

Molecular Laboratory Training Workshop for Africa-based agricultural researchers and PhD students

Department of Plant Sciences, University of Cambridge
(3rd-12th September 2018)



OVERVIEW

We are pleased to announce the successful completion of our second hands-on **Molecular Laboratory Training Workshop** held at the Department of Plant Sciences, University of Cambridge. The workshop is designed to provide Africa-based researchers with theoretical and practical knowledge in core scientific concepts, laboratory techniques and applications in agricultural research.

Seventeen PhD scholars from six African countries (Nigeria, Ghana, Ethiopia, Kenya, Zimbabwe and Benin Republic) participated in the workshop and UK-Africa Food Security Symposium, which took place at the Sainsbury Laboratory, University of Cambridge.



Our candidate selection was based on the following criteria: 1) strong intellectual ability and relevance of current research to the training course, 2) demonstrated need to acquire new knowledge and laboratory skills to improve their research, and 3) teaching responsibility at their home institutions.

The workshop was taught by research experts, post-doctoral researchers and PhD students from the Department of Plant Sciences and Earlham Institute in Norwich.



2018 Molecular Laboratory Training Workshop participants with speakers in front of the Department of Plant Sciences, University of Cambridge.



The JR Biotek Foundation Team and the PhD scholars from Africa at the Sainsbury Laboratory, University of Cambridge.

Learning Modern Scientific Concepts and Laboratory Techniques



The **Molecular Laboratory Training Workshop** began with opening remarks by Carol Ibe, Founder of JR Biotek Foundation and PhD student/Gates Cambridge Scholar at the Department of Plant Sciences, University of Cambridge. Professor Alison Smith (Head of the Department of Plant Sciences, University of Cambridge) followed with an inspiring welcome presentation.

Professor Sir David Baulcombe gave an excellent keynote lecture on 'The application of biotechnology for disease resistance in crops in Africa (and other regions)', and Dr Nicola Patron from the Earlham Institute, Norwich gave a presentation on 'The application of new bio-engineering technologies in crop agriculture'.

Lectures on plant physiology and general molecular biology laboratory techniques were presented by Dr Pallavi Singh and Greg Reeves from the Department of Plant Sciences, University of Cambridge, and this was followed by a day of training on bioinformatics and statistical analyses.

During the bioinformatics and statistics course, the participants learned to analyse complex data sets using a variety of programmes and statistical tools. The course was taught by Dr Ciara Dangerfield (Department of Plant Sciences, University of Cambridge) and Dr Greg Mellers (National Institute of Agricultural Botany, NIAB).



Opening remarks by Carol Ibe, PhD scholar/Gates Scholar and Founder of JR Biotek Foundation



Bioinformatics training led by Dr Dangerfield (Department of Plant Sciences) and Dr Greg Mellers (NIAB)



Welcome address by Professor Alison Smith, Head of the Department of Plant Sciences, University of Cambridge



Keynote lecture by Professor Sir David Baulcombe, Regius Professor of Botany, Department of Plant Sciences, University of Cambridge

