

Advancing Africa's Sustainable Development

Advancing Africa's Sustainable Development:

*Proceedings of the 4th
Conference on Science
Advancement*

Edited by

Alain L. Fymat and Joachim Kapalanga

Cambridge
Scholars
Publishing



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FOREWORD

As a philosopher and an academic specializing in the study of the sociological and philosophical world of education, we would like to start this preface to the 2016 SASA Conference proceedings by making certain observations that are pertinent to the advancement of science in Africa. In the wake of the Nelson Mandela's mystique, the philosophy of Ubuntu was given more prominence. Ubuntu means "you are because I am and I am because you are". Ubuntu is not only panAfricanist, it is also humanistic and internationalist. By the same token SASA is not only panAfricanist, it is also humanistic and internationalist. That is a philosophical statement. The philosophical is also scientific. Science is a currency of philosophical thought. The philosophical aspect can affect how we see ourselves, how we think and how we understand our world. Similarly, the scientific aspect helps us build and organize knowledge into testable hypotheses and predictions about phenomena in our world, so we can understand and make advances in our universe. Science helps us understand the human condition, how human beings live, and how we might live better.

Hence the philosophical is science and scientific thought is philosophy. Conceiving and launching SASA was a philosophical process. *SASA's ultimate and lofty mission is to advance science, improve health, and economic and social development on the African continent. SASA seeks to promote continent-wide African innovation and new frontiers of scientific research.* That is a philosophical statement.

Science and the related, and indeed, integral activity of research are a major function of a University. Kenyatta University thus was honored to host the 2016 4th SASA International Scientific Conference on its campus. African academic institutions should cherish association with a PanAfricanist and internationalist advancement of science in Africa. Cooperation between civil society organizations like SASA and academic institutions like Kenyatta University can accelerate the advancement of quality science on the African continent.

The 4th SASA international Scientific Conference was held on August 22-26, 2016 under the theme "**Advancing Africa's Sustainable Development**"

Through Science, Technology and Innovation". The deliberations addressed the need for promoting the advancement of science, the effective use of technology and inspiring innovation for economic and social development on the African continent. Several important sub-themes were covered: Encouraging international science & technology collaborations; Promoting science & technology research; Translating academic research to innovations; Accelerating Infrastructural development; Transforming the academic curriculum for advancing science, technology and innovation; Harmonizing country-to-country variations in science policy and government funding of research. The conference featured, *inter alia*, spirited presentations by young scientists and students from Kenyan academic institutions and indeed from across Africa. Quite a number of the student presentations are included as full articles in this publication. The Conference also featured announcement of the maiden **Student Research Excellence Fellowship Award (Student REFA) program**. The Student REFAs are one way in which SASA promotes and supports advancement of scientific research by investing in Africa's most talented students engaged in research. Awardees are selected by the SASA Awards Committee and volunteer judges based on abstract and presentation scores. Awardees are selected for three award categories: Gold, Silver and Bronze REFAs. Members of the Awards Committee include the Chairperson of the Scientific Committee, the Director of Student affairs, two other SASA Executive Committee (EC) members and a non-EC volunteer member. The Kenyatta University academic and student community were pleased to learn that two of the REFA awardees were Kenyatta University students. The ceremony for the awards was proudly held in January of 2017, again on the campus of Kenyatta University.

Advancement of Science in Africa is an imperative for economic development on the continent. There are aspects about Science in Africa that stand out. These include the challenges of:

- Building science capacity either due to lack of funding, faulty funding or corrupt use of funding;
- Translating African science results into policy due to lack of appropriate and effective mechanisms;
- Sufficient African scientists attending international conferences for advancement of their scholarship;
- Holding Pan-African Science conferences in which scientists discuss the problems they face in their place of work; and
- Lack of relevancy of science taught in our schools.

One of the goals of SASA is to ensure that relevant science is advanced in Africa; and that we have scientific African journals that place Advancement of African Science at their forefront. Currently, too much emphasis is placed in publishing in foreign journals (for the prestige) that do not speak to the African issues. The Society for the Advancement of Science has already made its mark on the African scientific and research arena. In partnership with academic institutions across Africa, SASA will no doubt continue to play a crucial role in providing a forum for discussion and finding solutions for the challenges, hurdles and pitfalls of doing science in Africa.

