research project, our goal was to investigate HIV drug resistance, particularly mutations in HIV integrase to integrase inhibitors (INSTIs). There were two main objectives to the project:  
- The recombinant expression and purification of wild-type and mutant HIV integrase proteins, to obtain sufficient quantities for later lab work. Six mutations identified as INSTI resistance mutations were selected for this expression.  
- Testing the binding kinetics of the wild-type and mutant integrases in vitro in the presence of different INSTIs.

“Being part of MIT-South Africa this summer has allowed me to perform exciting biology research – all while experiencing a new country and culture and meeting new friends and colleagues.”

Margaret Okobi, Senior, Biology  
Host: Early Infant Diagnosis Unit at the National Health Laboratory Service  
Project: My early work consisted of graphing national and provincial statistics for HIV viral loads—how many copies of HIV are in the blood—and polymerase chain reactions (PCR) tests, a diagnostic test for HIV. The statistics I worked with came from as early as 2004. I also read and summarized all of the HIV diagnosis and treatment guidelines released by the Department of Health since 2004. Through these initial efforts, I was able to gain a strong understanding of the prevalence of HIV and how South Africa has attempted to combat the large endemic.

"I was extremely happy with the work that I was able to do. Being outside of the US for the first time, I was very uncertain about what I would see and what my work would be like. I observed so many aspects of the healthcare system in South Africa, visiting five different hospitals in the Johannesburg area, meeting HIV-infected mothers and their children, shadowing at PCR and viral load laboratories, and a thalassemia clinic. I was very fortunate to experience so much in the short time that I was in Johannesburg."
Diego Manuel Guerrero Cardenas, Junior, EECS

Host: The African Institute for Mathematical Sciences (AIMS)

Project: The first project involved statistical analysis of Cape Town’s MyCiti Bus Transportation data. This consisted of a week’s worth of boarding/alighting activity in June 2014. The purpose of this project was to produce a series of statistical results and propose a series of future projects to the city of Cape Town. These projects would involve answering questions such as: Where do we put the next bus station? Should bus routes be changed? What are points of congestion?

The second project involved the use of machine learning, more specifically genetic programming, to find a nonlinear regression of supernova brightness. In cosmology, one of the biggest problems with supernova is estimating its brightness, this is due to many effects such as distance, black holes, and the type of supernova.

"MISTI South Africa was an eye opening experience. The culture, the people, the academia, Table Mountain; I came to love the lifestyle of Cape Town."

Megan Mansfield, Senior, EAPS & Physics

Host: South African Astronomical Observatory (SAAO)

Project: I spent the summer working on a project to measure the masses of galaxy clusters in a variety of different ways and see how well the different methods could approximate the cluster masses. While I didn’t have any specific research goals, such as producing a paper or a poster, ahead of time, I hoped to gain more exposure to academic research while contributing to the scientific community at the South African Astronomical Observatory (SAAO).

“I loved getting to experience astronomy research and learn so much while living in a city as beautiful as Cape Town!”
Robert Romero, Junior, Earth, Atmospheric & Planetary Sciences & Applied Mathematics

Host: South African Astronomical Observatory (SAAO)

Project: Given a field of various galaxies, knowing the sky positions and a proxy for how far away they are (in astronomy, this is done using the redshift, found by how quickly space is expanding at that distance), I was tasked to determine a way to tag galaxies as possible members of large groups of galaxies called galaxy clusters, hoping to be able to distinguish small clusters in the order of ten members very far away from the Earth (at redshifts potentially greater than 1).

“The MIT South Africa MISTI program allowed me to gain an expanded worldview and helped me decide what I want to do in my future academic endeavors.”

Brandon Wright, Recent Graduate, Mechanical Engineering

Host: University of Cape Town, CERECAM

Project: The goal of my project is essentially to create simulation models of the shoulder muscles that would help in the process of surgically planning a tendon transfer to allow patients to get the most benefit from the procedure.