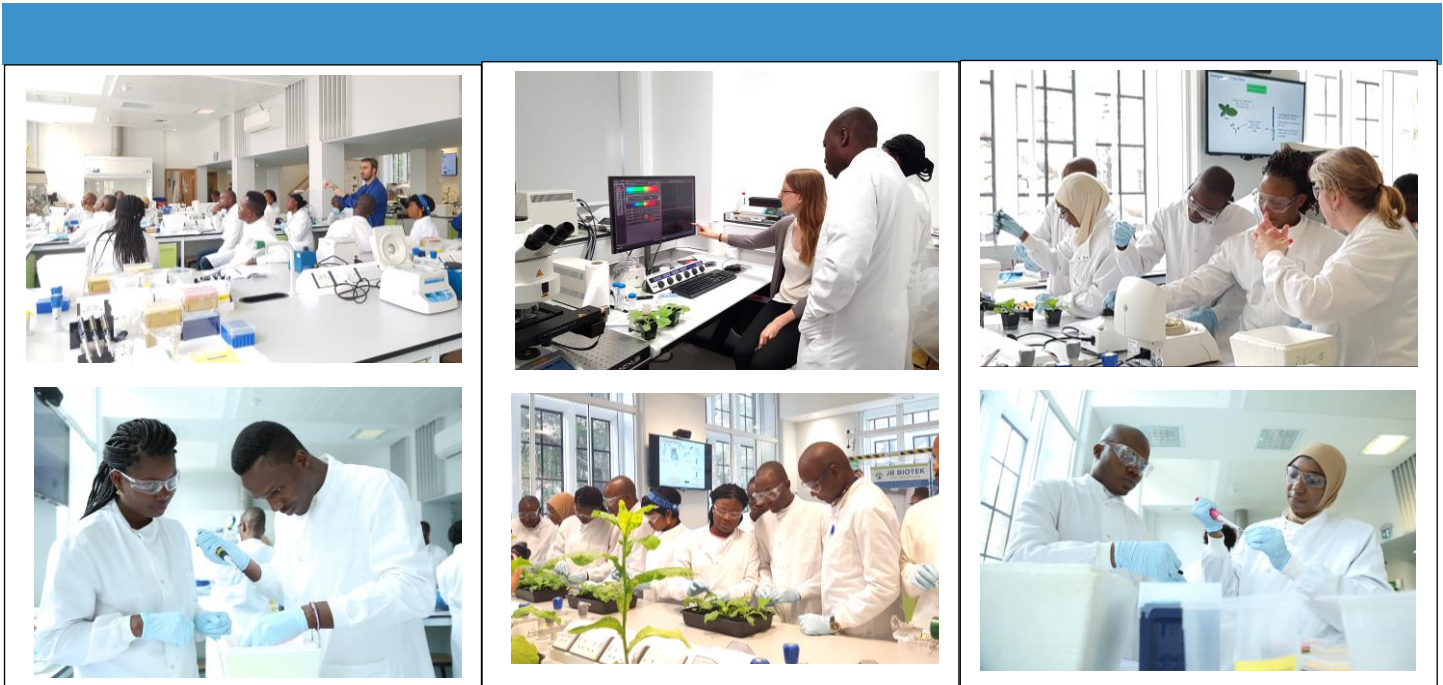


Lecture by Dr Nicola Patron, Research Group Leader from the Earlham Institute, Norwich

Hands-on Laboratory Experience



The African PhD scholars gained extensive hands-on experience in a variety of scientific laboratory techniques and research methodologies. This will significantly improve their research investigations at their home institutions.



Academic Writing Masterclass

During the hands-on Molecular Laboratory Training Workshop, Dr Ciara Dangerfield led an 'Academic Writing Masterclass'. The masterclass taught the African PhD scholars how to effectively write and communicate scientific questions to experts and the public. The session was very insightful and provided guidance to help the PhD scholars write successful theses and publications.



Academic Writing Masterclass led by Dr Ciara Dangerfield, a postdoctoral researcher in the Department of Plant Sciences, University of Cambridge.

Tour of Facilities

As part of our effort to inspire Africa's present and future scientists to advance knowledge in science, technology and innovation, we provided an opportunity for our workshop participants to visit modern teaching, research and plant growth facilities at the University of Cambridge. We hope this exposure will motivate them to influence positive change at their various institutions.



Tour of the Cambridge University's Plant Growth and Greenhouse facilities.

Networking and Roundtable Discussion



During the laboratory training session at Cambridge, we held various roundtable discussion sessions to facilitate interaction, relationship building and formation of new partnerships among the African PhD scholars. During these discussions, we identified the key challenges hampering research and innovation in African countries, which consequently, lead to low agricultural productivity, food insecurity, disease, water scarcity, and environmental degradation. These problems include the lack of adequate infrastructure, training and capacity building, obsolete curriculum and teaching materials, and lack of effective funding mechanisms to support world-class research and innovation in African tertiary education institutions. Carol Ibe and her team have identified potential partners in African countries (through the workshop participants) to work with in order to improve scientific training, capacity building and research and innovation in Africa.