Prof Paul K. Wainaina
Ag Vice Chancellor, Kenyatta University, Nairobi, Kenya

Prof Njoki Wane
Ontario Institute for Studies in Education, University of Toronto

ACKNOWLEDGMENTS

We thank the several authors for their contributions to the chapters that follow. We would like to thank the International Institute of Medicine and Science, Rancho Mirage, California, U.S.A. and the Schulich School of Medicine and Dentistry, Western University, Ontario, Canada for their benevolent support in our dedication of time and effort to this project and, more generally, to the advancement of science, technology and innovation in Africa. We would especially like to thank Professor Paul K. Wainaina, Ag. Vice Chancellor, Kenyatta University, Nairobi, Kenya and his staff for their warm welcome and hospitality while holding this Conference on their premises. Professor Wainaina was also so kind as to convene a special meeting between his senior faculty and key staff and Executives of the Society for the Advancement of Science in Africa (SASA) to set forth the parameters of a future joint collaboration between the two institutions represented. Thanks are also due to Professor Emilio Ovuga, Gulu University and SASA Vice President for Africa, for his unwavering support, enthusiasm for, and contribution to SASA's vision, mission and objectives. Thanks are further due to Dr. Francis Akena Adyanga, SASA Director of Administration, and his team, especially Mr Morris D. C. Komakech, and all others who will remain anonymous, for the organization of all international and local arrangements that contributed in no small measure to the success of the Conference.

We would particularly like to thank our keynote speaker, Professor David W. Dunne, Department of Pathology, University of Cambridge and Director of the Wellcome-Trust-Cambridge Center for Global Health Research, CAPREx, THRIVE-Cambridge and Cambridge-Africa, United Kingdom for his spirited presentation and participation to our deliberations. We further like to thank Professor Christine Dranzoa, Vice Chancellor, Muni University, Uganda, Professor Leon Mutesa, Director, Center for Human Genetics, College of Medicine and Health Sciences, University of Rwanda, Dr. Thomas G. Egwang, Med Biotech Laboratories, Kampala, Uganda, and Dr. J.P.R. Ochieng'-Odero, Commission for University Education, Nairobi, Kenya for their support and important contributions.

Also, for the first time in its short existence, SASA was able to formally recognize and present awards to the following Kenyatta University Faculty members with heartfelt gratitude for shaping and moving the advancement of science in Africa: Professor Paul K. Wainaina “With greatest appreciation for hosting the 4th Annual SASA Conference”, Professor Michael Boit, Distinguished Honorary Lifetime SASA Member “In appreciation for steadfast support during the 4th Annual SASA Conference”, Professor Simon M. Onywere, SASA Executive Council Member and Africa Regional Director “In recognition of championing the advancement of science in Africa”, Professor Grace Bunyie “For support and facilitation of the 4th Annual SASA Conference, and making a huge difference” and Professor Vincent Onywera “For skilful and unwavering support in facilitating the 4th Annual SASA Conference”.

SASA also awarded Certificates of Excellence to the following young scientists for outstanding platform abstract presentations, as well as travel assistance to national or/and international scientific Conferences for furthering their scientific work and contributing to the development of Africa: Ms Martha A. Odhiambo and her team, composed of Ms Catherine W. Muui and Mr Mukiri Gesundheit of Kenyatta University for “Effects of Organic and Inorganic Fertilizers on Seed Quality of Upland Nerica Rice Varieties in Siaya County, Kenya” (Gold Award), Mr. Joseph M. Ochieng' Odor and his team, composed of Mr. Nyamongo Onkoba, Mr. Fredrick Maloba, Mr. Washington Ouma Arodi and Mr. Atunga Nyachio of Kenyatta University for “A Comparative Study on Efficacy of Bacteriophage and Clindamycin Against Multi-Drug Resistant *Staphylococcus aureus*” (Silver Award), and Mr. Olivier Wekesa Simiyu, Great Lakes University of Kisumu, Kisumu County, Kenya and Atieno-Amadi-Ndede and Julius Nyerere Odhiambo for “Towards Exploring the Link Between Science, Technology and Innovation in Advancing Africa's Sustainable Development Agenda: A Case Study of Mobile Money Technology in Kenya” (Bronze Award).