“My experiences in South Africa has given added nuance to my understanding of its social issues and gave me the chance to hone the problem-solving skills I learned at MIT. I really wanted to go to South Africa to learn about how the country had evolved since the end of apartheid and about how the dynamics of racial and ethnic divisions might manifest in an environment so different from anything I had experienced before.”
Anna Neuman, Sophomore, Chemical-Biological Engineering  
Host: Makerere University  
Project: I utilized machine learning techniques to create a mobile application for the recognition of disease in cassava plants (one of the main crops in Uganda) from an image. Currently when a farmer sees disease in his crops he must contact professional crop researchers to come and properly diagnose the crop, which is very expensive and can take weeks for the professional to arrive, allowing the disease to spread further. Mobile technology is quickly spreading throughout the country and many farmers, even in the most rural areas of Uganda, own smartphones. This application will be simple to use for local farmers and will save time and money. The application will diagnose four different diseases commonly found in cassava: cassava mosaic disease, cassava brown-streak disease, cassava green mite, and cassava bacterial blight.

"I really enjoyed learning about Ugandan culture through my many visits to different parts of Kampala. I learned about the Bantu tribes of central Uganda by visiting the Kasubi tombs. I learned about the Baha’i religion by visiting the only Baha’i temple in Africa. I learned about the cultural roots in dance around eastern Africa by going to a traditional dance show. I loved how much I could learn by participating in a project in a country very different than my own."

Aaron Lin, Sophomore, EECS  
Host: Makerere University  
Project: My work was in Makerere University’s Artificial Intelligence Research lab (AIR). My project was writing software to assist farmers and researchers in assessing the severity of root necrosis, a disease affecting one of Uganda’s staple crops the cassava plant. Users take photos of cassava roots, and the software aims to compare the area of necrotized regions of the root (brown) to healthy parts of the root, as shown in the image below. The code was written in Python 2.7 using Numpy and OpenCV 2.4 libraries.

“Prior to the trip, I prepared some side projects for myself in the event that I wouldn’t enjoy the city and my internship as much as I hoped. I began some of these projects in the first weeks, but after, was having too much fun with new friends and with the work, that he was not able to complete them. I learned a tremendous amount about myself and Ugandan culture. The trip itself made me reflect about my life; for example, about the pace of daily life, general thoughts about travelling to new places, learning to live without commodities at home I have grown up with.”
Pooja Jethani, Recent Graduate, Biology

Host: SBIMB at WITS University

Project: I performed bioinformatics research at WITS, capturing data from questionnaires collected in rural and urban areas onto an online database and checking online and paper versions for accuracy. I also worked to study the effects of age, education and socioeconomic status on substance use of approximately 1000 men from the urban township of Soweto. To do this, I created regression models using a statistical programming tool called R. Through work, I had the opportunity to visit the Chris Hani Baragwanath Hospital in Soweto, an urban township in Johannesburg. There, I learned about one of Africa’s longest-running and largest longitudinal studies involving the study of child health and development called Birth to Twenty.

“MISTI presented me with an incredible opportunity to experience a new field of work, to taste independence, and to push past my limitations in a beautiful country!”

Hansol Kang, Recent Graduate, Biology-Chemistry

Host: Morris Lab at NICD, Weinberg Lab at WITS Medical School

Project: The only HIV vaccine clinical trial to show efficacy was RV144 conducted in Thailand in 2009. The study reported an efficacy of 31.2%, highly correlated with the presence of antibodies targeting the variable 2 (V2) region of the HIV envelope. Given the importance of the V2 region as a broadly neutralizing antibody (bnAb) target, there is a need to better understand both the neutralizing and effectors functions, including antibody dependent cell-mediated cytotoxicity (ADCC) of such antibodies. To this end, monoclonal antibodies (mAbs) isolated from B cells of two subjects in the CAPRISA cohort (CAP228 and CAP256) were selected based on V2-directed function and binding. Heavy and light chains of each mAb were combined into single-plasmid expression cassettes. Subsequent packaging into adeno-associated virus (AAV) vectors will allow delivery into humanized transgenic murine models for HIV. Through these studies, we aim to probe the neutralizing and ADCC potential of mAbs through gene therapy using vectored immunophylaxis (VIP).