Why is this training and capacity building initiative a much-needed intervention for African science?

“I studied microbiology at a Nigerian university that lacked modern teaching and research laboratories. We relied on theory-based learning, mostly using teaching materials and methods that did not meet the global standard. This problem is limiting the ability of many intelligent students in Africa to compete globally and to contribute to the sustainable development of their countries through research and innovation, and these are the problems we are looking to solve through our training and capacity building initiatives.” - Carol Ibe

Africa is endowed with rich natural and human resources, yet it is considered the poorest continent in the world. The United Nations FAO estimates that there are about 233 million hungry people in Africa, with 1 in 4 people being undernourished. The poverty gap on the continent continues to widen, and in some cases, transfers from generation to generation.

Food insecurity, water scarcity and environmental degradation in Africa can be addressed with science, technology and innovation, but currently, there is a severe lack of capacity on the continent to provide these kinds of solutions. For example, many African universities often do not have the basic resources and facilities needed to support the next generation of African scientists. This chronic impoverishment has created a huge gap in knowledge and is hindering many intelligent students in African tertiary education institutions to compete globally as well as to contribute to their country's sustainable development.

In 2017, the World Economic Forum on Africa reported that Africa does not have enough scientists to tackle its own problems (<https://www.weforum.org/agenda/2017/05/scientists-are-the-key-to-africas-future/>). The report stated that compared to the United States and the UK that have over 4,000 researchers per one million people, Africa only has 198 researchers per one million people. This means that Africa would need one million new PhDs to achieve the world average for the number of researchers per capita.

At JR Biotek Foundation, our vision is to provide world-class scientific laboratory training to help build capacity for research conducted in African tertiary education institutions and national research institutes. In partnership with world leading research institutions such as the University of Cambridge, we utilize a two-way train-the-trainer approach to provide quality scientific training to Africa-based researchers in Africa and at Cambridge.

With support from the University of Cambridge's Department of Plant Sciences, OpenPlant, Bioscience Impact Team and Trinity College, we funded 15 outstanding PhD students from Nigeria, Kenya, Ghana, Ethiopia and Benin Republic to participate in the laboratory training workshop held at the Department of Plant Sciences from 3rd-12th September 2018. The candidates acquired extensive knowledge and scientific skills, and also made useful connections that will contribute to their personal and professional development.



This Nigerian farmer makes a living by growing and selling seedlings of tropical fruits in his small yard because of lack of land and finance.



The African PhD scholars learned new experimental techniques during the workshop held at the Department of Plant Sciences, University of Cambridge



Tour of the Greenhouse and Plant Growth Facility, University of Cambridge

UK-AFRICA FOOD SECURITY SYMPOSIUM 2018

Developing effective and equitable interdisciplinary partnerships to address food insecurity in Africa

Sainsbury Laboratory Auditorium, University of Cambridge, UK
Tuesday, 11 September 2018

The **UK-Africa Food Security Symposium** was created by the JR Biotek Foundation to provide an interdisciplinary platform for research and non-research professionals from Africa and the UK/EU to come together, exchange knowledge, and develop new partnerships to help address food insecurity in Africa. The symposium brought together delegates from universities, research institutes, NGO's, and businesses from Africa and the UK. This included the 17 PhD students from six African countries who had participated in our laboratory training workshop hosted at the Department of Plant Sciences, University of Cambridge the previous week.

The symposium included a keynote address and panel sessions highlighting the challenges contributing to food insecurity in African countries, and how effective and equitable partnerships between UK and African researchers can help solve the problems.



Dr Debisi Araba, the Regional Director for Africa at The International Center for Tropical Agriculture (CIAT), Nairobi, Kenya delivered the keynote address. His keynote highlighted various challenges faced by smallholder farmers in Africa (e.g. lack of know-how, deteriorating soil conditions, and slow adoption of new technologies), and how these problems are contributing to reduced agricultural productivity on the continent. To solve these problems, Dr Araba suggested the development of a comprehensive agricultural transformation agenda with input from key stakeholders including research institutions, private enterprises and policy/government sector.