All the above awards were presented on behalf of SASA during a special ceremony held at Kenyatta University on January 30, 2017. The Master of Ceremonies was Professor Simon Onywere, assisted by Mr. Henry Clarke Kitembo, representing Professor Emilio Ovuga, and Dr. Francis Akema Adyanga, on behalf of the SASA Central and Eastern Africa Directorate.

Lastly, we would also like to thank our editors at Cambridge Scientific Publishers, particularly Ms. Victoria Carruthers and Ms. Amanda Millar, for their support and assistance in this project.

Editors

A.L.F.

J.K.

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- Tanzina Islam, University of Toronto, Ontario, Canada
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ABOUT THE EDITORS

DR. ALAIN L. FYMAT, BA, BS, MA, MS, PhD, PhD, is a medical-physical scientist and an educator who was educated at the Universities of Bordeaux and Paris-Sorbonne, France, and the University of California at Los Angeles. He is the current President/CEO and Professor at the International Institute of Medicine and Science with a previous appointment as Executive Vice President, Chief Operating Officer and Professor at the Weil Institute of Critical Care Medicine, both Institutes located in Rancho Mirage, California, U.S.A. He was formerly Professor of Radiology, Radiological Sciences, Radiation Medicine (Oncology), Critical Care Medicine and Physics at several U.S. and European Universities (University of California at Los Angeles, University of Southern California, and Loma Linda University, California; University of Lille, France). Earlier, he was Deputy Director (Western Region) of the U.S. Department of Veterans Affairs, Veterans Health Administration (Office of Research Oversight). At the Loma Linda Veterans Affairs Medical Center, he was Scientific Director of the Radiology Service, Director of the Magnetic Resonance Imaging Center and, for a time, Acting Chair of Radiology. Previously, he was also Director of the Division of Biomedical and Biobehavioral Research at the University of California at Los Angeles/Charles R. Drew University of Medicine and Science in Los Angeles, California.

In an earlier research career, at the California Institute of Technology (Jet Propulsion Laboratory, a contractor of the U.S. National Aeronautics and Space Administration), Dr. Fymat was actively engaged in atmospheric sciences, the environment, climatology, and space exploration. He was an investigator in several Earth- and space-based experiments within the U.S. Earth and space exploration program. He was an Advisor to the U.S. National Research Council, National Academy of Sciences for its post-doctoral programs tenable at the Jet Propulsion Laboratory. His industrial experience was in the context of the U.S. Strategic Defense Initiative (Ballistic Missile Defense Program) researching and designing atmospheric probes and electromagnetic sensors operating in benign and stressful nuclear environments.

Dr. Fymat's current research interests lie at the interface between science and medicine (particularly molecular/personal/precision medicine, nanomedicine, bionanotechnology, human genetics/ epigenetics/ecogenetics), cancer, neurodegenerative diseases, and pharmacogenomics. He has extensively published (in excess of 425 scholarly publications including patents, books and monographs, book chapters, refereed articles). He has received numerous research grants from government, academia and private industry, and has frequently consulted with these entities. He has lectured extensively in several national and international academic, professional, governmental and industrial venues. He is Editor-in-Chief, Honorable Editor or Editor of over twenty scientific Journals. He is a Board member of several institutions and a Health Advisor to the American Heart and Stroke Association, Coachella Valley Division, California. He is a past or current Member of several national and international professional societies (International Radiation Commission; American Association of University Professors; American Association of University Radiologists; American College of Radiology; Radiological Society of North America; California Radiological Society; Los Angeles Radiological Society; American Association of Physicists in Medicine; American Institute of Physics, among others).

With interest in Africa, Dr. Fymat is also associated with the Society for the Advancement of Science in Africa (SASA) where he holds several executive positions (Vice Chair of the Board; Member of the Executive Council; Director of the Scientific Directorate; Chair of the Scientific Committee). He was also Chair of SASA Conference Programs (2013 in Polokwane, South Africa; 2014 in Kampala, Uganda; 2015 in Toronto, Canada; 2016 in Nairobi, Kenya; and 2017 in Kigali, Rwanda).

