Science*Policy*Africa

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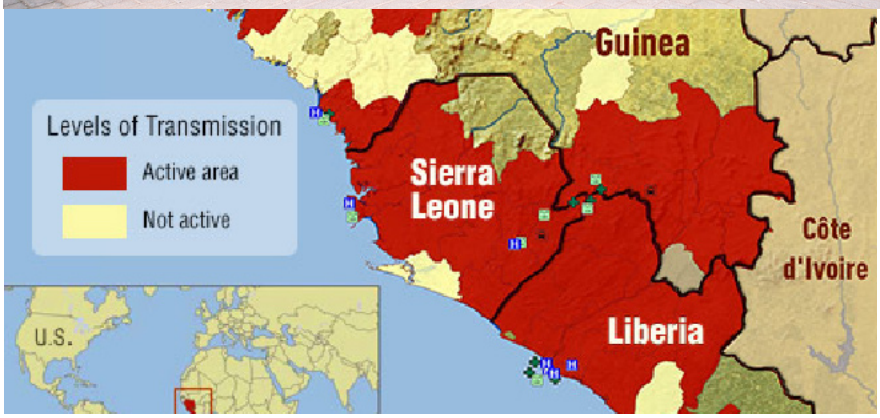

"Science * Policy * Africa" Is a quarterly newsletter of the African Academy of Sciences. The Newsletter carries information on science and policy issues on the African continent and beyond. It seeks to deepen the science-policy discourse in Africa. The Newsletter also provides information on activities of the AAS to the global science and policy community. Views and opinions expressed in this newsletter are those of the authors and do not necessarily reflect the official policy or position of the African Academy of Sciences. "Science * Policy * Africa" is produced with support from The World Academy of Sciences (TWAS)

Message from the President

It is indeed my great honour and priviledge to write this mess message for the fourth and last issue of our Newsletter for 2014.

I am aware that our previous Newsletters in 2014 have had lot of impact in propagating the activities and accomplishments of AAS and I am optimistic that this issue will be equally effective in this direction.

Firstly, we are happy to report that the platform AESA — Alliance for Excellence in Science in Africa, created by the African Academy of Sciences and NEPAD with a consortium of very committed international funding partners is gradually taking off and is on track. Professor Kevin Marsh has joined AAS on AESA platform as a Senior Advisor. A position of Director and Chief Operations Officer for AESA has been advertised and an AAS-NEPAD MoU has been signed. Moreover, AAS has just secured a grant of 2 million dollars from the Bill and Melinda Gates Foundation to move this platform forward.

In the direction of collaboration with other African Academies, AAS has signed an MoU with the Nigerian Academy of Science (NAS) and a joint AAS-NAS activity—YAWI (Young African Women ICT) Awards is being planned in Nigeria for 2015 under the auspices of the Nigerian Federal Ministry of Communications Technology. The aim of YAWI Awards is to encourage and reward exemplary research and development, teaching, learning and extensive use of ICT among African Women and hence bridge the proverbial gender gap in ICT development in Africa.

On popularization of science as well as enhancement of the visibility of AAS in Africa. AAS now has four Commissions -- on Science Education in Africa; on Pan-African Science Olympiads(PASO); on African cultural scientific heritage; and on Women in Science in Africa. We are happy to report that the Nigerian Federal Honourable Minister of Education has accepted the invitation of AAS to Nigeria to host AAS PASO in 2015 and the Hon. Minister is in the process of setting up a Nigerian National Committee to promote the process. A website has been created for the Olympiad containing a lot of information among others, on the aims, objectives, rules and regulations for the Olympiad.

AAS has been very active in educating the scientific community as well as the general society on the Ebola virus. In the last issue of this Newsletter, the Editorial titled "Ebola Outbreak---a wake-up call" as well as an article "Ebola outbreak - Africa at the crossroads" by Dr Kissau Tchedre, threw a lot of light on this virus and how to contain it. In the current issue of this Newsletter, the article "Lessons from the control of Ebola crisis—impact on other endemic killer diseases" by Professor Vincent Titanji is an excellent addition to the previous write-ups. AAS intends to continue alerting and enlightening the public from time to time on such killer diseases.

I like to seize this opportunity to congratulate the AAS fellows – highlighted in this issue - who have been honoured or recognized for one achievement or the other-- Professors Gurib-Fakim, Calestous Juma, Quarisha Kareem, Daniel Makinde, Romain Murenzi, Wandera Ogana and Baldwin Torto. I wish all of them continued successes for the future

Also highlighted in this is-sue are befitting tributes to two of our highly distinguished Colleagues — Professors Ali Mazrui and Paulus Gerdes who have passed on. I use this opportunity to console their families, friends and well-wishers for this irreparable loss. May their great souls rest in peace.

Prof Aderemi Oluyomi Kuku

President,
AAS

Romain Murenzi picked to head new UN High-Level Panel on Technology Bank for Least Developed Countries

Prof Romain Murenzi

The UN Secretary-General has appointed Romain Murenzi, a Fellow of the African Academy of Sciences and Executive Director of The World Academy of Sciences in Trieste, Italy as the Chair of the High-level Panel to study the scope and functions of a proposed new "technology bank" and dedicated to helping the world's least developed countries (LDCs) advance out of poverty.

In 2001, President Paul Kagame of Rwanda appointed him to serve as Minister of Education, Science, Technology and Scientific Research. From 2006 to July 2009, he served as Minister in the President's Office in Charge of Science, Technology, and Scientific Research, with responsibilities including Information and Communication Technology. As a minister, Prof Murenzi is commended as playing an important role in driving the Rwanda's scientific renaissance..

The High-Level Panel – which is to advise on the organizational and operational aspects of the planned "Technology Bank and Science, Technology and Innovation Supporting Mechanism" – includes five women and five men from LDCs and their development partners from the Global North and South.

Among other members of the High-Level Panel include two other AAS Fellows. They are Prof Mohamed Hassan of Sudan and Prof Tebello Nyokong of South Africa.

"The High-level Panel is constituted in response to a request to the Secretary-General by the UN General Assembly, during its 68th session, to establish a panel to examine the scope and functions of the proposed Technology Bank, its organisational aspects and its institutional linkages with the UN," the UN statement announcing the appointment said.

The Panel will hold its first meeting in February 2015.

From the ED's Desk

The year 2014 was a very eventful one.

I will attempt to highlight the major events, while a detailed report of the activities of the year will be covered in our Annual Report 2014.

2014 began with calling on AAS Fellows to make their nominations for the 2014 AAS Fellowship. Many responded and I was delighted with the quality of the nominations,and the increasing number of women
My only disappointment was our failure to receive nominations from countries like Zambia, Libya, Gambia, Namibia, etc, that are not represented. Our Strategic plan makes reference to having Africa-wide membership by 2018. Hence this is a matter that needs our attention for the future.

We then had our 9th General Assembly. The Government of Congo hosted us generously. The week of our meeting in Brazzaville coincided with other Scientific meetings by the African Union Commission that took place in the beautiful city of Brazzaville. The 2013 Olusegun Obasanjo Prize for Scientific Discovery and/or Technological Innovation was presented at a very colourful ceremony attended by Ministers of State of Congo and AAS Fellows present. The President of Congo launched an Africa-wide Innovation Prize under the aegis of the Africa Union, appointing AAS as the implementing body. The latter was most welcome by AAS, and we look forward to doing a great job for the award.

On the programmatic side of our activities; it was early in the year that the results of our inception study of the CIRCLE program was concluded and the results submitted to DFID. We were delighted to receive the decision of the funding partner to approve full funding of this project for three years. Accordingly, the first cohort of fellowship winners have been announced and will begin their research next month. An even more exciting achievement is the success of a task force set up by the GC to create a funding platform entitled: Alliance for Accelerating Excellence in Science in Africa (AESA). This is a joint initiative of AAS and NEPAD. I am delighted and honored to be part of this team with Dr. Thomas Kariuki, AAS Treasurer and member of the GC, Professor Kevin Marsh, Senior Advisor to AAS, and Professor Aggrey Ambali, of NEPAD. We have been in negotiations with a small group of funding partners and African Financial institutions with varying degrees of positive results. The creation of AESA, if successfully completed, will lead to a significant increase in the number of staff at the Secretariat. Also, we have just secured funding from the Bill and Melinda Gates Foundation to host two proposal working workshops this year in two different venues in Africa.

Finally, this has also been a year with sad moments – we have lost two senior Fellows, namely, Professor Ali Mazrui and Professor Paulus Gerdes.

Our relationship with the AU has been gaining depth and scope. We are engaged with many activities of the AUC – the PAU on several fronts; as member of the Council (one seat), in the High Panel (four members from four of the five regions), and in the Steering Committee (one position) and the Kwame Nkrumah Prizes. AAS has also started engaging African Governments. During the last six months we are in discussions with the Governments of Kenya and Nigeria to identify ways by which we can work together and also to obtain more support for AAS pro-grams and activities. We will report on the outcome of these endeavors in the future.

I wish to repeat my observation in acknowledging the increasingly important roles that AAS fellows are playing in the functions of the Academy. The success of our various efforts often requires the input of our fellows. AAS Fellows are serving in various standing as well as ad-hoc committees that we set up from time to time. I would like to appreciate all of you who have responded positively when we asked you to join various committees.

Let me conclude by acknowledging TWAS for extending funds that goes to the production of this Newsletter.