"During my stay in South Africa, I aimed not only to learn and engage in top-notch science, but I also strived to engage in a new cultural experience. I wanted to step outside of my comfort zone and learn how to adapt to different lifestyles as a way to increase my awareness and understanding of the world."
Natalie Burgos, Senior, Chemistry  
Host: WITS University, Department of Chemistry  
Project: The organic chemistry lab at WITS University has previously worked on the synthesis of a series of imidazopyridines that showed activity against a range of cancer cells yet did not show toxicity against white blood cells. My work involved further development of these compounds through the synthesis of metal complexes containing these imidazopyridines. The goal was to combine two small molecules that show activity against cancer with a linker (in this case, the metal) to see if the result is increased anti-cancer activity.

“I was very focused on only work the first two weeks. So, one of my lab mates even called me out, making the observation that I was always on the go and wouldn’t stop to talk to people often. That’s when I decided to take more time to chat with people around the lab. It was a difficult process, as I was used to working 24/7, but my supervisors insisted I was there to learn and that I should enjoy my time in SA. I was really glad to have such great lab mates and supervisors, because I don’t think I would have enjoyed my time in SA so much if I hadn’t taken their advice and gotten to know them better. So I was eventually able to put people first before my work!”

Joseph Lim, Graduating PhD Candidate, Chemical Engineering  
Host: Bertha Centre at the University of Cape Town  
Project: I’m working on a team collaborating with Oxford University and the World Health Organization, studying innovations in healthcare delivery implemented by organizations around the world. Our work entails literature research on each organization and the healthcare systems of the countries in which the organization operates, site visits (e.g. to local clinics where the organization works), interviews of key personnel (e.g. CEO, healthcare practitioners, etc.), documentary filming, and of course writing and other auxiliary tasks. The goal is to develop and compile these case studies in a WHO publication to be presented at a conference in Geneva this coming December, to disseminate lessons learned from the innovations and connect the organizations with policymakers and funders to help scale up their work.

“Without MIT-AFRICA I would not be here and MIT-AFRICA provided me with this opportunity which is uniquely perfect for me.”

Joseph Lim was one of the winners of MISTI’s Video Competition; you can find his video here.
Teaching

Fernanda Lavalle, Junior, EECS
Host: African Institute for Mathematical Sciences Schools Enrichment Programme (AIMSSEC)
Project: Fernanda taught local math teachers on GeoGebra and Moodle, helping them gain new skills for their classroom.

“Working for AIMSSEC through MISTI made me feel like I could use my education to directly impact people. It was an inspiring experience.”

Erica Du, Graduating Senior, EECS
Host: iXperience
Project: Over three months, under the lead of a head instructor and working with a co-TA, together we taught 73 students how to code, through three one-month coding courses. We worked with these students to understand fundamental programming concepts so they could build a fully functioning web application in groups of two to three using HTML, CSS, JQuery, and Ruby on Rails as the final project. The course culminated to a night of final presentations, in which each group demonstrated and talked about the functionality of their app, as well as their inspirations and the larger impact they saw their app having.

“I had the adventure of a lifetime, built lasting relationships with my students, and learned an incredible amount through my internship at iXperience.”

Erica was one of the winners of MISTI’s Video Competition; you can find her video here.
Abigail Anderson, Freshman, Architecture  
**Host:** African Institute for Mathematical Sciences Schools Enrichment Programme (AIMSSEC)  
**Project:** The work that I was involved in during the MT24 course impacted over a hundred rural South African teachers. We were able to introduce them to computers, and ways that computers can aid them in their teaching. Some of our students had never touched a computer before. We also taught how to submit future assignments for the distance learning portion of the MT course on Moodle, AIMSSEC’s distance learning platform.

"**AIMSSEC offered me the opportunity to work in specific ways and make an impact in the South African education problem, one teacher at a time.**"

Babatunde Alawode, PhD Candidate, Materials Science & Mechanical Engineering; Chukwunwike Iloeje, PhD Candidate, Mechanical Engineering; Joy Ekuta, Graduating Senior, Brain & Cognitive Sciences  
**Host:** IMPACT LABS Nigeria  
**Project:** ImpactLabs is an initiative that was launched by students and graduates of the Massachusetts Institute of Technology (MIT) and Harvard University in 2014. The ImpactLabs Summer Workshop is a hands-on engineering education program designed for Nigerian undergraduate and high school students to learn how to apply technology to solve important problems in their communities.