-o-o-o-

DR. JOACHIM KAPALANGA, MD, MSc, PHD, FAAP, FACMG, DABMG, DABP is a physician-scientist and an educator who was educated at Yale University, the State University of New York (SUNY), Queens University, McMaster University and the University of Guelph. He is currently Professor (Adjunct) of Pediatrics at Schulich School of Medicine and Dentistry and South Western Ontario Academic Health Network - Knowledge Translation Group and Medical Education Network. He is also a faculty member at McMaster University and a Visiting Professor at Gulu University, Kampala, Uganda. He is also Chief of Pediatrics at the Grey Bruce Health Services, Ontario, and a consultant

pediatrician and medical geneticist at the Summer Side Medical Center (SSMC), Prince Edward Island, (PEI), Canada.

Dr. Kapalanga has held faculty and leadership positions in various institutions and organizations. He was formerly Associate Professor and Head of the Division of Medical Genetics at Upstate Medical University/State University of New York (SUNY), Assistant Professor and Member of the PEI University and Health Research Institute; Clinical Instructor in Genetics at Yale University; Assistant Clinical Instructor in pathology and pediatrics at SUNY; and Lecturer at Dalhousie University. He was also Chairman of the Perinatal Committee of the SSMC / Prince County Hospital, Head of the PEI Newborn Screening Program, and PEI Representative at the Fetal Alcohol Spectrum Disorder Canadian Expertise (FACE) Research Round table. He was also appointed to the PEI Council, College of Physicians and Surgeons.

Dr. Kapalanga is a Fellow of the American College of Medical Genetics, Fellow of the American Academy of Pediatrics, Diplomate of the American Board of Medical Genetics, Diplomate of the American Board of Pediatrics, and an Associate Fellow of the Canadian College of Medical Genetics. He is a member of the American Medical Association, American Society of Human Genetics, FACE Research Roundtable, Canadian Congenital Anomalies Network Surveillance Network, Canadian Medical Association, the Ontario Medical Association and a founding member of the African Society of Human Genetics.

Dr. Kapalanga's current scholarly and research pursuits are in the epigenetics of neurodevelopmental disorders and in neurobehavioral genetics and genomics. He espouses multidisciplinary, multicenter and international research.

With interest in Africa, Dr. Kapalanga is the founder, Chairman of the Board and Executive President of the Society for the Advancement of Science in Africa (SASA).

PREFACE

While many African countries, particularly the lesser developed ones, currently lag behind the rest of the industrialized world in scientific and medical research and development, the situation is progressively improving. The fact that Africa holds advanced international scientific Conferences is a testimony to this change. Such Conferences are (and should be) aimed principally at Africa's needs and their fulfillment.

Catalyzing and contributing to this needed evolution, the Society for the Advancement of Science in Africa (SASA) aims to contribute to Africa's economic advancement and sustainability through science research, education and innovation. The present Conference on Science, Technology and Innovation through Sustainable Development was conceived, designed and held with this overarching purpose.

SASA held its Inaugural Meeting and First International Scientific Conference in Polokwane, Limpopo Province, South Africa, April 25-28, 2013, under the theme “Pushing the Frontiers of Science in Africa”. Its Second Conference was held in Kampala, Uganda, May 6-10, 2014 under the theme “Science Innovation for Economic Development”. The third Conference, encompassing the theme “Science Research and Education in Africa”, was held in Toronto, Canada, August 28-31 2015. It addressed the need to promote the development of science research and education in the African continent. Its Proceedings have since been published in a book format (January 2017) by Cambridge Scholars Publishing (U.K.). This book is available through most distribution channels, including social media and directly from the publisher. A quick preview of that volume can be obtained via the internet link:

<http://www.cambridgescholars.com/science-research-and-education-in-africa>.

This book provides a selection of papers from the Advancement of Science in Africa's fourth annual Conference in Nairobi, Kenya, August 24-26 2016, The conference was held under the overarching theme of “Advancing Africa's Sustainable Development Through Science, Technology and Innovation”, with several important sub-themes,

including improving health research and disease surveillance education; collaborating in research responding to epidemic diseases with high mortality in Africa; promoting women's interest in science careers; fostering youth development with science education; and building inter-institutional collaborations. The collection illustrates how, although the chapter contributors come from various countries and universities, representing their own academic research, they all share a common interest in advancing science, technology and innovation in Africa. For the benefit of the readers and for completeness, the 'program at-a-glance' listing the key abstracts approved for presentation at the Conference, is provided below. It will help gauge the scope of the Conference program.