Carol Ibe, Founder of JR Biotek Foundation opened the symposium with an inspiring welcome address



Professor A. Fowden, Head of the Biological Schools, University of Cambridge presented certificates to the African scholars during the symposium



Delegates from Africa, the UK and EU attended the symposium

The symposium included two interdisciplinary panels, which addressed:

1. How effective and equitable regional (Africa-Africa) and international (UK-Africa) research partnerships can address food insecurity in Africa.
2. How international partnerships can be leveraged to build capacity for research conducted by African researchers in African research institutions, especially in universities across the continent.



The first panel was chaired by **Dr Shailaja Fennell**, Senior Lecturer in Development Studies and Fellow at the Department of Land Economy, University of Cambridge. The panel highlighted the opportunities and challenges of international partnerships in addressing food insecurity in Africa. While international partnerships provide new perspectives, ideas and funding; inherent power imbalances may occur because of 'forced partnerships'. A take home message from the panel was that having a shared vision, clear agenda and priorities, effective communication, long-term commitment, and equality can significantly strengthen UK and African research partnerships.

Panelists: **Dr Marta Tufet** (Executive Director of the UKCDR), **Prof. David Dunne** (Director of the Cambridge-Africa Programme), **Jolly Dusabe** (PhD student in Development Studies, University of Cambridge), **Dr Christopher Darby** (Head of Policy and International, John Innes Centre), and **Dr Sara Serradas Duarte** (Cambridge Global Challenges, Coordinator).



Panel Two was chaired by **Dr Pauline Essah** (Manager of the Cambridge-Africa Programme). The panel emphasized the urgent need for international partners to help build research capacity in Africa to enable African researchers to develop and conduct world-class research aiming to solve problems of hunger, malnutrition and poverty; disease, and environmental degradation on the continent.

Panelists: **Dr Jane Lichtenstein** (Centre of Development Studies, University of Cambridge), **Dr Franck Ditengou** (University of Freiburg, Germany), **Nafisa Waziri** (Centre of Development Studies, University of Cambridge), **Dr Tim Chancellor** (Director of Capacity Strengthening and Learning, NRI, University of Greenwich), and **Dr Jenny Molloy** (Department of Plant Sciences, University of Cambridge).



The symposium provided an opportunity for networking, knowledge sharing, and the formation of potential new partnerships.

'Bio-innovation for Africa' Pitch Competition 2018

"We created the 'Bio-innovation for Africa' pitching competition to encourage African scientists to become more proactive in finding solutions to the problems faced on the continent." - Carol Ibe



Before the African PhD scholars came to Cambridge to participate in the Molecular Laboratory Training Workshop, we challenged them to propose solutions to some of the problems faced in their countries. Sixteen scholars participated in the bio-innovation pitching challenge after extensive online and face-to-face mentoring by Carol Ibe. Individually or as part of a group, the contestants pitched their products to a panel of expert judges during the UK-Africa Food Security Symposium. The judging panel was chaired by Dr Belinda Clarke of AgriTech East.

Carlos and Dedeou from the Benin Republic were awarded £1,500 to enable the continued development of their sustainable horticultural seed company, EcoSeed. The co-founders saved part of their undergraduate scholarship stipend to buy land which they use to produce horticultural seeds sold to smallholder farmers in their region. The awards were donated from the University's Research Strategy Office's ESRC IAA grant awarded through Dr Shailja Fennell of the Department of Land Economy, University of Cambridge.



Carlos and Dedeou from Benin Republic and PhD students in Plant Breeding at the University of KwaZulu Natal won the 'Most Promising Innovation Award' with their product EcoSeed.



Boniface Mangeni, a PhD student in Crop Protection at the Masinde Muliro University of Science and Technology, Kenya, won £500 for his '**One Village One Poultry Vet Project**', which aims to alleviate poverty and provide a sustainable means of livelihood to the many unemployed youths in rural Kenyan communities.



