



SACEMA
DST-NRF Centre of Excellence in Epidemiological Modelling and Analysis

Director: Juliet Pulliam (pulliam@sun.ac.za)

Research Manager: Lynnemore Scheepers (scheepersl@sun.ac.za)

Mailing address: Private Bag X1, Matieland 7602, South Africa

Physical address: 19 Jonkershoek Road, Stellenbosch, 7602, South Africa

Phone: +27 (0) 21 808 2589

Fax: +27 (0) 21 808 2586

Inquiries: info@sacema.org

Web site: www.sacema.org

Quarterly Epidemiological update: www.sacemaquarterly.com

SACEMA NEWSLETTER

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We wish all our friends, colleagues, students and collaborators a Blessed Holiday Season!



NEWS:

SACEMA participates in NRF Science for Society Lecture Series

NRF Science for Society Lectures aim to bridge the gulf that seems to exist between the world of scientific research and society. The lectures seek to do this by making the subject of science exciting and relevant to everyday life through the delivery of lectures by passionate, enthusiastic and inspired scientific minds at the forefront of scientific research in the country.

This year's lecture was hosted by SACEMA on World Aids Day, 1 December 2016 and was broadcast live on SAfm with talk show host, Naledi Moleo. The lecture titled "Ending HIV/AIDS in South Africa" looked at how mathematical models play a critical role in helping reduce HIV-related mortality and the rate of new infections, and how clinical studies within South Africa are helping revolutionize treatment and prevention. The speakers were Prof John Hargrove, senior research fellow and founding director of SACEMA, and Dr Gert van Zyl, virological pathologist at the National Health Laboratory Service in Tygerberg and an associate professor at Stellenbosch University.

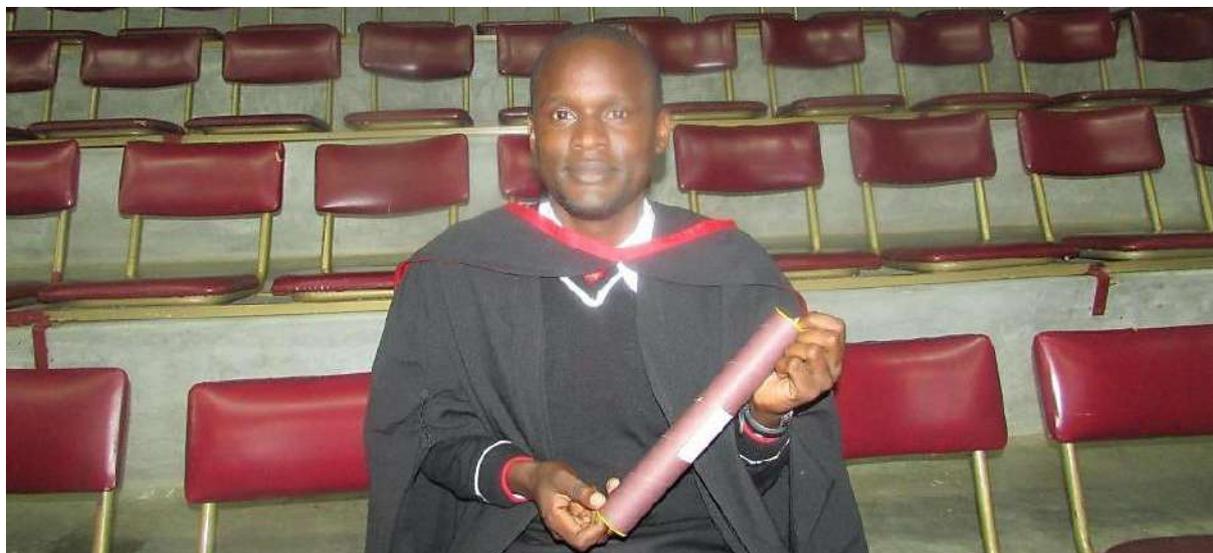
This was the second NRF Science for Society lecture that deals specifically with the subject of HIV/AIDS. The first lecture was hosted at UKZN in 2015 and was titled “Getting to Zero – Exploring HIV/AIDS and its Impact on Women”. Prof Hargrove’s talk was published in SACEMA’s quarterly magazine at <http://sacemaquarterly.com/hiv-prevention/monitoring-progress-towards-ending-aids-south-africa.html>



