

Science and Biotechnology in Africa

Science and Biotechnology in Africa:

*Proceedings of a Conference
on Scientific Advancement*

Edited by

Joachim Kapalanga, Dennis Raphael
and Leon Mutesa

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FOREWORD

The Society for the Advancement of Science in Africa (SASA) is dedicated to pushing the frontiers of science by facilitating local African research efforts, encouraging international collaboration on research in Africa, harmonizing academics and grassroots science and integrating multidisciplinary research projects, all with the ultimate objective of having an enduring impact on sustainable economic development and the improvement of population health conditions in Africa. Further, within SASA, we strive to promote the development of a sound and solid scientific infrastructure, as well as proliferating a culture of science in the general public, and among our educators, and civic and political leaders.

The 2017 Joint Society for the Advancement of Science- University of Rwanda (SASA-UR) Conference attracted attendees from all over the world - from Africa, North America, Europe, South America, and Asia. Attendees included researchers, academics, professionals, students, industry and government representatives, and others who have a special interest in advancing science and economic development in Africa. The full participation of segments of the government of Rwanda, including the ministry of health and education in the Conference, further enhanced the advancement of the frontiers of science in Africa. Finally, the students' traditional dance troupe show was an apt cultural addition, initiating the proceedings of the conference and providing an appetizer for pushing the frontiers of science.

While Translational Science and Biotechnology and Advances in Africa were the overarching focus of the 2017 SASA-UR Conference, keynote speeches and platform presentations were identified in all eight areas of SASA's mission viz; health, biomedical science, genetics and genomics, energy, engineering and technology, environmental science, agriculture and fisheries, mining and metallurgy, science education, women in science, ethics and the impact of science on society. About two hundred abstracts were submitted, and of these, 150 met the requirements of high quality original research, topical review or practice perspective. Ten percent of these were additionally submitted as high quality full text

articles, and constitute a major content of this publication. All the high quality abstracts which were accepted are also published here.

The Joint SASA-UR Conference was a fine demonstration of SASA's philosophy, mission and vision. Some of the key elements demonstrated during the conference included:

- collaborations between, and cooperation from organization to organization, institution to institution, people to people, and country to country;
- working in concert and pulling in tandem to overcome the challenges, hurdles and pitfalls which are impediments to the advancement of science in Africa;
- promoting peer-to-peer interactions and increasing the number of publications from Africa,
- the multidisciplinary flavor of the conference presentations;
- developing a purpose-driven multidisciplinary, multisector and multi-country collaboration in health promotion, advancement of science, biotechnology, discovery and innovation in Africa;
- fostering of international scientific cooperation between scientists and institutions in Africa and those in North America, Europe, Asia, and other parts of the world;
- applying science in capacity-building and workforce enhancements by partnering with regional, community, village, government, institutional and individual actors;
- multidisciplinary and coordinated application of science in fostering sustainable development.

The teaming up of SASA with the University of Rwanda, Académie, de Recherche et D'enseignement Supérieur (ARES), Promega, and other organizations, in organizing and facilitating the Conference was a fine demonstration, and an example of the typical cooperation in advancement of science in Africa which is desired. We aim to replicate this kind of cooperation and collaboration with other institutions and organizations in future years. We particularly hope to broaden our reach by establishing scholarly cooperation, and to share SASA's forward-thinking ideas with established scientific organizations such as the American Association for the Advancement of Science, the British Science Association, the Leopoldina German Academy of Science, the Royal Swedish Academy of Sciences, the French Academy of Science, the National Institutes of Health, the Chinese Academy of Sciences, the World Health Organization,

and other international scientific organizations. These are exciting days for SASA in its quest to push the frontiers of science in Africa.

Professor Emilio Ovuga
Emeritus Professor,
Gulu University.

ABOUT THE EDITORS

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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 paediatrics 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 Paediatrics, Diplomate of the American Board of Medical Genetics, Diplomate of the American Board of Paediatrics, 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. With passionate interest in advancement of science, Dr. Kapalanga is the founder, Chairman of the Board and Executive President of the Society for the Advancement of Science in Africa (SASA).

DENNIS RAPHAEL PhD is a professor of health policy and management at York University in Toronto, Canada. His scientific publications focus on the health effects of living and working conditions, the quality of life of communities and individuals, and the impact of government decisions on citizens' health and well-being. Dr. Raphael is editor of "Social Determinants of Health: Canadian Perspectives", "Tackling Health Inequalities: Lessons from International Experiences" and "Immigration, Public Policy, and Health: Newcomer Experiences in Developed Nations" all published by Canadian Scholars' Press.

DR. LEON MUTESA MD, PhD is a professor of human genetics at the College of Medicine and Health Sciences-University of Rwanda. He obtained his MD from the University of Rwanda in 2003 and his PhD in 2009 from the University of Liege-Belgium where he also completed his post-doc in 2011. Throughout his career he has been immensely involved in clinical services, academics, research, capacity building, and management in the health sector. He served as the Director of Department of Clinical Laboratory Dept. at the Kigali University Teaching hospital, which is the largest referral hospital. He has been Director General of Medical Research Center in Rwanda Biomedical Centre under Ministry of Health, where he coordinated health related research activities in all national medical institutions. Since starting his genetic career, he specifically drove new developments and implementation of medical genetics in Rwanda where he is developing clinical practice, molecular, cytogenetic, newborn-screening analyses among others. He has supervised/mentored more than 70 MSc, MMed, PhD, and Post-Doc fellows from Rwanda and from overseas universities. He has published over 100 peer-reviewed papers. Prof Mutesa is a member of various expert committees and has led various regional and international research consortia and fora. Over the past 10 years he has participated in several international research and training collaborations. Currently, he is dual-PI/PD of a NIH grant- National Cancer Institute (NCI)- U54-HIV/HPV Cancer Prevention, Treatment and Pathogenesis: Rwanda/Einstein (1U54CA190163-01); the PI/PD of NIH/H3Africa grant – National Institute of Mental Health (NIMH)-U01-Transgenerational Epigenomics

of Trauma and PTSD in Rwanda (1U01MH115485-01); and also PI of other research grants in various aspects including cytogenetic and molecular studies, precision medicine, forensic science, malaria, and newborn screening among others.