Lilian Okiro, a PhD student in Plant Biotechnology and Molecular Biology at Egerton University, Kenya was the second runner-up. She was recognized for her '**Maji-Safi 3-in-1 Water Filter**', which she is developing to provide fluoride- and pathogen-free drinking water to many people living in rural and urban areas in Kenya.



The winners and runners-up received awards through the generous contribution of the ESRC IAA fund led by Dr Shailja Fennell, Department of Land Economy, University of Cambridge. They also received personal donations from Dr Debisi Araba, who was passionately moved by their presentation and the potential impacts of their products in sub-Saharan Africa.

Outcomes of the Molecular Laboratory Training Workshop and UK-Africa Food Security Symposium 2018

“I am very pleased by the success of the Molecular Laboratory Training Workshop and UK-Africa Food Security Symposium 2018. The African PhD scholars who participated in the workshop and symposium gained extensive knowledge and expertise that will help advance their research and teaching at their home institutions. We also gained a better understanding of the challenges hampering agricultural research and innovation in Africa, and how we might work together to develop more impactful projects to train, inspire and empower Africa’s present and future scientists”, says Carol Ibe.

Benefits of the Molecular Laboratory Training Workshop

It provided excellent opportunities for the workshop participants from Africa to:

- ❖ Acquire extensive practical experience in a wide-range of modern molecular laboratory techniques and research methods that they can apply to improve the quality of their research and teaching at their home institutions.
- ❖ Connect and exchange knowledge/ideas with research experts from African universities, the University of Cambridge, and other Universities in the UK.
- ❖ Establish new collaborative relationships that may strengthen existing and/or lead to new research investigations that may contribute to food security, poverty alleviation, and shared prosperity in Africa.
- ❖ Be inspired to make a difference in their various communities. For example, Bonphace Mangeni, one of the workshop participants from Kenya recently organized a STEM outreach event to inspire secondary school students in Western Kenya. He said the workshop at Cambridge inspired him to give back to others in his community.

The UK-Africa Food Security Symposium & Debrief Meeting provided opportunities for:

- ❖ A better understanding of the factors contributing to food insecurity in African nations, and how the problems can be effectively and equitably tackled through regional and international research collaborations.
- ❖ Research professionals across disciplines and at all levels from Africa, the UK, and the EU to connect, exchange knowledge and forge useful regional and international collaborations.
- ❖ The ‘Bio-innovation for Africa’ Pitching competition broadened the contestant’s views with more socially driven and applied way of solving Africa’s challenges. It encouraged the African PhD scholars to think outside the box and to be more creative in finding solutions to some of the problems faced on the continent.



Hands-on laboratory practical at the University of Cambridge’s Department of Plant Sciences Teaching Lab.



During the symposium wrap-up meeting, the African PhD scholars met Prof. Stephen Toope, the Vice-Chancellor of Cambridge University.



Our Cambridge Workshop Alum, Bonphace Mangeni from Kenya recently organized a STEM outreach event at Booker Academy, a secondary school in Kakamega in Western Kenya.

Measuring Impact: We created an alumni network to help us keep in touch with our trainees and to track their progress. We receive news and testimonials from our alumni by email, social media groups, and word-of-mouth.

Testimonials from our workshop participants

“I am very grateful for the opportunity to participate in the 2018 Molecular Laboratory Training Workshop and UK-Africa Food Security Symposium held at the University of Cambridge. The training experience was transformative both professionally and socially. **The workshop will long remain a high point of my life as it offered me the opportunity to practice, for the first time, theoretical and laboratory procedures that I had been reading about for years. It has indeed bridged the gap between theory and practice.** The facilitators’ communicated very useful information and actionable concepts in an excellent manner that encouraged hands-on application. The avenue to meet and interact with fellow scholars and distinguished professionals was very rewarding. Networks and relationships have been forged through which lasting partnerships and collaborative research is expected to emerge. Far more inspiring is the fact that JR Biotek Foundation was conceived and birthed by one of our own, Carol N. Ibe. Her initiative has really motivated me to use whatever resources and opportunities at my disposal to make an impact on society. A big thanks to the organizers, sponsors and facilitators of this memorable programme.” - **Kwabena Darkwa, PhD student at the Pan African University, Institute of Life and Earth Sciences, University of Ibadan, Nigeria.**