SACEMA Director, Juliet Pulliam with Lynnemore Scheepers, Thabiso Nkone (NRF), John Hargrove, Gert van Zyl, Kina Nhlengethwa (SAfm) and Naledi Moleo (SAfm) at the NRF Science for Society Lecture in Stellenbosch.

Graduations 2016

Evans Omondi graduated from Stellenbosch University on 9th December with an MSc in Mathematical Sciences. His thesis titled “A mathematical model for onchocerciasis and its treatment with ivermectin” was supervised by Prof Farai Nyabadza.



Mary Familusi graduated from the University of Cape Town on 20th December with an MSc in Statistics. Her thesis titled “Analysis of Clustered Competing Risk with Application to a Multicentre Clinical Trial” was supervised by Dr Freedom Gumedze.



We wish Evans and Mary the very best for the future!

New faces at SACEMA

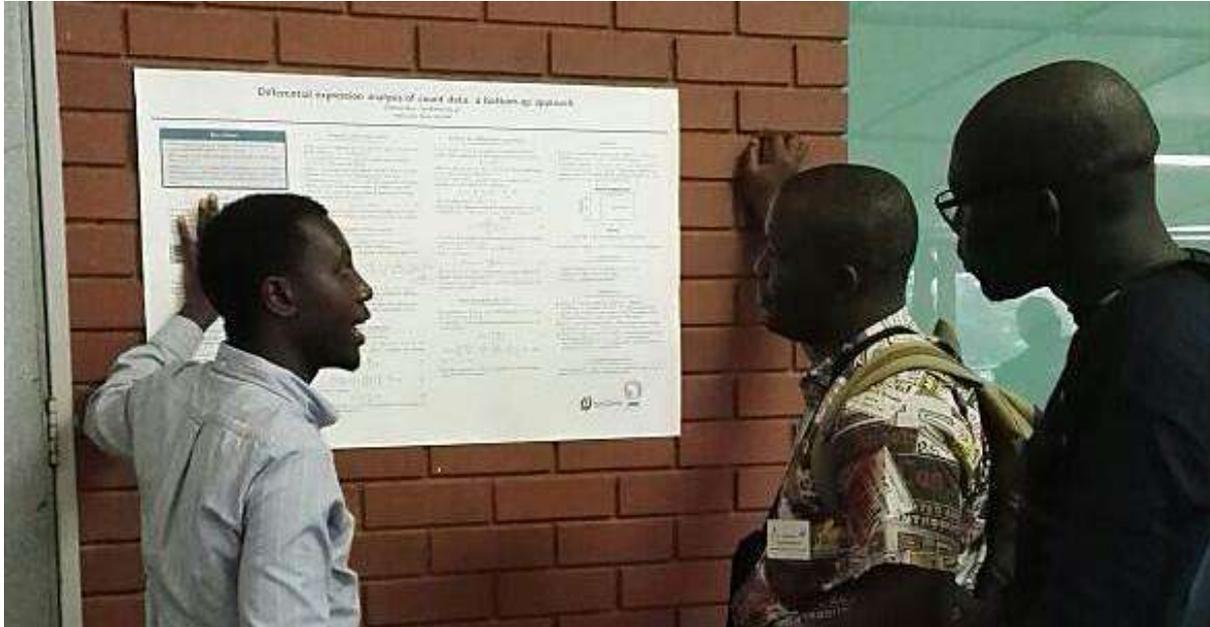
SACEMA welcomed the following new internal students:



David Niyukuri is a PhD student funded through the Africa Renaissance Doctoral fellowship program of TWAS/NRF. His research interests are in HIV prevention with interdisciplinary approaches. He holds a Master’s degree in Mathematical Sciences with a project on “fitting a complex stochastic model using Approximate Bayesian Computation methods”. His research at SACEMA aims to combine such models with phylodynamics and sexual behaviour survey data to gain a better understanding of the structure and dynamics of sexual networks, for a strong evidence-base for policy making in HIV prevention and treatment. He is registered in the Faculty of Medicine and Health Sciences at Stellenbosch University and is doing his research at SACEMA under the supervision of Prof Wim Delva.