Prof Berhanu Abegaz,
Executive Director, AAS

Lessons from Control of the Ebola crises, impact on other endemic killer diseases

Professor Vincent P. K. Titanji, PhD, FTWAS C/o the Biotechnology Unit, Faculty of Science, University of Buea, Buea, SW Region Cameroon

ABSTRACT

The current Ebola epidemic erupted early this year in three West African countries (Guinea, Liberia, and Sierra Leone) then spread to Nigeria and Senegal on the continent with a few cases exported to the United States and Spain (CDC,2014). As a result of the timely and response the epidemic in Senegal and Nigeria was brought under control and the other countries are expected to follow suit even if, for the time being, the epidemic is still expanding there. While it is predictable that developed countries with strong health systems like the US and Spain would contain the disease, it could be asked why Nigeria and Senegal and indeed Congo after them, with weak health systems could contain the disease better than the initially infected countries which are still lagging behind. In other words, what lessons can we learn from the control of the EBOLA crises and can these lessons be applied to stem other killer diseases of Africa? Herein, have I argued that timely resource mobilization, effective leadership at all levels, active involvement of the affected communities, and above all, the rigorous application of the best scientific knowledge all taken together, were critical for success. It is proposed that if this science- based- and-coordinated approach is applied to other endemic scourges of Africa, it will result their eradication and elimination within the short or medium term.

INTRODUCTION

The current wave of EBOLA infections erupted in Guinea, Liberia and Sierra Leone almost at the same time and then was quickly spread to Nigeria, Senegal, the United States and Spain by travelers returning from the initially infected countries. After some hesitations, the International community lead by the World Health Organization (WHO) mobilized resources to fight the crisis. In October 2014, the WHO declared Nigeria and Senegal free of EBOLA.

The isolated cases exported to Spain and the US have been controlled, even if two of the victims died. But the epidemic is still raging on, albeit at different rates in Guinea, Liberia and Sierra Leone. It is hoped that if the momentum of the fight against Ebola is maintained, the tide will turn and the epidemic brought under control. But it is extremely worrying that African countries were caught unawares and that most of them still rely on the international community and friendly countries to provide the knowledge, skills, drugs and materials- in short- the resources that are required to continue the fight.

Ebola is not the first deadly disease to affect Africa in recent times. HIV/AIDS, malaria and tuberculosis have been among the top ten endemic killer diseases in Africa for decades. When the AIDS epidemic first erupted in the early 1980's the number of cases reported in North America and Europe were higher than in Africa. By the 1990's Africa had become the most affected continent in the world and has remained so until today. In Europe and North America HIV/AIDS has been brought under control through concerted interventions, though the disease is not yet eliminated there.

The question arises as to why the Ebola control initiative, like the HIV/AIDS pandemic before it, is succeeding in some countries, but not in others. Differences in the quality and availability of health care services do not fully explain the observed discrepancy, although they are important for disease control. I uphold that no single factor taken alone can be effective in controlling an epidemic of these proportions.

However, the concerted impact of key critical factors can make a difference. The aims of this review are to identify the critical lessons that have led to success in stemming the Ebola epidemic, so far, and to propose elements of a strategy for the control of other endemic scourges of Africa.

THE EBOLA VIRUS AND DISEASE

The World Health Organization (WHO) and the Center for Diseases Control and Prevention (CDC) have published authoritative information about the appearance, spread and control of EBOLA (CDC,2014;WHO,2014). Briefly, the Ebola disease first appeared in the Congo Democratic Republic (former Zaire) in 1976 in a village near the river Ebola from which both the virus and the disease have taken their name. Subsequently, episodes were reported in Sudan (1976), Congo Democratic Republic (ex Zaire,1976), Gabon(1994) Uganda (2000)[CDC,2014;WHO, 2014)

The causative agent of the disease is a virus of the family Filoviridae. The disease is transferred from person to person by direct contact with body fluids (blood, urine, saliva, semen, sweat) of the infected person.

The virus can infect primates like gorillas and chimpanzees. Bats are thought to be the natural reservoirs of the Ebola virus, which they can transmit through half eaten fruits to other wild and domestic animals. Humans are believed to have contacted the virus from eating dead animals, or while dissecting hunted game for food. But these theories of the origin of the Ebola virus have not been proven. What is certain is that Ebola is real and every effort must be made to eradicate it.

According to a recent WHO (2014) Fact Sheet, the symptoms include sudden onset of fever, intense weakness, muscle pain, head ache and sore throat, followed by vomiting, diarrhea, rash, impaired kidney and liver function, and in some cases, both internal and external bleeding .The incubation period is estimated to be 2-21 days. It has been suggested based on clinical evidence that victims can transmit the infection only when they become ill. Up to 50-80% of the infected persons die from the disease. There is currently no approved effective cure or vaccine for the disease, although a number of experimental drugs and plasma from Ebola survivors are being used to treat the disease.

To avoid catching Ebola, it is advised to:

- Identify and isolate the infected persons and their contacts;
- Avoid all unprotected contacts with infected persons and their body fluids;
- Avoid handling corpses and ensure the safe burial of infected corpses by trained personnel;
- Use of personal protective equipment by health personnel to avoid getting infected and infecting others;
- Avoid eating or touching bush meat;
- Provide adequate treatment of the symp toms and accompanying infections in spe cialized treatment centers.

Although these measures are necessary to curb the spread of the disease, they have profoundly modified peoples' customs. For example, the shaking of hands and hugging has been discouraged if not outright banned to the dismay of many. The abandonment of century old burial rites has imposed psychological strains on bereaved families struggling to cope with the loss of their loved ones.

Governments around the world have taken certain measures to prevent the spread of the virus to their countries and these include travel bans, quarantine of returnees from affected countries, systematic screening of air travelers for signs of fever etc. Some of the unaffected countries in Africa have, as a precautionary measure, set up isolation wards/ clinics and trained personnel in the management of any Ebola cases that may appear. It can, however, be stated that Africa, as a whole and the affected countries in particular were caught unawares and have so far depended heavily on external assistance. Since Ebola is certainly not the last health crises we are likely to face in the future, and indeed since we are currently fighting to curb other long-standing scourges like HIV/AIDS and malaria, what useful lessons can we learn from the Ebola challenge?

LESSONS LEARNT FROM THE EBOLA CRISES

The lessons from the Ebola epidemic, which has mobilized the whole world and killed so many people in such a short time are numerous and will apply to the international, national, local and individual levels. However it may not be feasible or even necessary to compile a comprehensive list of such lessons at this stage. Rather, I will focus on what I believe to be the critical drivers/principles of success that are amenable to future disease control efforts. These to my mind are the:

- Adherence to scientifically proven and ethically acceptable principles;
- Sensitization and health education
- Timely mobilization of and deployment of resources (human, material and logistic)
- Active involvement of the affected communities;
- Strong leadership, concerted action and synergies at all levels

These factors in themselves are not new to the health professionals interested in disease control. What is new is that, this time around, these factors were brought to bear in a concerted and timely manner and it was strong leadership that made it to happen. Brief comments will illustrate how these factors affected the outcome of the fight against Ebola in the short term and how they could be applied in the future to other endemic diseases.

Applying proven scientific principles

It has been stated time and again that Ebola currently has no approved cure. But its mode of transmission is known and scientists have developed accurate diagnostic methods for it (CDC,2014;WHO,2014). This means that infected persons can be identified, isolated and taken care of in an environment designed to limit the further spread of the disease. Thus, the old maxim that prevention is better than cure has been more than confirmed. The decisions to quarantine people and to use experimental drugs have been criticized on ethical and political grounds. Yet, they have been implemented exceptionally in many countries because of the deadly nature of the disease. Significantly the control strategy for Ebola was not predicated on the use of the experimental drugs and vaccines, but on well established principles of controlling infections.

It is known that the application of scientifically proven prevention methods has limited the spread of HIV/AIDS in the developed countries, whereas poor or non-adherence to such principles has favored the persistence of the diseases in sub-Saharan Africa. Obviously, there is a gap in the public understanding and acceptance of science in two worlds that needs to be bridged in order to fully apply preventive measures.

Mobilization of Resources

The Ebola crises demonstrated once more the dire economic situation of the affected countries and their limited ability to cope with crises. The World Bank estimated the economic loss resulting from the current Eb-

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About the Author

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Lessons from Control of the Ebola crises, impact on other endemic killer diseases

Continued from page 4

ola crises to be 32.6 billion US dollars in the short and medium, an amount, which is way beyond the economic means of the countries affected. It is thanks to the generosity of the international community and rich countries like the USA, Britain, China, France etc., that resources have been mobilized so far. The question to ask is when will Africa be able to foot the bill her peoples' health? I think the answer depends very much on the health system model we choose for our different countries .

Without entering into polemics about the merits and demerits of different health systems, it can be stated that not all successful heath systems are expensive and therefore unaffordable. For example, though the the health systems of Cuba and India relatively less expensive than those of Europe and America, they are capable of providing quality health care with outcomes comparable to those of the rich countries. African countries can thus design and implement health systems that take into consideration their local realities and are both effective and proactive without being replicas of foreign systems. The Ebola crisis is a clarion call to make health care a priority of our development programs through concrete actions, not words.

Strong leadership roles

The role of strong leadership manifested itself in the efficient manner in which the WHO, USA and the Governments of the affected countries responded to the Ebola crises. In Sierra Leone, for example, a lock-in weekend was implemented whereby the entire population stayed at home and trained volunteers visited to sensitize them on the disease and identify any symptomatic cases. These measures were criticized on the grounds that they infringed on peoples freedom-of- movement and could breach the confidence and trust of the population in health workers.

Although, the impact of the lock-in has not been fully evaluated, it nevertheless allowed for more than 80% of the population to be sensitized (unwomenwestandcentralaffrica.com/news1/). In Liberia, President Elaine Sirleaf personally lead sensitization teams to educate the population on how to avoid the infection. The actions taken by the Government of Guinea are not well publicized and may reflect the relative dysfunctional state that country's institutions. The point I am trying to make here is that when the highest authority in each country leads the fight against a disease, it makes a great difference.

Community involvement and community lead interventions

Most disease control programs in sub-Saharan Africa are organized in a top-to-bottom manner as actions taken for the benefit of the target population by the Government, International NGOs, and other stakeholders.

The communities are seldom empowered to plan for and take care of their health through adopting preventive measures. It has however been observed in the case of onchocerciasis or river blindness(ref) that community lead intervention can be very effective, but often falls short of expectations because there are no mechanisms in place to make them sustainable.