"**MIT-AFRICA’s support has been invaluable towards the planning of our annual summer workshops and our recent drive to establish an open-access hands-on workshop in Lagos in 2016.**"

For a full report of the 2015 ImpactLabs Summer Workshop, please click [here](#).
QinQin Yu, Graduating Senior, Physics; Jakob Dahl, Graduating Senior, Chemistry; June Park, Junior, Chemical Engineering

**Host:** Kepler Tech Lab, Kigali, Rwanda

**Project:** We are working with a start-up university called Kepler to design a low-cost science laboratory course for their students. It will be a model lab course for other universities across Rwanda. Our lab course also has the potential of being a model low-cost lab courses associated with online courses, which can potentially make lab instruction more accessible to developing countries over the Internet."

“We could not have embarked on this exciting project without the support of MIT-AFRICA.”

June was one of the winners of MISTI’s Video Competition; you can find her video [here](#).

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Heather Beem, Graduating PhD Candidate, Mechanical Engineering; Karthic Kosgi, MS Candidate, Systems Design & Management

**Host:** Practical Education Network (PEN) Ghana

**Project:** PEN equips science teachers in Ghana to use MIT-style learning-by-doing in their classrooms.

“With MIT-AFRICA’s support, this summer we tested our model, running teaching trainings with more than 300 teachers across 9 districts of Greater Accra, equipping them each with at least 10 hands-on activities mapped to the national syllabus. We eagerly push this work forward with a vision for sharing “mens et manus” across the continent.”
Industry

Mina Alanoly, MBA
Host: EMSS – Field Office
Project: The culmination of my 6 weeks of work resulted in two recommendations:
- how they should enter an international market
- what markets they should consider entering

A thorough and in-depth analysis was conducted on both of these fronts. I first leveraged the knowledge within the Field Office team and interviewed several team members about the business operations. I then put together a framework for tackling the internationalization strategy. A step-by-step analysis was conducted and presentations/updates were provided to the managing director.

“MISTI South Africa was an enriching and fulfilling experience that exceeded all my expectations.”

Phillip Gara, MBA
Host: Knife Capital
Project: My work was divided into two tracks working with Knife Capital where I spent around 40% of my time working with Knife Capital providing due diligence and consulting on their investments and accelerator, while the other 60% of my time was working directly with one of Knife Capital’s Grindstone companies, Sea Monster. With Sea Monster I helped the company develop a commercialization strategy for game based learning applications as well as advised the company on investor pitches and building a successful business plan and business strategy.

“MISTI was a life-changing experience where I learned about the entrepreneurial opportunities and challenges in South Africa working with some of the leading start-ups in Cape Town.”
Laura Diamond, MBA

Host: Deloitte-Africa

Project: My project was on Corporate Social Investment, I was able to learn a tremendous amount about the country. My manager supported my professional goals and allowed me to allocate part of my time to meeting with the energy and innovation side of the business. My project had a tight timeline and very much leveraged the skills that I have been focusing on while at the Sloan School of Management. At the end of my internship, I submitted a 23-page thought leadership piece on Corporate Social Investment spending in South Africa that will be published on behalf of Deloitte.

“Johannesburg is like being inside of a working painting...there is such a blend of cultures and styles and personalities. Amongst all the places that I have lived, I have never been in a place with so much individualism.”

Candice Chow-Gamboa, MBA

Host: Formula-D

Project: There were three projects that I focused on:

1. **LearnLab: Formula D’s education initiative.** I helped with redefining strategy for LearnLab as it entered into a new phase of grant seeking. With clear articulation of the programs value proposition and desired outcomes, I helped with two grant proposals in addition to creating budget templates and marketing materials to use when meeting new partners. I also attended two sessions of LearnLab in a Khayelitsha primary school. I facilitated one of these lessons for 1.5 hours.