Gershom Buri is currently enrolled for a PhD in computational Biology at Stellenbosch University and is based at AIMS in Muizenberg. He graduated from Mbarara University of Science and Technology in Uganda in 2013 with a Bachelor’s degree in Mathematics. Thereafter he worked with the Infectious Diseases Research Collaboration in western Uganda on a study about ART therapy. Later, he joined AIMS- Ghana where he did both the structured masters and Research (MPhil) degrees in Mathematics.

His research project involves working on an approach for analysing the differential expression of gene data. He is interested in the application of mathematical and statistical tools to genome data to generate a new understanding of the immune system. Gershom also attended the SAMSA conference on 21st to 24th November where he won a prize for best poster presentation.



Gershom Buri (left) explaining his poster to SAMSA participants

SACEMA says goodbye to Rachid Ouifki



After having been employed at the Centre for more than a decade, Dr Rachid Ouifki our longest serving staff member is leaving SACEMA at the end of December to take up a position at the Mathematics Department, University of Pretoria. While we are sad to be losing him, we wish him the very best for his new position and look forward to continuing our collaborations with him.

Visiting Researchers



Prof Wayne Getz spent one month at SACEMA from October to November as a Visiting Research Fellow. Wayne has been an Honorary Professor at the Mammal Research Institute in Pretoria, and is an Honorary Professor in the School of Mathematical Sciences at UZKN. He has been on the faculty at UC Berkeley since 1979, a past Chancellor's Professor, and the Starker-Leopold Professor of Wildlife Ecology. He is also one of three founders of SACEMA.



Dr Ibraheem Adebayo is spending 6 months at SACEMA, working with Prof Wim Delva on investigating the acceptance of PrEP and its impact on condom usage among Female Sex Workers in suburban areas around Cape Town. Ibraheem qualified as a medical doctor in Nigeria in 2009 and had a short practice as a general practitioner in Abuja. He later obtained an MPH from the University of Leeds UK in 2014; and subsequently volunteered as a program coordinator of adolescent health with Impact Aid International in Central London, UK. He is currently on a 1 year research internship with the International Centre for Reproductive Health (ICRH), Ghent University, Belgium where he completed a 6 month posting (being first part), and is currently spending a further 6 months under Prof Delva's supervision at SACEMA doing field research.

STUDENT SCIENTIFIC ACTIVITIES:

SA PhD Regional Conference

The SA PhD Regional Conference Western Cape was held at the CTICC in Cape Town on 13th September. The theme for this year was "The Future of South Africa's Knowledge Economy is in our hands". The conference is part of the South African PhD Project, an NRF-DST driven initiative. SACEMA PhD student, Faikah Bruce attended the conference. The attendees at the conference were divided into 2 groups: pre-registered and currently registered PhD candidates. Both groups were exposed to glimpses of what a PhD entails, ranging from "Choosing a PhD supervisor", to "What to expect during PhD examination" and "Beyond the PhD – postdoctoral funding opportunities". Talks also included doctoral funding opportunities that are available from various funders. Speakers were from diverse backgrounds, including industry representatives, mentors, government and funding representatives. Higher Education Institutions were also given the opportunity to showcase what they had to offer in terms of doctoral programmes and training.