“The 2018 molecular laboratory training workshop in Cambridge has been the most wonderful, structured, organized, and instructive workshop I have ever attended. **I came to Cambridge with many expectations, and to be honest, they were all met, and let me say, even more.** I recognize the dynamism, professionalism, and intelligence of all our instructors, and especially the JR Biotek Foundation’s team, Carol, Chloe, Leonie and colleagues for having prepared such an enriching programme for us. JR Biotek Foundation is building capacity and empowering the next generation of African decision makers and this endeavor needs to be supported and promoted forever. The workshop enabled me among others to extract DNA for the first time. It was a great moment; a moment that I had been waiting for since 2015. I sincerely thank the JR Biotek Foundation and the Department of Plant Sciences of the University of Cambridge for making this possible.” - **Dedeou A. Tchokponhoue, PhD student at the University of KwaZulu Natal, South Africa.**

“The Workshop presented the opportunity to learn about cutting edge research conducted in the Department of Plant sciences, University of Cambridge, as well as new molecular techniques that can be applied in less advanced laboratories in Africa. **The bioinformatics session was phenomenal. Knowledge gained will aid me in data analysis as well as to draw better inferences from my analysis.** This session was well complemented with the lectures on academic writing and scientific presentations. The Symposium was also very educative, presenting a platform to widen my social network through interactions with world class professors, scientists and industry players. The Bio-innovation for Africa Pitching Competition forced me to think outside the box and uncovered some hidden potentials in me. The regional and international connections I made during the programme will be beneficial throughout my career. I am glad that I participated in this well-organized and educative programme. The organizers and the facilitators were friendly and ever willing to assist us. I am very grateful to the team. I will be excited to share the knowledge and experiences I acquired from the workshop and symposium with the younger generation as well as contribute to science education and research in Africa.” - **Leander Dede Melomey, PhD student at the West African Centre for Crop Improvement, WACCI, University of Ghana.**

Testimonials Cont.

“The Workshop organized by the JR Biotek Foundation in collaboration with the Department of Plant Sciences at the University of Cambridge was really a world-class hands-on training, and **exactly what I needed to fill the gap existing between my theoretical background and practical skills**. The training gave me hands-on skills on molecular laboratory techniques. I have learned a lot. For instance, I am now able to carry out DNA and RNA extraction, loop assembly, plant transformation with *Agrobacterium* and some bioinformatics analysis. I am 200% satisfied with the workshop since it gave me more confidence and I can efficiently use those advanced molecular techniques to improve my research. The training is already impacting my research. With what I have learned, I have already had an idea of what I will do after my PhD. I have received some powerful elements that I am already sharing with my colleagues and will teach students in my different laboratories in Benin and South Africa. The workshop also allowed me to increase my network and initiate collaborations among scientists in Africa and the UK.

Additionally, the UK-Africa Food Security Symposium was another unique and exciting event because it allowed me to meet international peers and to discuss the problems in tertiary education and food security in Africa and to propose solutions. What was exciting was the Bio-innovation pitching competition, where my team won the first prize. The prize will help my team to extend our activities for more impact on the lives of our farmers to effectively ensure food and nutrition security in my country and Africa. I would like to sincerely thank the JR Biotek Foundation and the University of Cambridge for organizing such a unique event, and all the partners for their support. I hope this workshop will continue and be established as part of the University of Cambridge and JR Biotek Foundation’s yearly agenda.” - **Aristide Carlos Houdegebe, PhD student at the University of KwaZulu Natal, South Africa.**



“A taste of the University of Cambridge’s Department of Plant Sciences was a taste of first class molecular lab training, innovation, applied research, knowledge gain and confidence building period for a young academic of my status. I have learned proper planning and execution of molecular lab practical, not only for my current experiments, but also for the students I teach at my university. **The bioinformatics module unlocked the data analysis dilemma I had in my PhD thesis. I am now working on this with ease.** The Professional Development module taught me how to keep up with the current standards of work in the scientific world and to ensure that my knowledge stays relevant and up to date. The highlight of the workshop events that made a big impression on me was the UK-Africa Food Security Symposium and the ‘Bio-innovation for Africa’ pitching competition.