The involvement of the target population in the control and prevention of Ebola and other diseases is an indispensable prerequisite for the development of a cost effective, efficient and proactive health care systems in African countries south of the Sahara. This is one of the key lessons that needs to be systematically applied in all future disease control and prevention interventions.

Health Education/ sensitization.

Health Education /sensitization played and continues to play an important role in the fight against Ebola. But factors like the language barriers, certain traditional beliefs and practices, and the insufficient development of the scientific culture in target population has limited, and even blocked, successful sensitization in certain contexts. It will be important for African Governments and health authorities to systematize health education at all levels and to actively involve the communities in propagating ideas on healthy living and disease prevention.

This would certainly lead to a change of traditions and customs, and may in some cases be resisted for this reason. However, legislators should be ready to accompany health educators by enacting appropriate health promoting laws. Specifically they should enact and enforce laws forbidding the willful spreading of infections to other persons and promoting public hygiene by banning public urination etc.

In the case of Ebola health education was rightfully recognized/ employed as a powerful and effective disease control tool alongside other measures. The theory is that health education and sensitization should be carried out before other interventions are implemented. In practice this does not always happen, and even when it does, it is not sustained. The lesson to learn is that health education is an indispensable tool for disease control and innovative methods should be sought to entrench it in our society.

Malaria control can benefit from the lessons learnt in the fight against Ebola.

I single out malaria among the devastating diseases of Africa to illustrate the fact that, if the cardinal principles enunciated above are consistently applied, they will lead to an elimination and eventual eradication of malaria. Malaria is transmitted from person to person by the bites of anopheles mosquitoes, the species of which vary from one ecological zone to another.

The symptoms of malaria include chills, fever, muscle and joint pains, vomiting and generalized malaise leading to prostration. Heavily infected children may convulse and enter into coma. Malaria is a serious illness and can kill its victims, particularly children, if left untreated. In 2013 the WHO estimated that malaria killed 670 000 people the world over, 90% of whom were African children less than five years old. It can be noted that some symptoms of malaria are similar to those of Ebola though both diseases vary in their modes of transmission. Fortunately, there are numerous effective treatments for malaria even though, like in the case of Ebola, there is currently no registered malaria vaccine (WHO,2014)

The main malaria control methods include:

- Rapid detection and treatment of malaria cases;
- Use of long lasting insecticide impregnated bed nets;
- Destruction of the mosquito vectors by limited/targeted insecticide spraying;
- The important strategy of eradicating the mosquito vectors is not systematically ap plied because of heavy costs and threats to the environment.

Thus the control of malaria is severely limited by the failure to apply all the scientifically proven control methods in a concerted and coordinated manner.

An examination of the current malaria control strategies reveals that not all the five control principles listed above are being applied in a concerted manner; hence the persistence of malaria despite considerable efforts to control it.

Without belaboring the question, I will draw attention to the non-systematic integration of health education, insufficient involvement of the targeted communities and incomplete application of scientifically proven vector control methods like destruction of mosquito habitats through drainage of stagnant water bodies and spraying with insecticides. In my view malaria can be eliminated from the African continent in the short term if the scientifically proven methods and strategies are applied in a coherent and systematic manner. A few examples in recent history will illustrate this point.

• When it was decided in an attempt to meet one of the Millennium Development Goals (MDGs) by reducing the burden of malaria through the wide use of mosquito bed nets, the Government of Cameroon undertook a major, nation- wide distribution of eight million bed nets to all the ten regions of the country. Significantly, not only the staff of the Ministry of Public Health was involved, but Governors of the Regions, Divisional Officers, the security forces , and the local communities were mobilized to distribute the mosquito bed nets within a limited time frame. Though the effect of the use of the bed nets has not yet been fully evaluated, it is clear that massive mobilization of human and material resources lead to the implementation of a control measure within a short time frame.

The point I am making here is that the strong leadership of the Government of Cameroon, the mobilization of human and material resources, and the application of a scientifically proven and ethically acceptable strategy resulted in success recorded.

However, there were many cases of misuse of the bed nets, as well as non compliance in their usage, which could have been eliminated by health education and appropriate legislation. Furthermore, the other control methods like diagnosis followed by treatment and the destruction of mosquito habitats were not implemented simultaneously or in tandem, which may lead to a recrudescence when the nets become ineffective.

• It has been reported that malaria has been eliminated in the island nations of Seychelles and Mauritius through application of a concerted program, thus giving hope that these same principles may be effective in the mainland of Africa. The question is, "Will we rise to challenge in the same manner like we have done and are doing for Ebola?"

CONCLUSION

The essence of this essay has been to highlight the concept that science-based strategies can be effective in controlling the scourges of Africa in the short term if concerted actions involving all the stakeholders are instituted in a timely and sustainable manner. This to my mind has been one of the main lessons from the Ebola crisis.

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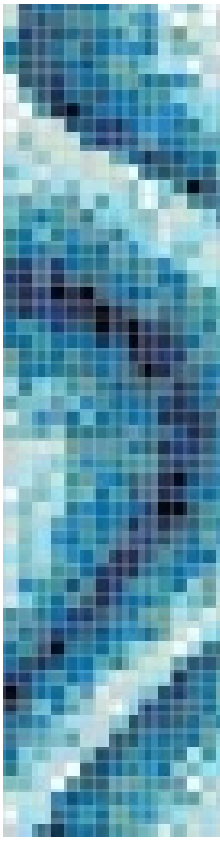

AAS FELLOWS IN THE NEWS

AAS congratulates Prof Abdool-Karim for winning "The 2014 TWAS-Lenovo Science Prize"

The 2014 TWAS-Lenovo Science Prize has been awarded to AAS Vice President for Southern Africa, Prof Quarraisha Abdool-Karim. Prof Abdool-Karim won the award for her life-saving research into medical and social strategies against HIV and AIDS. The award, one of the most prestigious honours given to scientists from the developing world, was announced at a special ceremony during the 2014 General Meeting of The World Academy of Sciences (TWAS). The annual prize includes an award of USD100,000 provided by Lenovo, the global leader in consumer, commercial, and enterprise technology that is the largest PC company in the world.

Prof Quarriasha Abdool-Karim has also been elected Foreign Associate of the Institute of Medicine of the USA National Academy of Sciences. These very important recognitions of Prof Andool-Karim's work has received great commendation from AAS Fellows. Leading AAS Fellows to congratulate Prof Abdool-Karim, Prof Aderemi Kuku, the AAS President, who was also present at the award ceremony in Muscat said "I feel personally very proud and delighted to have witnessed the award as well as listened to your award lecture. These awards are indeed a befitting tribute to your great achievements over the years in your field of research and I like to wish you more resounding accomplishments for the future".

"I feel personally very proud and delighted to have witnessed the award as well as listened to your award lecture". Prof Kuku, AAS President

Professor Makinde awarded Nigeria National Honour for 2014

The President of Nigeria Dr Goodluck Ebele Jonathan decorated and awarded Prof Oluwole Daniel Makinde a Nigeria National Honour Award titled "Member of the Order of the Federal Republic" (MFR) on 29th September 2014. This was in recognition of Prof Makinde as an Outstanding Scientist in Africa for his enormous contribution to Mathematical Science Research, Capacity Building and Training across the continent including Nigeria.

Prof Makinde is a Fellow of the African Academy of Sciences and currently the Secretary General of African Mathematical Union. In 2011/2012 he received the African Union Kwame Nkrumah Continental Scientific Award from the African Heads of States at the African Union Summit in Addis Ababa Ethiopia for outstanding contribution to Basic Science, Technology and Innovation in Africa.

Calestous Juma receives Lifetime Africa Achievement Prize

Prof Calestous Juma has been awarded a Lifetime Africa Achievement Prize (LAAP) for his leadership in socioeconomic development in Africa.

The Lifetime Africa Achievement Prize was presented to Prof Juma in Nigeria on Oct. 10 2014 by the Millennium Excellence Foundation.

Prof Juma, a Dr. Martin Luther King, Jr. Visiting Professor at the MIT Department of Urban Studies and a research affiliate of the MIT Center for International Studies, was among 16 recipients of this year's esteemed award.

The Millennium Excellence Awards is held once every five years and acknowledges and celebrates distinction in our society by individuals, groups and organizations both local and foreign.

Prof Wandera Ogana elected President of IMU Commission

Prof Wandera Ogana, is the new President of the Commission for Developing Countries (CDC), a commission of the International Mathematical Union (IMU). He becomes the first African to hold this position. The election took place during the General Assembly of the IMU held in Gyengju, Republic of Korea, from August 10 to 11, 2014. His term will run from 2015 – 2018.

His main area of research interest is computational fluid dynamics, involving application of boundary element methods to solve transonic flow problems. He has also undertaken mathematical modeling in diverse areas such as ecology, wind energy assessment and the impact of climate change on infectious diseases.

Dr. Baldwyn Torto selected to speak at 2016 XXV International Congress of Entomology

Dr. Baldwyn Torto, an organic chemist and principal scientist at the International Centre of Insect Physiology & Ecology (ICIPE) in Nairobi, Kenya, has been selected as one of the plenary speakers at the 2016 XXV International Congress of Entomology to be held in Orlando, Florida, USA.

The 2016 XXV International Congress of Entomology is expected to bring together the largest delegation of scientists and experts in the history of the discipline. It will create important connections between entomologists and scientists from around the world. The Congress will be under the global theme "Entomology without Borders.

Prof Francisca Okeke on CNN African Voices

Nigerian Scientist and Professor of Physics, Francisca Okeke who is also a Fellow of the African Academy of Sciences was featured on 'African Voices', CNN's International weekly half-hour programme highlighting Africa's most engaging personalities. 'African Voices' focused on Francisca's journey to becoming the University of Nigeria's first female Dean of Faculty of Physical Sciences, and how her father's effort greatly influenced her choice of career.

On the programme broadcasted on November 7, 2014, she recounted her childhood ordeals in the southeastern part of Nigeria, where education for the girl child was not that important, and how the aftermath of the Biafra war and violence almost to put an end to her education. She told 'African Voices': "When I was a child, I would wonder about the changing colour of the sky and the ability of airplanes to fly in the atmosphere without falling back to earth".