ABBREVIATIONS

- [PA]: Presidential Address
- [KAI]: Keynote Address (International)
- [KAA]: Keynote Address (Africa)
- [IA]: Invited Address
- [PM]: Panel Moderator
- [PD]: Panel Discussant
- SC: Session Chair
- xx[.]: Abstract identification: Current number (xx) followed by [number posted on SASA website: www.sasascience.org]

2016 CONFERENCE PROGRAM AT-A-GLANCE

*** TUESDAY 23 AUGUST 2016 ***

17:00 - 18:00

SASA Business Meeting 1 (Closed)

*** RECEPTION ***

19:00 – 21:00

Opening Reception and Welcoming Address

*** WEDNESDAY 24 AUGUST 2016 ***

KEYNOTE AND INVITED ADDRESSES

09:00 - 09:30

Welcoming Address

Prof. Paul K. Wainaina

Ag, Vice Chancellor, Kenyatta University, Kenya

09:30 – 10:00

Presidential Address

Prof. Joachim Kapalanga

SASA Executive President

Professor (Adj) of Pediatrics, Schulich School of Medicine and
Dentistry and South Western Ontario Academic Health Network
University of Western Ontario, Canada

“Taking Africa to the World and the World to Africa” [PA]

10:00 – 10:30

Invited Address

Prof. Leon Mutesa

Center for Human Genetics, College of Medicine and Health Sciences
University of Rwanda

**“Advancement of Genetic Activities in Rwanda: Achievements,
Challenges and Perspectives” [IA1=AZ19=17]**

Sub-Theme 1: ENCOURAGING INTERNATIONAL SCIENCE & TECHNOLOGY COLLABORATIONS

Session 1: 10:30 – 12:45

Chairs: **Prof. Christine Dranzoa**

Vice Chancellor, Muni University, Uganda
and **Prof. David W. Dunne**

[AC, T, X, AR, AZ10, AJ, AU, AZ20, 11NP]
[1, 2, 3, 4, 5, 6, 7, 18, 8]

INVITED ADDRESSES

13:30 – 14:00

Invited Address

Dr. Thomas G. Egwang, PhD

Med Biotech Laboratories, Kampala, Uganda

“Malaria Vaccines in the Era of Malaria Eradication and SDG 3.3”
[IA2=AO]

14:00 – 14:30

Invited Address

Prof. Alain L. Fymat

SASA Vice Chair and Scientific Director
President /CEO and Professor

International Institute of Medicine and Science, U.S.A

“The Odyssey of Human Vaccination and Africa” [IA3=AZ21]

Sub-Theme 2: PROMOTING SCIENCE & TECHNOLOGY RESEARCH

Session 2 (in parallel with Session 3): 14:30 – 16:30

Chairs: **Dr. Thomas G. Egwang** and

Prof. Michael Cherubim

Professor of Zoology

Director of the City Campus of the University
Kenyatta University, Kenya

[AS, 5, AA, 4, AZ30, AZ29, AZ27, M]
[9, 10, 11, 12, 13, 14, 15, 16]

Session 3 (in parallel with Session 2): 14:30 – 16:30Chairs: **Prof. Lucy W. Irungu**

Deputy Vice Chancellor (Research, Production and Extension)

University of Nairobi, Kenya

and **Dr. J.P.R. Ochieng'-Odero**

Board Member, Commission for University Education, Kenya

[86, 91, AZ20, AK, H, 1, AZ12, 88]**[86, 91, 18, 19, 20, 21, 22, 88]**16:30 – 17:30**Panel 1**Moderators: **Prof. David W. Dunne** and **Prof. Emilio Ovuga**Discussants: **Prof. Christine Dranzoa, Prof. Alain L. Fymat, Prof. Joachim Kapalanga, Prof. Maurice Nyadawa, Prof. Isaac Para Oreo**
and **Prof. Jackson Too**17:30 – 18:30**SASA Business Meeting 2 (Closed)******* THURSDAY 25 AUGUST 2016 *******KEYNOTE AND INVITED ADDRESSES**08:30 – 09:00