Faikah Bruce at the SA PhD Regional Conference in Cape Town

Science Communication and Engagement Workshop

SACEMA postgraduate students participated in the Science Communication and Engagement workshop held on 26th August at the African Institute for Mathematical Sciences (AIMS) in Muizenberg. The workshop, sponsored by the British Council through the Academy of Science South Africa and hosted by AIMS South Africa, was aimed at equipping researchers with communication and engagement skills allowing them to communicate with different stakeholders at all stages of research. James Azam, one of the SACEMA Master's students who attended the workshop reports, "This workshop was well attended as the venue was filled to capacity. It was mostly patronised by postgraduate students pursuing various Masters and PhD programmes across the Western Cape. There were other attendees from places outside academia as well. The workshop was very well organized and featured several speakers on topics such as: "Preparing presentations for a diversified audience" by Thakane Ntholi, "What does it take to become an engaged researcher?" by Marina Joubert, "Skills and communication for scientists outside of academia" by Prof Bruce Basset, "Networking skills, branding and social media" by Yasmin Hankel and Noluvuyo Hobana, "Personal impact and emotional intelligence" by Savannah Nuwagaba, and finally, "Policy briefing and press release" by Rebecca Helman and Ephifania Geza. Prof Neil Turok was the keynote speaker for the workshop. In his talk, he highlighted five pertinent points necessary for science communication and presentations in general. According to him, any individual who has set out to communicate their ideas or science to an audience must: have something to say (be prepared), speak from their heart (passion influences what we say), respect their audience (not to downplay the intelligence of the audience), and be simple and clear. These are key ingredients necessary to make sure your audience carries home the message you intend to put across. One clear theme re-echoed in all the talks that were given during the workshop: every speaker must know their audience!"



Prof Neil Turok (AIMS) with Faikah Bruce (SACEMA PhD student), Barry Green (AIMS) and Evans Omondi (SACEMA Masters student) at the Science Communication and Engagement Workshop in Muizenberg

South African Statistical Association Conference

SACEMA Master's student, Frieda Geldenhuys attended the 58th annual conference of the South African Statistical Association (SASA) from 28th November to 1st December 2016. The conference had over 350 delegates from both academia and industry who shared their work and ideas in the areas of Statistics and Data Science. Frieda reports, "We had an exciting group of international visitors teaching us about the latest developments in Statistical Learning for Data Science, Correspondence Analysis, Statistical Ecology, Astronomy, Computational Developments in High Dimensional Models and Change Point Analysis. On the first day I had to choose which workshop to attend and on the other days I had to choose from the many talks, including ecological statistics, biostatistics, financial statistics, Bayesian statistics, time series and electricity, to name but a few. I gave a talk at ecological statistics division about my research on "Using Species Distribution Models for spatial conservation planning of the African penguin" to date – what a great opportunity! There were three poster sessions too where one could go discuss with presenters about their research.

The social events were an added bonus – welcome function with the Hout Bay music project, young statistician's burger evening and pub quiz, conference dinner at our beautiful Kirstenbosch Gardens, including a walk. The dinner at Moyo was something different – they kept on dishing up food and I even tried mopane worms for the first time: crunchy on the outside and juicy on the inside – to me quite SIESA, not SASA!"



Frieda Geldenhuys (2nd left) with friends at the SASA conference

Mathematical Modelling for Infectious Diseases

SACEMA postgraduate students participated in the two-week course on the Mathematical Modelling of Infectious Diseases hosted by the Department of Statistical Sciences, UCT. The course was focused on the application of mathematical modelling and computer simulation to predict the dynamics of infectious diseases to evaluate the potential impact of policy in reducing morbidity and mortality. Topics covered included compartmental models, spatial models, introduction to agent based models, economic evaluation methods and more.

Some comments: "We focused on epidemiological modelling using SIR models and went ahead to add different things to it like vaccination and treatment among other interventions. It was very hands-on, starting as though we were all total beginners, which helped a lot in understanding how the SIR model equations are formulated, and the course from there on progressed very smoothly and swiftly whenever we had to come up with a toy model and work on it. I particularly enjoyed the diversity of the class, bringing a rich atmosphere during group work, because we had to reason from our different backgrounds, opening up our minds to how differently one question can be solved. It was also good to network and we set up a platform on a site called 'Vula' where we exchanged our contacts and resume's for future references and collaborations."