Discovering that physics could answer these questions, Okeke was motivated to become a scientist and was one of only two women in her physics undergraduate class of 30 students in 1980. She went on to become the first female Head of Physics Department at the University of Nigeria, and later, the first female Dean of the Faculty of Physical Sciences.

"When I was a child, I would wonder about the changing colour of the sky and the ability of airplanes to fly in the atmosphere without falling back to

Bringman and Mudogo awarded Gusi Peace Prize 2014

Gerhard Bringmann from the University of Würzburg, and an associate Fellow of the AAS since 2013 has together with his African partner and friend Prof Virima Mudogo from the University of Kinshasa (DRC) obtained the Gusi Peace Prize in Manila, Phillipines.

They were honored for building up a probably worldwide unique excellence scholarship program, BEBUC that gives Congo Republic a new generation of outstanding new professors. Launched in 2008, this scholarship program (www.foerderverein-uni-kinshasa.de) supports excellent young Congolese at 16 universities during their bachelor, master, or PhD studies, or during their return to the Congo. In particular for the support of girls, further young talents from two primary schools and six high schools are being supported – presently a total of 157 scholars.

Prof Ameena Gurib-Fakim on TED-Global

Prof Ameenah Gurib-Fakim, AAS Fellow and organic chemist at the University of Mauritius was a speaker at TED-Global talks on October 8, 2014, where she pitched for the conservation of plants, particularly those in biodiversity hotspots of the world.

In her intriguing talk, Ameenah Gurib-Fakim introduced the audience to rare plant species from isolated islands and regions of Africa - the shape-shifting benjoin; the baume de l'ile plate, which might offer a new treatment for asthma; and the iconic baobab tree, which could hold the key to the future of food.

TRIBUTE TO PROF PAULUS GERDES

Prof Paulus Gerdes: Greatest envoys of African Scientific Renaissance

By Hippolyte Fofack

Like many friends, family members and Fellows of the African Academy of Sciences I am still not ready to accept that Professor Paulus Gerdes is no longer with us.

His untimely departure on November 10, 2014 is of course a major loss for the African Academy of Sciences and the continent of Africa, but also for many people who had the chance to get to know him on a personal level.

As one who was welcomed into the Academy several years ago by professor Gerdes, I was indeed very fortunate and have learned a lot from his humility and high sense of public service and commitment, not only to the Academy but to the continent and future generations of African scientists and development practitioners.

Professor Gerdes' exceptional commitment to the African continent and to the radiance of its culture and scientific heritage resonated throughout his research in the fields of ethnomathematics and historiographic of mathematics in African culture.

One of the most important contributions he has made over the years is to honor and reclaim Africa's heritage in mathematics, specifically strengthening the African mathematical foundation in the post-independence era when mathematics was thought to be alien to Africa's historical and cultural heritage.

In so doing, he definitely raised the profile of the African Academy of Sciences as a millennial institution transcending the discontinuity created by centuries of slavery and colonialism on the path to scientific research and invention. At the same time Professor Gerdes was not just a scholar for academicians, but one of relevance whose research was also grounded in African reality and geometrical shapes.

I can hardly think of any other Fellow or scientist around the world who has done more to honor the scientific prowess of African women who for centuries have produced original geometrical shapes in the form of basket weavings.

Through his work modeling various forms of basket weavings Professor Gerdes has brought into classrooms and to the world the genius and scientific creativity of African women practicing geometry at its best, even though most never attended an introductory class in mathematics.

But more than revealing the mathematical content
and complexity of tasks undertaken by African women, Professor Gerdes also celebrated and honored them in a very special way.

He made it a rule to visit open markets and African bazars across the continent on a regular basis to remain constantly in tune with the genius and creativity of African women who through healthy competition have been taking new basket weavings with original geometrical shapes to markets every week.

Through his work modeling various forms of basket weavings, Prof Gerdes has brought into classrooms and to the world the genius and scientific creativity of African women practicing geometry at its best, even though most never attended an introductory class in mathematics

Thanks to his almost contagious passion and consistency over the years some of us also paid visits to these exceptional women of science who have not always received the fullest appreciation of their creativity and contribution to development in Africa.

Yet they have overcome one of the most difficult development challenges, maintaining a system of production across generations over several centuries in an environment where the structural break created by slavery and colonialism has resulted in a systematic destruction of production processes and systems in most other sectors throughout Africa.

Professor Gerdes' extremely productive scientific journey has been about honoring the African scientific and mathematical foundation and all its scientists, whether in modern labs or in open markets.

After several decades of sustained scientific research and teaching and following the highly captivating plenary lecture he delivered during the African Academy of Sciences General Assembly held in Brazzaville last April on "African History as a Source of Inspiration for the Discovery of new Mathematical Ideas", the continent took an important step, a couple of weeks ago, to honor him in turn when he was highly recommended for the 2014 African Union Kwame Nkrumah Continental Award for Basic Science, Technology and Innovation.

It is very painful to see that he will not be there to receive the prize he so eminently deserves. At the very least, I am hopeful that the prize will be awarded to him posthumously.

Such recognition will elevate Professor Gerdes' original work and sustained contribution over several decades in the fields of ethnomathematics and historiography of mathematics to the policy level and in the process further enhance the relevance and impact of his research.

Professor Gerdes' life was about transcending
the highly Eurocentric approach to science and mathematics in Africa to promote the reemergence of Afrocentric teaching of science by closing the knowledge and scientific gap between the pre—and post-colonial period.

By enhancing the dissemination and understanding of the African cultural heritage and its inherent linkages to mathematics and sciences he successfully re-established continuity in the scientific space and domains across the African continent—a nontrivial task.

As the African Academy of Sciences comes together as one family to extend its heartfelt condolences and pay tribute to Professor Paulus Gerdes, one of the most valuable and highly respected members of the African Academy of Sciences, who was always guided by strong scientific convictions about the African foundation of mathematical science, and who mentored so many young scientists across the continent, my hope is that his legacy will go on.

It is that the African continent will continue to be proud of his mathematical and scientific heritage, and will never reach another structural break—source of discontinuity in the scientific space which has been one of the primary causes of underdevelopment in post-independent Africa.

For decades Professor Paulus Gerdes has been one of the Greatest Ambassadors of African Scientific Renaissance.

Through his seminal contribution and exceptional ability to unearth and popularize complex African mathematical and scientific concepts he reaffirmed the confirming status of Africa as the cradle of scientific innovation and invention.

It is now up to Africans and African institutions, especially the African Academy of Sciences to make sure that confirming status remains more than ever on an ascendant path.

There is no better way of honoring Professor Paulus Gerdes than sustaining his legacy. In a way and to quote Marcel Proust, as Professor Paulus Gerdes' memory continues to nourish our hearts, the grief of his untimely departure will abate over time.

Tribute written by:
Dr. Hippolyte Fofack is a Fellow of the African Academy of Sciences and an Economist with the World Bank.

Mazrui's legacy of openness, humanism...

By Prof HORACE G. CAMPBELL

Ali A. Mazrui the great humanist joined the ancestors on October 12, 2014 in Binghamton, New York where he had lived since 1989. He had lived with his family and worked as the Albert Schweitzer Professor in the Humanities and Director of the Institute of Global Cultural Studies at Binghamton University, State University of New York. The boldness of his outlook was reflected at the prayers held for him at the Mosque in Binghamton days before his body was flown back to Kenya.

Perhaps in keeping with Prof Mazrui's controversial life, three women were allowed to speak at the mosque during prayers held over his mortal remains. After the performance of the Salat al-Janazah by the Imam and the men in front standing in three rows, the three women were called forward to speak. The speakers were Professors Betty Wambui, Professor Ousseina Alido and Professor Florence Margai.

After the second female speaker paid tribute to Mazrui and his contribution to the struggles of women, the host, Professor Ricardo Laremont had to comment that although there were many in the prayer who were raising eyebrows about the departure from the 'tradition,' this mixed gender prayer was consistent with what Ali Mazrui stood for. Many other tributes followed from all over the world for Professor Ali Mazrui whose mortal remains were interred at the historical monument of Fort Jesus in Mombasa, Kenya.

Ali Mazrui was born in Mombasa, on February 24, 1933. Ali was a prodigious writer who was the author or coauthor of more than 35 books, numerous book chapters, and hundreds of scholarly articles, magazine and newspaper commentaries and the host of the TV series the Triple Heritage. Mazrui toiled as an international scholar in every continent and he can be claimed as a great Pan Africanist, a great African, and a great East African, but for this tribute I want to hail Ali Mazrui as a great humanist.

In my recollection of Ali Mazrui over the past 42 years from the period at Makerere University in 1972, one could say a lot about his dedication to the cause of Africa and his service as one of the eminent persons of the OAU making the reparative claims. In this Tribute, I want to remember Ali Mazrui as unflinching in his support for justice for Walter Rodney and his service with the international commemoration committee for Walter Rodney and our trip to Georgetown, Guyana in June 2005. Many older East Africans will remember that great debate between Walter Rodney and Ali Mazrui at the Main Hall of Makerere University in 1970. The fact was that then, Walter Rodney and Ali Mazrui were on different sides of the political divide about the nature of imperialism.

By the time Ali Mazrui had relocated to North America in 1972 and began his service at Stanford University, the University of Michigan and then at Binghamton University, there was no doubt where Ali Mazrui stood on the crucial

issues of the fight for social justice and the anti-imperialist struggles. For this, those who justified the oppression of the Palestinian peoples vilified him and sought to diminish him, but Mazrui was not afraid of these forces that stood against academic freedom in the United States.

> ***Mazrui has left a vision of openness and peace for us to follow in these challenging times***

I want to salute the courage and humanism of Ali Mazrui. By humanism, I mean the philosophical and ethical stance that he took which emphasized the value and agency of human beings, individually and collectively. Importantly, this humanism of Mazrui was based on the dignity of all human beings regardless of race, religion, region, sexuality or gender. The humanism of Mazrui was linked to the quest for reparative justice, peace, self-determination, the rights of women, secularism and prosperity for all.