Keynote Address (Africa)

Professor Emilio Ovuga

Professor of Psychiatry and Mental Health, Gulu University, Uganda

“Positioning SASA in Africa's Development” [KAA=AZ13]09:00 – 09:30

Keynote Address (International)

Prof. David W. Dunne

Professor of Parasitology, University of Cambridge

Director, Wellcome-Trust-Cambridge Centre for Global Health Research

CAPREx, THRIVE – Cambridge and Cambridge - Africa

“Creating a Globally Competitive University Sector in Africa” [KAI]

Sub-Theme 3: TRANSLATING ACADEMIC RESEARCH INTO INNOVATION (#1)

Session 4A (in parallel with Session 4B): 09:30 – 11:30

Chair: **Prof. Jackson Too**

Ass. Prof. of Curriculum and Pedagogy
Moi University, Kenya

[3, AG, 6, AD, 94, 82, AZ9, U]

[23, 24, 25, 26, 94, 82, 27, 28]

Session 4B (in parallel with Session 4A): 09:30 – 11:15

Chair: **Prof. Laura Nyawira Wangai**

Head, School of Health Sciences
Gagarin University College, Kenya

[81, 87, 83, 90, 92, 89, 85]

[81, 87, 83, 90, 92, 89, 85]

Sub-Theme 3: TRANSLATING ACADEMIC RESEARCH INTO INNOVATION (#2)

Session 5 (in parallel with Session 6): 12:30 – 14:45

Chair: **Prof. David Ndeti**

Professor of Psychiatry, Nairobi University, Kenya

[AZ28, R, W, AQ, AI, Y, AZ2, AZ11, 7]

[29, 30, 31, 32, 33, 34, 35, 36, 37]

Session 6 (in parallel with Session 5): 12:30 – 14:45

Chair: **Prof. Wellington Otieno**

Maseru University, Kenya

[7, O, AB, AF, 9, 8, Q, AX, V, AZ26]

[38, 39, 40, 41, 42, 43, 44, 45, 46]

Sub-Theme 4: ACCELERATING INFRASTRUCTURAL DEVELOPMENT

Session 7A (in parallel with Session 7B): 14:45 – 16:00

Chair: **Prof. Maurice Nyadawa**

Associate Professor of Civil Engineering
Jaramogi Oginga Odinga University of Science and Technology, Kenya

[Z, AN, AM, AZ31, AZ7]

[47, 48, 49, 50, 51]

Session 7B (in parallel with Session 7A): 14:45 – 16:00

Chair: **Dr. J.P.R. Ochieng'-Odero**

[AZ24, AZ32, 93, 84, 95]

[52, 53, 93, 84, 94]

**Sub-Theme 5: HARMONIZING COUNTRY-TO-COUNTRY
VARIATIONS IN SCIENCE POLICY AND GOVERNMENT
FUNDING OF RESEARCH**

Session 8: 16:00 – 17:30

Chair: **Prof. Christine Dranzoa**

[N, J, AZ15, L, AZ18, AZ1]

[54, 55, 56, 57, 58, 59]

16:30 – 17:30

Panel 2

Moderator: Prof. David Ndetei

Discussants: **Dr. Francis Akena Adyanga, Dr. Thomas G. Egwang,
Prof. Michael Cherubim, Prof. Vincent O. Onywera, Prof. Wellington
Otieno, and Prof. Laura Nyawira Wangai**

***** FRIDAY 26 AUGUST 2016 *****

**Sub-Theme 6: TRANSFORMING THE ACADEMIC
CURRICULUM FOR ADVANCED SCIENCE, TECHNOLOGY
AND INNOVATION (#1)**

Session 9A (in parallel with Session 9B): 08:00 – 09:15

Chair: **Prof. Michael Gicheru**

[AZ6, AZ16, P, AP, AZ5]

[60, 61, 62, 63, 64]

Session 9B (in parallel with Session 9A): 08:00 – 09:15

Chair: **Prof. Maurice Nyadawa**

[AZ4, AY, AZ3, AZ25, 7NP]