INTERNATIONAL MEETINGS:



Eva Ujeneza, a PhD student at SACEMA, attended the **International Conference on Models in Population Dynamics and Ecology (MPDE2016)** which took place on 5th to 9th September, at the Centre de Rencontres Mathematiques (CIRM), in Marseille. The aim of the conference was to bring together theorists mathematicians and biologists to present recent work on developing models, dedicated to the study of dynamics of specific populations or epidemiological problems.

Eva's participation was supported by the Schlumberger Foundation, a non-profit organisation that supports young talented women pursuing science oriented carriers. Eva writes, "I found the conference very interesting, especially because of the diversity of the topics discussed, which ranged from modelling of infectious diseases and populations movement patterns, to adaptive dynamics."



Alex Welte went to Washington D.C. and Atlanta for meetings to evaluate and support progress on a number of aspects of work in the area of HIV incidence estimation generally, and the development and use of biomarkers of 'recent HIV infection' in particular. One day of meetings was devoted to a multicentre collaboration lead by Research Triangle Institute (Also known as RTI International www.rti.org) under contract to the US National Heart, Lung and Blood Institute, to investigate HIV incidence in blood donors in the US, Brazil, China and South Africa; one day to assessing the status of a major Gates Foundation funding initiative for which SACEMA is the analytical lead (CEPHIA collaboration incidence-estimation.org/page/cephia), and one day to nurturing active collaboration, on these same themes, with the US Centres for Disease Control and Prevention (CDC).

SACEMA Master's student, Evans Omondi attended the **International School on Dynamical Systems** in Biomedical Sciences held at Strathmore University in Nairobi, Kenya from 26th to 30th September 2016. SACEMA Senior Researcher, Rachid Ouifki was one of the facilitators of the course.

Evans reports, "The workshop provided powerful tools which allow students and researchers to relate data to modelling the disease dynamics."



Evans Omondi with Prof Farai Nyabadza, Dr Zindoga Mukandavire (Assistant Prof at London School of Hygiene & Tropical Medicine) and Titus Orwa (PhD student at Strathmore University, Kenya).

The **Southern Africa Mathematical Science Association (SAMSA) Conference**, which was hosted at by the Department of Mathematics at the University of Pretoria from the 21st—24th of November, 2016 was attended by more than 200 participants including: researchers, academics and students. SACEMA was represented at this event by Rachid Ouifki—a senior researcher at SACEMA along with two of his students, Tokpa Darwolo Jamah—who gave a presentation on the topic: "Modeling the Economics of Trypanocide and Insecticide-Treated Cattle against Trypanosomiasis within a Multi-host Situation" and Khaphetsi Joseph Mahasa—who also presented on the topic: "Mathematical modeling of oncolytic potency and reduced virus tumor-specificity in virotherapy", as well as Gershom Buri, a PhD student based at AIMS.

Tokpa and Mahasa expressed their thanks and appreciation to SACEMA for providing financial support which enabled them to attend the conference. Apart from receiving informative feedback from their talks, they considered their participation in this important conference as being very fruitful and rewarding because they got a unique opportunity of interacting with others senior researchers and students in their respective fields.

Aside from normal conference routine of plenary and contributed talks, and poster sessions, the conference was enriched with a number of exhilarating events, including tours to Lesedi Cultural Village [<http://www.aha.co.za/lesedi/>] and The Cheetah Farm [<http://www.dewildt.co.za>]. Tokpa and Mahasa also considered their excursion tour at the Lesedi Cultural Village--a World Heritage Site, which provides five traditional homesteads inhabited by Zulu, Xhosa, Pedi, Basotho and Ndebele tribes who live according to tribal folklore and traditions of their ancestors as one of the exciting moments during the conference.