As the son of the Khadi of Mombasa, Mazrui was a scholar of Islam and yet, he married twice, both times to women who followed a different faith. In this tribute I want to highlight the support of Mazrui for Amina Wadud and Ingrid Mattson and the question of the equality of women in the Mosque. In his newsletter of 2005, Mazrui wrote of his difference with the conservatives in the Mosque in Cape Town South Africa in 2004 when the religious leaders were opposed to Amina Wadud leading the prayers. Then Mazrui said that, "In post-apartheid South Africa, Amina Wadud and I witnessed the historic dialectic of Islam between the veiled face and the vision of openness."

The fact that Mazrui was cut off from the principal struggles for self-determination that were then raging in Kenya can be grasped from his own self portrait, "Growing Up in a Shrinking World: A Private

Vantage Point" and "The Making of An African Political Scientist" (International Social Science Journal No 25, 1973). There is scarcely any mention of the struggles of the Land and Freedom Army in Kenya and the ideals of independence. In those days, Ali Mazrui wanted his name to be associated with US realist scholars such as David Apter, Hans Morgenthau, Aristide Zolberg, David Easton and the other leading lights of the US political science establishment.

The courses of Makerere University reflected this orientation and hundreds of students passed through the halls of Makerere learning about the merits of western investments and the European enlightenment. This was when Mazrui was writing about the "Left and the super left in Africa." Mahmood Mamdani who was exposed to Ali Mazrui in East Africa in that period did point out that in the liberal traditions that Mazrui sought to associate himself with, "the young Ali stood for a tradition of free speech and critical inquiry."

From the Newsletters of the Institute of Global Cultural Studies there will be a treasure trove of the writings and thinking of Ali Mazrui. On the part of this writer, I want to pay tribute to the generosity of spirit of Mazrui and his willingness to support and nurture those younger scholars of all races, genders and social backgrounds. In this, Ali Mazrui left his mark as someone who stood for fairness and who believed that everyone deserved an opportunity. He worked hard in upstate New York in the African and Islamic communities and was never too proud to go to community meetings all over the region, when invited. "Those close to Mazrui loved him for his character and personal qualities.

His warmth was enveloping and his laughter was infectious. He was endlessly generous toward family, close and extended, and to people in less fortunate circumstances. He was gracious to all, including strangers and intellectual adversaries. The hospitality of Mazrui and his beloved wife, Pauline, drew hundreds of visitors to their Vestal, New York home from across town and the world.

He also kept in touch with relatives, friends and colleagues in far off places with a personal newsletter that he wrote annually for nearly forty years. He enjoyed learning from people from all walks of life and cultures. An egalitarian and humanitarian, he endeavored to treat all people with respect, dignity and fairness. At the same time, he valued spirited debate about political, economic and philosophical ideas. Mazrui modeled integrity and decency." Ali Mazrui has left a vision of openness and peace for us to follow in these challenging times.

The Writer is a professor of African American Studies and Political Science at Syracyse University

Geometric approach to physical systems

Authors: J. Batle and M. Abdel-Aty
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A quantum computer can be considered as a computation system (physical systems have complementary advantage in sending, manipulating or storing quantum states) that makes direct use of quantum superposition and entanglement, to perform operations on data which is different from classical computers (digital computers) that based on transistors.

In this article we have introduced a general geometric approach to obtain the probability distribution of finding quantum states of bipartite system (qubit-qubit, qubit-qutrit and higher dimension) with a given degree of mixture.

Analytical results have been found for different values of the entropy index.

The more convenient way to derive the probability distribution (density matrix) of finding a bipartite mixed state in arbitrary dimensions with a given degree of mixture has been suggested.

Finally, we have derived explicitly the final state in a physical meaningful case of a qubit–qutrit system.

As the degree of mixture increases, quantum states tend to have a smaller amount of entanglement. In the case, the two-qubit system states with a large enough degree of mixture are always separable.

For practical or purely theoretical purposes, it may happen to be relevant to generate mixed states of two qubits with a given participation ratio.

It may represent an excellent tool in the simulation of algorithms in a given quantum circuit; as the input pure states go through the quantum gates, they interact with the environment, so that they become mixed with some participation ratio.

This degree of mixture which varies with the number of iterations, can be used as a probe for the evolution of the degradation of the entanglement present between any two qubits in the circuit.

The main aim here was that given a particular way to explore the space of both pure and mixed states in bipartite systems, it is possible to provide a clear physical geometric insight into the problem of how states distribute according to their degree of mixture.

We consider our results with an error less than 103 units, i.e. we have generated a number of points around 10 or 100 million.

Then the natural applications arise when we try to simulate certain processes through random matrices, whose probability distribution ought to be described accordingly.

Also, the fact that we introduce a general recipe for generating arbitrary states with a given degree of mixture, either in the form of R=1/Tr(□2), where □ is the density matrix, or in terms of the maximum eigenvalue of the state □m is extremely useful for laboratory purposes.

Recall that maximally entangled states with respect to R have been found experimentally and, by definition, they are stronger against decoherence.

Thus, in any optical system, it is required to have the maximum possible coherence, but when we come to terms, this is not the case and description of mixed states is mandatory.

Furthermore, the geometric picture introduced, valid for any bipartite system dimensionality, is definitely inspiring and useful for computing several averages of relevant quantities in the WHOLE set of states.

Prof M. Abdel-Aty is a Mathematics Professor and Vice President of the African Academy of Sciences. He is also a Director of NSP USA and Head of Scientific Publishing Center, Bahrain.

Nutrition in pregnant women at Tlemcen (Algeria)

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The quality of nutrition in women during pregnancy and lactation has marked implications on child development and long-term health. During pregnancy, the availability of nutrients to the fetus depends on placental supply and maternal nutrition.

There is growing evidence that maternal under-nutrition or over-nutrition has long-lasting consequences for the health of the infant. Special attention is then focused nutrition during pregnancy. Our laboratory is engaged in a large national project sponsored by the Ministry of higher education and scientific research, aiming to investigate energy intake and diet composition in pregnant women at Tlemcen (Western Algeria).

The study population consists of 4870 pregnant women attending the Maternity department of Tlemcen Hospital, Tlemcen, Algeria, during 2010 to 2014. The study is approved by the Tlemcen Hospital Committee for Research on Human Subjects. Free and informed consent is obtained from each participant of the study. Pregnant mothers with pre-existing pathology (diabetes, obesity, hypertension, infection….) are excluded.

The 24 h multiple pass recall (MPR) is performed, basically consisting of a quick list of all foods and drinks consumed, a detailed description and a review with the interviewer probing for information on time/occasion, forgotten foods and food details. Accurate details and estimation of consumption are obtained by appropriate questions regarding food identification, preparation and ingredients, portion sizes and the use of household implements. Food models and cup size portions are used to assist in volume estimation. The 24 h MPR is ad-ministered on three separate occasions to include one weekend day and two weekdays. Values for energy intake and nutrients are derived from intake records using the nutritional analysis program with database of food composition (REGAL Windows, France).

Daily macronutrients and micronutrients intakes of pregnant women are compared to the international recommendations. The results show a lower median energy intake in Algerian pregnant women than the recommendations. Protein and carbohydrate intakes, expressed as percentages of total energy intake, are low; however, fat intake and saturated fatty acids (SFA) are increased in Algerian pregnant women. Iron, calcium, vitamin A, vitamin C and vitamin E intakes are also low compared to the recommendations. In addition, after evaluat-ing the quality of a woman's diet using the Mediterranean Diet Score (more legumes, grains, fruit, nuts, vegetables, fish, more monounsaturated fat than saturated fat and less dairy, meat, and sweets), the results indicate that pregnant women nutrition is far from the Medi-terranean diet in this region.

It is clear that all these nutritional abnormalities could have an impact on maternal and neo-nate health. Future interventions that target dietary recommendations may be effective strategies to improve nutrition in pregnant women in Algeria. Our team are now acting in preparing simple messages for nutritional education.

Members of PPABIO-NUT laboratory working on maternal nutrition project: SAKER Meriem, Associate professor MERZOUK Hafida, professor MERAD amel, Dr BOUANANE Samira, Associate professor

About the Author

Mme MERZOUK Hafida, is a Professor at the university of Tlemcen and Director of the laboratory "Physiology, Physiopathology and Biochemistry of Nutrition. She is a Fellow of the AAS and also an active member of Algerian society for nutrition and orthomolecular medicine (SANMO).

Africa: The origin of Humanity, values and knowledge

By Mammo Muchie

Africa is the cradle of humanity. Civilisation, astronomy, science, mathematics and philosophy originated from Africa. There is a real challenge for Africans to understand that the difficult today and tomorrow can be transformed into a beautiful after tomorrow if Africans are prepared to look back to the deep and rich cultural contributions made by the ancestors to help mend the current social-economic reality that remains intoxicated with the colonial cultural liquor failing to protect Africa from pervasive Western cultural re-penetration. Africa continues to be penetrable rather than being the real provider of its rich values and culture to liberate not only Africa but also redeem and save all humanity.

How did African values, science, ethos, thoughts, knowledge and practice fare throughout history? How was African thought understood and expressed before the 15th-16th century before slavery, colonialism, apartheid and neo-colonialism? How was their knowledge and values degraded or rejected during their time of humiliation under colonialism and imperialism? Now that they have formally come out from colonialism and apartheid how has African scientific standing recognised or diminished? These are critical issues that must be addressed. My main proposition is neat and simple: African culture, African knowledge, African philosophy, African civilisation, African astronomy and African mathematics and logic that our ancestors left behind, that others stole and claimed Africans had nothing to do with their creation, must be re-claimed as part and parcel of the social and economic liberation Africans have embarked upon and have not yet fully realised to date.