[65, 66, 67, 68, 69]

Sub-Theme 6: TRANSFORMING THE ACADEMIC CURRICULUM FOR ADVANCED SCIENCE, TECHNOLOGY AND INNOVATION (#2)

Session 10A (in parallel with Session 10B): 09:30- 11:00

Chair: **Dr. Francis Akena Adyanga**

University of Toronto and University of South Africa

[AZ, AZ22, AV, AZ17, AZ14, AZ23]

[70, 71, 72, 73, 74, 75]

Session 10B (in parallel with Session 10A): 09:30- 11:00

Chair: **Prof. Alain L. Fymat**

[S, 2, AL, AW, AZ8, 95]

[76, 77, 78, 79, 80, 95]

11:00 – 12:00

SASA Annual General Meeting (Open)

CONFERENCE ADJOURNED

This book provides the Proceedings of SASA's 2016 Fourth International Scientific Conference that was held in Nairobi, Kenya. It is naturally subdivided into three parts respectively addressing science, technology and innovation in Africa.

Alain L. Fymat, BA, BS, MA, MS, PhD, PhD
SASA Director, Scientific Directorate Director and
Chair, Scientific Committee

CHAPTER ONE

INTRODUCTION

ALAIN L. FYMAT

INTERNATIONAL INSTITUTE OF MEDICINE AND SCIENCE,
RANCHO MIRAGE, CALIFORNIA, U.S.A.

In his presidential address, Professor Joachim Kapalanga (Executive President, Society for the Advancement of Science in Africa, SASA) reviews the state of science, society and public policy in Africa. Despite the gloomy state of science compared to the Western World, during the past decade, Africa has witnessed several encouraging developments, including: a heightened tempo of scientific activity, an increase in major international funding for science and research projects, a huge surge in the number of institutions of higher learning, a marked increase in the number of national academies of science and civil society scientific organizations, and an increased national political awareness about the societal good of science, all pointing to an improvement in certain aspects of scientific activity, notably an increase in the quantity and quality of research, and a modest increase in the number of scientific publications. Unfortunately, the more advanced African countries have yet not attained world class status in science, research or innovation, and certainly not in invention.

While it is recognized that science advancement in Africa is imperative for economic development, practicing science and translating it into policy and tangible economic and developmental outcomes have faced formidable hurdles, including: challenges of building science capacity, faulty funding or/and corrupt use of funds; few high quality local research initiatives; insufficient number of African scientists attending Africa-relevant international and Pan-African science conferences; the misguided impression that such conferences are merely research results platforms which often present international questions (and responses to the same)

that are not African questions; and career advancement detached from serving African needs and priorities.

Professor Kapalanga then offers a catalog of what stakeholders in Africa can do. The list includes: recognition that funding science is a public investment for societal good; the implantation of science's place in society; the cultivation of societal awareness of science; and the tapping of Africa's abundant natural resources for major investments in funding and advancing science. It is also imperative for academic institutions to foster a culture of excellence, original thinking, internationalism, and healthy competition in science, and for young scientists to attend and present Africa-relevant research at major international conferences and publish their work in reputed peer-reviewed journals.

National academies should prioritize areas of relevant scientific inquiries and engage and educate the public about the good and relevance of science to society. The business and private sector should also come to the same realization, so as to improve the work force in all dimensions and enhance the consumer base. Likewise, civil society scientific and professional organizations should promote a culture of science, advocate for science, and set standards and guidelines for practicing science in Africa. Further, scientific organizations should foster sciences' many interfaces with culture, society, government and academic institutions and provide technical, regulatory, deliberative, informal, and crises and emergencies advice to government, engage academic institutions in internationalizing science in Africa, and support fellowships for young African scientists. In short, to transform scientific activities to better serve society, to generally engage in activities that benefit the greater scientific enterprise in Africa, and to collaborate with the World Health Organization's programs in its activities on behalf of Africa.

Instead of depending solely on foreign training programs, fellowships and funding sources, stakeholders in Africa should develop Africa-based collaborative continental programs, fellowships and funding institutes, foundations, and trusts. In short, civil society scientific organizations should espouse the vision and mission to set the tempo, fervor and flavor of advancement of science in Africa.