2. **Scoutsta: a new initiative to build out a gamified recruiting capability.** I developed user survey questions and conducted and participated in several interviews with potential clients. I tried to help in strategy meetings to deliver clear action items for how to move forward, including the framework for a business plan. I conducted research on competitors and what sort of offering Formula D could provide to differentiate.

3. **Urban Orbit: a new initiative to expand Formula D’s business focused on real estate marketing tools.** I created a financial modeling tool to help with the tool’s pricing and scenario planning. In addition I provided a business and marketing plan, including a clear sales process and a mock up website.

“South Africa, and in particular Cape Town, is absolutely stunning. MISTI gave me the chance to really get to know a new part of the world for me.”
Santiago Perez, Graduate Student, Mechanical Engineering  
**Host:** Formula-D  
**Project:** My internship consisted of rewriting and revamping their BlokApp for production. Resuscitating the old app for a building deadline consumed the majority of my internship. In the later stages I concentrated on migrating to using unscalable practices, and generating code which was portable to any mobile device.

Elizabeth Thys, MBA  
**Host:** Knife Capital  
**Project:** During my internship I learned how to analyze companies from a venture capital perspective and gain more insight into startup strategy in an emerging market.  

“The variety of experiences and projects gave me insight not only into the startup world in Cape Town, but also into the broader South African business environment.”

Additional Interns

Aleth Gaillard de Saint Germain, Sam Kazer, Alex S Genshaft, Marc Wadsworth II, Sanjay (Jay) Prakadan, Kellie Kolb, Carly Ziegler, Travis Hughes  
CAPRISA
MIT-GLOBAL STARTUP Labs

The rise of young tech business adds new hope for finding solutions to pressing social and economic challenges. The market is starving for homegrown content and services, but culture and structures that catalyze and nurture entrepreneurship are missing.

MIT Global Startup Labs was founded with the mission to cultivate, support and empower a generation of young tech entrepreneurs.

University Partners: MIT Global Startup Labs partners with top universities across the globe to transform them into regional centers by building local skills and sustainable programs to foster entrepreneurship.

Technology Incubator Courses: At each partner, MIT Global Startup Labs sends a team of four MIT student top university students in a developing country to guide them through a real Computer Science graduate students instruct and mentor young entrepreneurs. Courses focus on ideation, market research, pitching, and appropriate technology platforms, culminating with a pitch and prototype competition.

Organize Networks: Businesses do not grow in isolation. Centered on each partner, MIT Global Startup Labs organizes investor and mentorship networks of local and regional players.

Funded Startups: MIT Global Startup Labs culminates with a pitch competition where regional mentors and funders have the opportunity to invest in the course startups. Over half of MIT Global Startup Labs’ graduates go on to register their own startup after completing the workshop.

We held programs in both South Africa and Algeria in 2015 and hope to greatly expand in 2016.
MIT Global Startup Labs-South Africa  
Team: Bolaji Finnih, Sloan Fellow; Emily Zhang, Graduating Senior, EECS; Anita Kibunguchy, MBA Candidate; Oluwasoga Oni, MS Candidate, Systems Design & Management  
Host: WITS University  

“We worked really well as a team because each one of us brought different strengths and experiences to the program. The team got a chance to spend time together bonding over prepping curriculum, jollof rice and Nandos chicken.”

MIT Global Startup Labs-Algeria  
Team: Nissia Sabri, MS Candidate; Abdelkrim Doufene, Postdoc, Systems Design & Management  
Host: Ooredoo Algeria, WTA Algeria Telecom  

“The goal of this boot camp is to introduce tools to help Algerian students gain more confidence, leadership abilities, long-term vision, strategic thinking and communication skills.”
Future Plans

The goals of the MIT-AFRICA Initiative for the upcoming year (pending funding) include the following: raising endowment funds to secure the program in perpetuity; developing more cohesiveness between the education components before, during and after MIT-AFRICA internships; increasing the number of internship opportunities on the Continent; a dedicated MIT-AFRICA Faculty Fund in order to enable research collaborations between MIT and African scientists; growing our community and support mechanisms within the Institute.
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- Secondary School Enrichment Centre (AIMSSEC)
- South African Astronomical Observatory
- Knife Capital
- University of Cape Town (UCT)
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- CAPRISA
- EMSS
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