It is not only thingification /commodification of Africans that Africans were subjected to. It is not only their resources that they were deprived of still to this day after formal de-colonisation. It is also the theft of their knowledge, their philosophy, their science, their astronomy and mathematics. It is not just only the theft of all these valuable treasures created by Africans, it is above all the nasty and shallow castigation of Africans that they are incapable of thinking and creating all these knowledge systems. The denial of the clear and unambiguous recognition cannot be tolerated that that they have been capable to create and are also today even more capable to think, invent, innovate and apply fully their creative imagination. This prejudice remains entrenched still now. It must be resisted systematically and with full knowledge power that Africans better hurry to establish and promote to reach the whole world. There is a real need to make sense of the past and present to make Africa's own destiny and the world in which we all live in today, tomorrow and after tomorrow. The values and philosophy of Africans is rich and deeply associational. This value will help Africans to un-think the unthinkable in order to re-think along the liberation cultural trajectory; to unlearn the ignored, rejected and the different in order to re-learn to create the liberated learning path, to coordinate the uncoordinated, to unite the unitable, to unfree the fettered, to articulate the inarticulate, to open the closed space, to make clear, the obtuse. There is a need to bring back the knowledge of how Africans used to understand and explain the unexplainable, the space, the spirit, the perception of human existence and the nature of the world. We need to do it and not just talk this. We have to prepare the material and start doing it.

Africans can only address ignoring what their ancestors left behind that authors like Martin Bernal in his book Black Athena has acknowledged by looking back in order to look forward. There is a real need to combine thought and practice liberation by making sure a new education curriculum that is rooted in unearthing and promoting the great contributions Africans made in the past becomes truly as the accepted mode of learning and training new generations. The African Academy of Science and indeed all the universities must radically redesign and re-engineer their educational curriculum to promote the true origin of all the science where they came from: Africa pure and simple.

Africans have created the philosophies of Ma'at and Ubuntu that will not only help to promote the liberated culture for Africa but the universal value, the foundation for politics and economics and the deep culture that will save the world. The mystery and chaos of the universe can be re-engineered and re-designed with truth, order, law, morality, justice and humanity through Ma'at involving family, community, Africa with the rest, everything and God. Africa should unleash science to explain the mystery of the universe. It must unleash the spiritual roots of its pre-Christian and Pre-Islamic religions to relate meaningfully and with cultural rootedness the mystery of God.

"Humans respond to symbols, such as words, ideas, concepts, opinions, emotions, projections, and beliefs. We join social movements because of abstract beliefs, certain words can galvanize us to group action or involve us in mass hysteria, emotions motivate us to join mobs, we join discussion groups and academic classes to share ideas, we mary because of love, we create armies because of fear of invasion, and we socialise because of friendship. We assign meaning to things that have no physical substance. These mental constructs interact with reality in such complex ways that some philosophers question whether our worlds are physical reality or cognitive illusions. Reality or not, they catalyze us to create complex webs of alliances that we call social structure"(Marion,1999 p.51)

Both Ubuntu and Ma'at reinforce each other. Both have roots that can promote science, constructive social relations and African spiritual distinction. They both put human kindness first. Thus by putting human kindness first, Africa can make universal bond by interlinking or connecting all humanity to be part and parcel of the primary constitution for self-expression so that all other confining othering definitions such as race, religion, language, tribe and ethnicity are superseded and transcended. No difference can overcome or replace human similarity valued and made with the defining culture and creation of human relations with Ubuntu and Ma'at. Celebrate unity with universal humanity whilst appreciating any difference.

African philosophy and culture provide this liberation thought. The other is not othered, but connected and substantiated in and to the existential constitution as a part of the self... I am because you are, there is an 'I' in you and there is a you in 'I', and with these values as liberation thought and practice as the bedrock of human constitution and evolution, the culture that emerges can only save the world and not destroy it by the instrumental and calculative money and profit driven value that has imposed a mean temper on our time by pricing everything and valuing nothing judged by the current Eurocentric driven civilizational journey full of conflicts and uncertainties.

The world is misdirected both today and tomorrow by the domination of this instrumental and calculative

Continues on page 14

About the Author

Prof Muchie holds a DPhil in Science, Tech-nology and Innovation for Development (STI4D) from the University of Sussex. He is currently a DST/NRF Research Professor of Innovation Studies at the Institute of Economics Research on Innovation (IERI), at Tshwane University of Technology. He is also a NRF rated Research Professor. He is a fellow of the African Academy of Sciences and is currently adjunct professor at the Adama Science, Technology University, Ethiopia.

Philosophy of the PhD, career prospects

Prof Abed Peerally, Email: apeerally@intnet.mu; abed.peerally@gmail.com

The impact of the global economic environment in academia and research in the western world is so dramatic that one of the strongest intellectual indicators of industrial development, the PhD system, is coming under severe scrutiny and not surprisingly the world's most powerful science journal, Nature devoted several articles on this issue in its April 2011:472 issue.

Very recently, in Nature's2 September 2014:7517 journal, the career aspect has been quite thoroughly addressed. It is worthwhile for developing countries to draw lessons from such findings and take appropriate measures as a matter of urgency. Acquiring a PhD is a source of considerable pride but its value depends largely on the competence of the candidate, the supervisor and on the reputation of the department/institution.

The degree takes from two to several years to complete and once done, in some countries like the USA, most students have to go through a post-doctoral attachment of up to several years.

There are some very rare cases where a candidate completes his research within some months, as with the Nobel Laureate Abdus Salam at Cambridge and in the case of the Nobel Laureate Louis de Broglie, the candidate won the Nobel Prize on the basis of his PhD work, but did little research subsequently.

However there is unanimity that the PhD is a very important qualification for industrial, professional and intellectual mastery. Actually the world's most successful entrepreneurs, like Bill Gates and others, who do not themselves have any important academic qualifications, depend on scores of PhDs to produce the goods and services that make them multibillionaires.

The successful entrepreneurs have the luck to have had a great vision at the right time and at the right place, an attitude we need to emulate at least in our management practices in research and development institutes.

It is difficult to give quantitative data on the optimal proportion of PhDs in any context but it could be around 20 to 80 per million of population per year in a rapidly prospering industrialized country.

In Singapore, in addition to the recruitment of many PhDs from overseas, local institutions have been enrolling some 160 new local candidates per year in the last few years. The PhD situation appears to be becoming particularly gloomy in the US and Japan where more and more PhD holders are now seeking jobs in business, education, NGOs and in the public sector.

As a result, in the US, there has been a trend recently to modify the PhD programme from a research intensive base to one of an interdisciplinary character to create a more flexible, adaptive degree for a variety of job opportunities. In Japan the PhD faces an even more acute situation. Government policy in the 1990's was to triple the number of PhDs to 10,000 which has led to a consequential crisis of employment opportunities with the result that Government had in 2009 to start subsidizing private firms for recruiting unemployed PhDs.

Basically the philosophy and merits of the PhD themselves remain largely unchanged. You do not need a genius to tell you that creating and running advanced university courses require reflection and monitoring in relation to relevance and quality.

Modern socioeconomic models are based on complicated facets of governance and wealth creation. In the face of economic and financial chaos, remedial actions often require timely ethical and regulatory frameworks which politicians, administrators, lawyers and legislators have the responsibility to address.

Therefore we can see that we have to place the fate of the PhD in the industrialised western nations in its proper context. The current 'rethinking' has a lot to do with the consequences of the economic crises and not to any damning weakness of the PhD per se. In the prospering Asian, South American and African countries the trend is one of increasing outputs of PhDs, particularly in science and technology.

In China PhD outputs went up to 50,000 in 2009 in all disciplines while India produced 9000, in science and technology and this is expected to go up to 20000 by 2020. Both China and India, as well as Brazil, view the future with great hope for dramatic industrial growth where a large number of well-trained PhDs will have a major role to play in boosting economic development.

Africa is rich in talents and natural resources and the huge potential of its tourist industry, of the export of value added manufacturing, in finance in addition to mining and rare metals, gas and other non-renewable energy resources is immense.

There will be need for innovative initiatives in terms of high quality human resources. The consequential implications for our current and future human resources will impact directly and forcefully on our destiny.

Already we are witnessing impressive infrastructural and institutional investments all over the continent, but we are just at the beginning of a new era. Keeping in mind our determination to balance sustained industrial and economic progress with social progress, what will then be necessary is a well-trained human capital base in which the PhD system, both academic and applied, will play its vital part where critical thinking and innovative thrust are essential.

In particular we should avoid the mistake of imitating the western countries' concern with broad based PhDs. In quality conscious PhD programs students are meticulously coached to have good projects, to devise the best hypotheses and to develop methodologies for high level field or experimental research.

Gradually PhD holders have to deal with projects management whether in academia or business. They are likely to develop a good grasp of managing systems.

The final conclusion is obvious: in the PhD system by being trained to be an efficient and effective specialist researcher you can also become a particularly good generalist for managing systems.

However the world is now witnessing lots of constraints in job satisfaction and from the increasingly competitive environment for securing research funds and subsequently for well paid jobs.

As the September 7517 issue of Nature writes, while researchers and academics love their work, the majority feel their well being foundation is now eroding.

In a world wide survey of 7216 respondents half feel that their morale in the department is dipping without hope of improvement soon. This particularly applies to the increasing hardship to secure funds for research and development.

Similarly about half of the respondents also see their job satisfaction slipping due to financial availability difficulties. The bright aspect of this otherwise world academic insecurity is that the people involved continue to like their jobs. We are all aware that professional duties impact differently on males and females. One job problem worth highlighting has to do with lady academics.

During a conference, which I attended, organized by the London Royal Society a few years back on the topic of "Tomorrow's Giants", several lady academics present voiced their unhappiness about the lack of adequate institutional appreciation of the hardships related to maternity and post maternity issues.

They made strong pleas for more substantial sympathetic institutional decisions to alleviate those hardships which have to do with basic human rights for the female section of humanity. This fortunately is being more comprehensively addressed in some Canadian universities, I saw in recent years.