A take home message from Carol Ibe, the founder of JR Biotek Foundation was “Whatever we do, however small it is, if it aims to improve humanity, be dedicated and do it passionately to make an impact.” Indeed, my project, ‘One Village One Poultry Vet Project’, which won the second prize during the ‘Bio-innovation for Africa’ pitching competition is on course to reach many rural households in Kenya with a key goal of improving poultry production for dietary and economic benefits.” - **Boniface Mangeni, PhD student at the Masinde Muliro University of Science and Technology, Kenya.**



Acknowledgement and Appreciation



We give special thanks to the Department of Plant Sciences, University of Cambridge and other sponsoring partners (below) for their generous financial and intellectual support, which contributed to the success of the Molecular Laboratory Training Workshop and UK-Africa Food Security Symposium 2018. These events are making a significant difference in the lives and careers of Africa-based agricultural scientists.

Special thanks to members of the Department of Plant Sciences, especially the organizing team (Dr Trisna Tungadi, Dr Leonie Luginbuehl, Dr Ciara Dangerfield, Chloé Orland, Dr Pallavi Singh, Emily Servante and Carol Ibe) for contributing their time, knowledge and efforts to this year's training workshop and symposium. We also specially acknowledge our speakers, delegates, and sponsors who contributed to the success of the UK-Africa Food Security Symposium 2018.

Thanks to the generous financial contribution from the University of Cambridge's Department of Plant Sciences, OpenPlant, Global Food Security Interdisciplinary Research Center, Trinity College, the Bioscience Impact Team, Department of Land Economy (Dr Fennell Shailaja), and the Gates Cambridge Scholars Council, which enabled us to fully fund 15 PhD students from six African countries to participate in the laboratory training workshop and symposium. We have received excellent feedback and testimonials from the trainees about how the training programme at Cambridge is enhancing their research and teaching, as well as creating useful opportunities for their personal and career development.



Molecular Biology Teaching Workshop (for Africa-based Academics and Researchers)

Location: University of Abomey-Calavi, Benin Republic, West Africa
Date: 1st-5th April 2019



We are pleased to announce our plan to hold a non-laboratory-based **Molecular Biology Teaching Workshop** at the University of Abomey-Calavi from 1st-5th April 2019. The workshop is designed as a 'train-the-trainer' programme aiming to teach **100** academics and PhD students from African universities, the fundamental principles, techniques and applications of molecular biology and biotechnology in agricultural and biomedical research.

It will provide an excellent avenue for lecturers and researchers in African universities to gain knowledge that they can transfer to their students and colleagues, especially as there is a severe lack of expertise in molecular biology (teaching and research) across Africa. The workshop will be taught by lecturers and researchers from the University of Cambridge, and we strongly believe it will significantly improve the teaching of applied biosciences in African tertiary education institutions.

The proposed Africa-based Molecular Biology Teaching Workshop will build on the success of the Molecular Laboratory Training Workshops and conferences (the African Diaspora Biotech Summit 2017 and the UK-Africa Food Security Symposium 2018) that we have organized at the Department of Plant Sciences, University of Cambridge. To date, we have provided opportunities for world-class scientific laboratory training, knowledge transfer, research collaborations and professional development to 33 Africa-based agricultural researchers from 10 African countries - Nigeria, Ghana, Ethiopia, Kenya, South Africa, Benin Republic, Morocco, Egypt, Zimbabwe and Uganda. We look forward to your continued support and partnership as we educate, inspire and empower Africa's present and future scientists.