About the Author

M. Abed Peerally holds a PhD from Manchester University and is a Fellow of the African Academy of Sciences, of TWAS, the Academy of Science of the Developing World, based in Trieste, Italy. He was Pro Vice Chancellor of the University of Mauritius, Chairman of the Road Development Authority, Mauritius and is currently a Consultant Scientist, Cosmology Researcher, and an Adviser on Corporate Governance, Corporate Administration and Capacity Building.

Fifty years with Science and Education in the Middle East

- Prof Mohamed Hilmy Elnagdi

Summary: This article demonstrates the extent of deterioration in health as well as educational systems in the Arab North as well as the Middle East. The gradual change in middle class values to the present state is also discussed. It shows that governments in the region should strive against brain drain as it costs huge amounts of money to train a single productive professional. According to statistics 4.8% of population in the Arab world is now over 65 and only 1.2% are over seventy.

Analysis of University, graduate and postgraduate qualities over time

University education in the Arab region started by establishment of the American University in Cairo in 1908 followed by the establishment of the Cairo University in 1912. Before this elite Arabs could only access University degrees from European (basically British and French) Universities.

Then Ain Shams and Alexandria were established shortly after the Cairo University and in the 1960 several other universities were established in Egypt and other Arab countries. Despite the fact that initially American and Cairo Universities had infrastructure and educational qualities comparable in some way to those of second rank universities in the west, all universities established afterwards had infrastructure of much less quality.

Academic qualifications of staff in these universities has also witnessed plenty of variations over time. Attempt to evaluate this critically should start by defining the goals of both graduate and postgraduate education and the expected role of universities in societies. Universities should contribute effectively in modernizing society by creating awareness of global development and how they relate to local situations both technically and culturally. Universities should help students through education to be qualified as well as trained for relevant jobs needed to develop their societies.

University education at the beginning contributed significantly to Middle East development. Most of infrastructure developments in Egypt and surrounding countries in the 1930's to 1970's was conducted through efforts of University graduates of Egypt, of course, in some aspects, under supervision of western directors or organizations. Hospitals, roads, energy generation and agricultural projects were run by Egyptian University graduates. Gradually technical gap increased and universities graduate in the Middle East found it difficult to compete with South East Asian graduates, former eastern block graduates as well as western ones. Oil rich countries could find it financially possible to hire those better qualified professionals. Now we look in depth to the current situation.

Evaluating Science and Scientists

The role played by universities for spreading knowledge to the public remained very limited in the Middle East with exception of the role of the American University press in Cairo that had in fact quite positive impact. Finally we come to a trial to evaluate university graduate academic qualifications. I think that the most important issue is now not for the past. It is easy to conclude that graduates, at least in my field, are not prepared to meet the market qualification requirements. The majority of graduates did not receive any modern practical training. This alone may be possible to deal with through intensive short training. But the sad situation is their basic knowledge of the modern science as all courses, with few exceptions, are outdated and have not been modernized in the last ten years. The student evaluation is loose and exams are not directed to measure student's ability to solve problems but only to direct memorization. Fields of postgraduate studies are also outdated and no trial to modernize research trend has ever been seriously attempted. However, there were some efforts to modernize research field by few groups. In conclusion university graduates with such inadequate training are unable to contribute to the region modernization trials in several, if not all aspects.

Graduate and Post-Graduate academic standards in Arab Universities

Post graduate research seems easier to evaluate as there are plenty of ways to conclude this, almost exactly, its quality. For this reason I will start with this latter subject:

Postgraduate research in Egypt

This may now be easily evaluated as there are now different agreed upon parameters for such evaluation. Generally it is possible to access from ISI web of knowledge or from Google scholar the number of papers published from every country and or institute as well as their impact as can be readily seen from number of citations or better from number of citations per paper. However, recent work may not have yet its chance to be cited. On average a paper need some time to be cited. Here one can rely on impact of journals in which the work has been published.

The COMESTIC compiled this as 0.7 for number of citations + 0.3 for impact of journal I think this is a fair measure. Citation per paper as opposed to total number of citations or total number of papers is used here. With this method, it can be seen that Egypt is ranked 71th place while Israel now is in the 7th place. Best after Israel is Lebanon (49th) followed by Turkey (54th), Oman (56th), Iran (61st), Kuwait (64th), Morocco (66th); Jordan (68th) in the Middle East. North African universities continue to perform poorly. Other than Morocco (66th), Egypt follows at position 71st followed by Tunisia, Algeria at 76 and 77 respectively. Qatar is at position 80.

One can may conclude that chemistry standard of performance is worse in Egypt compared to other Middle Eastern countries today. In the 50's to 80's the situation was much better. Chemistry appears to suffer from a shift to focusing on renewable energy sources, catalysis or biofuel is quite scars. Subjects studied, with few exceptions, in chemistry are not at frontiers of science. As example heterocyclic chemistry dominating Egyptian Scholars attention are not now hot subjects in as research

One may also point out to the fact that some part of work coming from Egyptian Universities was not in fact proposed or conducted with the University again facilities as NRC students should register in Universities if their work would lead to degrees. Now we come to try to get an in depth look to University infrastructure for research. I will here stick to Cairo University and I confirm that all institutions have already reported that it is the most productive research institute in the whole country.

Although UNESCO have established in Cairo University an analytical data unit of reasonable quality by time of establishment (1969) bad management and corruption led it now to be obsolete. No NMR facility, highly imprecise elemental analyses and in addition, it was turned to be commercial facility and even faculty members have to pay (from their salaries) to get any measurement done. In the chemistry department there is also NMR facility but again one has to pay plenty and analyses are highly imprecise.

As staff is under pressure to publish, plenty of scientific misconduct has resulted as I discussed earlier. About ranking, I have indicated the situation for chemistry; it may be of value to report ranking in other fields and total ranking of the country's total position in science and technology. Already my net research Africa and comestech commented that the country output is weak. Here, I will give citation for every science and total ranking as citation per paper as well as total citation.

It is reported both by my net research Africa and also comestech that, despite rumors, Cairo University is the most prolific institution and Abouelghar, Shific, Soliman and Elnagdi are the most prolific scientists.

Kuwait University

The students' laboratories are standard and comparable to internationally recognized university laboratories. Courses are inspected by experts from time to time. Thus it is possible to get graduates of high level. This is due to the fact that exams are not directed to evaluate students' abilities to use their science but only to remember data.

Postgraduate studies in Kuwait are really limited and most research is conducted by hired professionals mainly from Egypt and India. In general published work has one of the highest impacts in Middle East but despite this Kuwait is ranked in 64th place. There are now trials to upgrade research output

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Africa: The origin of Humanity, values and knowledge

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Eurocentric shallow culture. African liberation culture should make world futures if the world is to survive from its present dangerous trajectory by rooting human development on a social inclusive and green trajectory that is richly anchored on a powerful ontological density and epistemic virtue.

The world needs Africa. The diverse people from every part of the world should come to know that Africa has been the origin of humanity, and the true producer of the philosophy, science, value and culture that will save all humanity. Africa continues to give hope to the world to open a more associational civilizational trajectory to save humanity for good.

That is why it is important to appreciate and recognise that nothing is more relevant in our time than to put Africa first, if only for the sake of and in order to put humanity first.

Africans and all those who stand in creating a humane world must promote Africa first to redeem those that have degraded not only Africans but those that have followed a knowledge pattern that is contaminated with ontological shallowness and epistemic vice and continue to do so.

Bringing back the Africa that created the philosophies, sciences, values, culture and thought as first and not last that can contin-ue to radiate moral vibrancy to all humanity and the universe. (See Muchie et al:, 2003.

May I conclude by urging us to continue the strategy of liberation by pursuing the effort at two levels: The first is to go back and examine how Africans developed science, engineering, astronomy, technology and mathematics? There is a real need to unearth and excavate them and build them in the African curriculum from kindergarten to tertiary level including developing strong research. It is important to recognise the importance that above all else, let Africans learn them and share them with the rest of the world. Combined efforts to implement must start. It is long overdue. The African Academy of Science should help as we have scientists hailing from all parts of Africa.

The second is that Africans have to enter finally into the era of post-coloniality for good. For this the resistance must continue to end all varieties of colonialism, racism and humiliation. There is much we must do like reviving Ethiopianism philosophy for dignity, self-worth, freedom, self-reliance and pride like the founders of ANC did, the Pan-Africanism of the 19th century and the current Africa unity for renaissance education effort that we started in 2010 in South Africa and have now published three books.

The latest book is with the title Unite or Perish and there is already great interest across the world to this book. We can only continue these in order to realise African full freedom by pursuing unity and renaissance at all levels from the science, philosophy, engineering, technology, astronomy, mathematics ;and culture, education to politics and economics.

Both the first and the second reinforce each other. The first helps the second and the realisation of the second promotes the first. So we need the journey of synthesis to realise full liberation the day after tomorrow if not today or tomorrow. "If you want to know your past, look into your present conditions. If you want to know your future, look into your present actions."

Finally let us not dream African liberation, let is make it a reality soon. Action is essential to make the future. Let us revamp the curriculum and bring back what others stole and rejected Africans had anything in the creation and wean generations of Africans to grow up with pride, dignity and full imagination to create a beautiful humane world. That is what Africa's future, mission and vision must be. No one can create it but true Africans. Go for it! Be it. Do it. Do not just say/talk it.

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Fifty Years with Science and Education in the Middle East

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Situation in some Saudi Universities

Level of comprehension of the English language hampering development of research. Research output, with few exceptions, is made either by postgraduates or in co-operation with other universities in the world, little from the locals.

The situation in Syria

This country was kept out of date and when I saw the universities I realized the effect of western scientific embargo on the situation of science although the staff there is talented and some were properly educated in the West. Of course we have now to forget about this country for at least hundred years.

National and international efforts to upgrade university performance: What is the impact?

By the end of Mubarak's rule in Egypt, the society had realized urgent need to upgrade educational system in general and universities in particular. Several national and international efforts were attempted. I will discuss the impact of few trials I was involved in and try to conclude if money and effort offered could really help. I will start from the beginnings.

Japan Committee for UNESCO

UNESCO Japan has established "among other efforts to help mainly in "Asia" a university course at Tokyo Institute of Technology. The Japanese do select best third world applicants who end up making huge contributions in developing research in chemistry at home and more important are able to appreciate the cultural values they were exposed to. In general this program the interested to hone their skills. The Japan Society for promotion of Science is another successful Japanese program. It supports several talented young Egyptian scholars.

Scandinavian aid and research funding

The Scandinavians especially Norway and to some extent Denmark have implemented several programs that are supposed to help both parties. In chemistry several colleges could benefit from these activities. I personally got finance for a year to stay in Oslo and it again had huge impact on my future research directions.

The Austrian role

For some time in the 80's the cultural attaché office in Cairo was actively moving to help advance research in chemical science in Egypt. The role of Hanz Junek and Tomas Kappe in Vien should be mentioned. Again these programs helped plenty of Egyptian scholars to conduct their research in Europe and surely some could benefit from the chance and several scholars got training this way.

The German Contribution

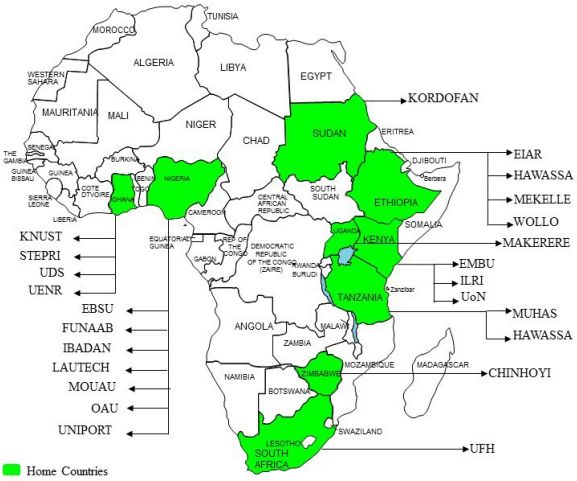
German Government has placed emphasis on helping advancing science and technology in the Middle East and money donated generously over tens of years have had the highest impact on advancing science in this region. There are several foundations active in Egypt.

34 early career researchers offered CIRCLE Fellowship for 2015

The Climate Impacts Research and Leadership Enhancement (CIRCLE) programme has offered 34 early career researchers a one year fellowship to undertake research in climate impact in African Institutions. The 1st cohort of CIRCLE Visiting Fellows (CVFs) will commence their fellowship from 1 January 2015 and will last for one year, ending on 31 December 2015.

The 34 CIRCLE Visiting Fellows (CVFs) are from 24 institutions in Africa from 9 African countries; Ethiopia, Ghana, Kenya, Nigeria, South Africa, Tanzania, Sudan, Uganda and Zimbabwe. CIRCLE recognizes developing human capital as critical for sustaining organisational and institutional research capacity in Africa climate change. Out of the 34 selected CVFs for the cohort 1 of CIRCLE, 44% are females and 56% are males. Also 44% are offered Post-Masters fellowships whilst 56% of them are offered Post-PhD fellowships. The programme aims at offering 100 fellowships in total by the end of the third cohort; 50 males and females 50 females whilst offering 60% of the fellowships to Post-PhD fellows and 40% to Post-Masters fellows.

Home Institutions



The CVFs are expected to complete their proposed research within one year; comply with reporting and evaluation requirements and work collaboratively with all programme stakeholders to ensure a successful fellowship. The CVFs will also participate in training workshops offered by the host institutions and the CIRCLE programme. They will present the findings of their work at internal and external seminars, workshops and conferences and also publish at least one research article in a relevant peer-reviewed journal. At the end of the fellowship, the CVFs will return to their Home Institutions and extend, transform and apply knowledge acquired during the CIRCLE Fellowship. The CVFs are also encouraged to identify external collaborators and funding for continued research.

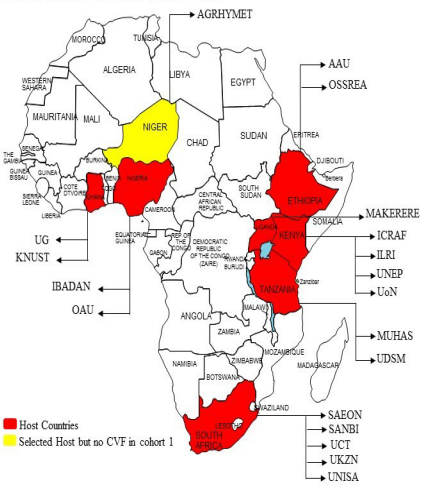
The Home Institutions of the CVFs are expected to assist the CVF in making all necessary arrangements related to taking up the fellowship and also maintain a full employer-employee relationship with the CVF during the fellowship. The home institutions are also expected to comply with reporting requirements of the programme, appoint a senior scientist as a mentor to support the research development of the CVF and coordinate with the host institution of the CVF to ensure a successful fellowship. The institutions are also to commit to supporting early career researchers and strengthening research culture in the institution through the active and full participation in the institutional strengthening programme (ISP) component of CIRCLE.

The 34 CVFs in the cohort 1 will be undertaking their one year research fellowships in 13 African Host Institutions, in 7 African countries. The CIRCLE programme envisages working with 19 host institutions by the end of the programme. The Host Institutions will appoint a senior researcher to be the supervisor of the CVF for the one year stay at the institution and make available space and facilities to the CVF to undertake research within the institution for the fellowship period. The institutions will also assist the CVF by providing training and access to courses available to support and develop the research skills of the CVF.

The Host Institutions will provide periodic reports on the progress of the CVF's work to the CIRCLE programme and liaise with the CIRCLE Programme Implementation Team in meeting the needs the needs of the CVF for the one year fellowship period.

CIRCLE emphasizes providing critical support for institutions participating in the programme to capitalise on the skills and knowledge gained by their returning researchers and build partnerships with reputable advanced research institutions in Africa which offers training to the researchers.

By concurrently strengthening the capacity of institutions to manage, organise and support the career development of 'next generation' researchers, it is intended that the CVFs will return to a more enabling and sustainable environment for further research. This focus acknowledges the importance of nurturing early career academics to the long-term future development of university research, while also offsetting some of the common disadvantages they face in obtaining funding and time for scientific enquiry.



Currently, the Programme Implementation Team is facilitating the departure of the CVFs from their Home Institution/Country to their Host Institution/Country. The Host Institutions are coordinating logistical arrangements to help the CVF in settling at the Host Institution. There will be 2 induction programmes in the first week of February to bring together all participating institutions as well as the CVFs to establish the first cohort and create effective research collaboration.

CIRCLE is funded by the Department for International Development (DfID) and implemented by the African Academy of Sciences (AAS) and Association of Commonwealth Universities (ACU).

For more information on CIRCLE:
http://aasciences.org/index.php/projects/circle
https://www.acu.ac.uk/focus-areas/early-careers/circle/climate-impacts-research-capacity-leadership-enhancement

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NEWS

Royal Society - DFID Africa Capacity Building Initiative

The Royal Society, in partnership with the Department for International Development (DFID), has opened the second round of applications for Programme Grants as part of its Royal Society - DFID Africa Capacity Building Initiative. Applications will be invited in three priority areas:

1. Water & Sanitation
2. Renewable Energy
3. Soil-related Research

The main purpose of this new programme is to assist in strengthening collaborations between scientists based in sub-Saharan Africa.

The level of support for Programme Grants: The awards will support research consortia of one UK lab and three African labs with up to just over £1.2million over five years. Applications will have to be submitted by 19 March 2015.

For more information on this programme, visit: https://royalsociety.org/grants/schemes/africa-capacity-building/ or contact: the programme through this e-mail address: panafrica.awards@royalsociety.org.

IPICS Reference Group Meeting held at AAS Secretariat

The International Programme in Chemical Sciences (IPICS) held its yearly gathering of the Scientific Reference Group at the African Academy of Sciences headquarters in Nairobi, Kenya, from November 17-20. IPICS is the chemistry program of the International Science Programme at Uppsala University, Sweden.

Participants came from university faculties around Africa. They had made application for funding to IPICS. IPICS thus invited them to present their applications.

There were 16 applicants all of who came to present their proposals to IPICS. The proposals were discussed and assessed by the reference group members present with the exception of Praf. Ameenah Gurib Fakim from Mauritius and Prof. Iqbal Parker from Republic of South Africa who could not make it to the meeting.

The applicants received individual feedback on the assessment outcome. The final decision on budgets are to be taken by the ISP Board on 4 Dec 2014. IPICS focuses its activities on providing assistance to create viable and independent research teams of an international standard. In the countries with which IPICS has cooperation, chemistry is in a stage of development.

The overall ISP program was started to address some common situations in most countries they work in. According to Peter Sundin, Head, Director of the ISP Chemistry Program (IPICS), most of these countries have universities with small chemistry departments of 10-20, or even less, academic staff; with few PhD holders. "The staff has little or no contact with other members of the scientific community and there is skewed age profile---usually few young staff members".

Peter Sundin adds that there is also usually small and outdated library; poor internet access; high teaching load and large lecture groups. The staff works in countries whose governments are also focused on opening many new universities.

Therefore, most of the research groups supported by IPICS are located at university departments. This means that in the support given, IPICS also assists the department in creating or strengthening their MSc and/or PhD programmes. All activities to be supported are proposed by the groups in the respective countries and should be in line with the plans of department, and follow national priorities.

IPICS supports a broad range of chemical research; both fundamental and more applied. IPICS also encourages interdisciplinary research, based on well-founded knowledge within the participating disciplines. IPICS also encourages interdisciplinary research, based on well-founded knowledge within the participating disciplines.

The main areas supported are:
Organic and inorganic environmental chemistry
Chemistry of natural resources (bioactive substances, clay)
Biochemistry, biotechnology and molecular biology
Food chemistry/nutrition
Ecological chemistry
Material science