When expressing his experiences at Lesedi Cultural Village, Tokpa said: “At each of these traditional homesteads, we were strongly greeted by the beauty and nature of the African Continent; more besides, we were given a brief history about the culture and tradition of the original inhabitants of each of these homesteads, which had me living in a dual world at that moment because I could literally see myself entering into my native village thousands of miles away in West Africa”.



Group photo taken at SAMSA conference in Pretoria

Rachid Ouifki and PhD student, Joseph Mahasa attended the **2016 joint meeting of the European Society for Mathematical and Theoretical Biology and the Society for Mathematical Biology** at the University of Nottingham, United Kingdom, from 11th to 15th July 2016. The meeting brought together more than 800 participants representing wide range of biomedical expertise. The meeting provided an excellent opportunity for experimental biologists, clinicians, research clinician, biophysicists, computational and mathematical biologists ranging from advanced undergraduates to senior faculty to learn and share their researches. The conference provided a great and informal forum for the participants to discuss their work outside their formal presentations and/or poster sessions. Furthermore, the conference allowed participants to foster new cross-disciplinary collaborations to understand important biological questions. Most interestingly, each participant was given an opportunity to give a short talk and/or poster of her/his research.



Mahasa writes, “At the meeting, I learnt a lot on mathematical modeling of biological problems from a wealth of high quality talks and posters to choose from. I was very pleased to hear many talks on cancer modeling and treatment protocols. I personally gave a talk on my recent mathematical paper captioned “Mathematical Model of Tumor-Immune Surveillance”, under the minisymposium titled “Tumor-Immune Dynamics and Virotherapy” organised by Prof Amina Eladdadi and Dr Rachid Ouifki. My supervisor, Rachid Ouifki, also presented an exciting

talk entitled “Oncolytic Potency and Reduced Virus Tumor-specificity in Oncolytic Virotherapy: A Mathematical Modelling Approach”. Coming from cold winter weather of South Africa, I tremendously enjoyed the sunny week of the conference and the morning walks via green yards to the conference venue. Intriguingly, the meeting provided a unique opportunity to network with other researchers from around the world, form collaborations and friendships. To foster quality research and collaborations, SMB ran a mentoring scheme that aimed at pairing early career researchers, like me, with more enthusiastic and well established mentors. Unequivocally, the mentoring program gave me and other mentees, ample opportunities to network and receive instructive feedback about long-term career goals and quality research. I would like to express my sincere gratitude to the Stellenbosch University (SU) for awarding me the Postgraduate & International (PGIO)-Overseas Conference Grant (OCG) to attend the 2016 ECMTB/SMB Annual Meeting. Apart from their generous bursary for my PhD study, I would also like to pass my outstanding thanks to SACEMA for sponsoring my drip to this important meeting. Finally, I wholeheartedly thank my supervisors Prof Amina Eladdadi, Dr Rachid Ouifki, and Prof Lisette de Pillis for advising me to attend this auspicious meeting. It was really worth attending”.

INTERNATIONAL EXCHANGE PROGRAMMES:

International Disease Dynamics and Data Research Scholars Exchange Program (I3D)

SACEMA PhD graduate, Bewketu Bekele participated in the International Disease Dynamics and Data Research Scholars Exchange Program (I3D) which provides former ICI3D clinic participants the opportunity to do a 6-week research exchange abroad. He worked with Dr Jonathan Dushoff, faculty supervisor, for 6 weeks (Oct 10 – Nov 20) at McMaster University, Canada. Bewketu writes, “It was a great experience for me as I worked on the impact of early HIV treatment project. The aim of the program is to continue collaboration, and thus I plan to continue working on the project and submit a manuscript for a publication. Apart from the research, I was able to visit interesting places such as Niagara Falls; a famous tourist attraction. Following my research visit, I am back in Ethiopia and continue to be working at the department of Mathematics, Debre Markos University”.



Bewketu Bekele at Niagara Falls

EVENTS:

Bayesian Analysis of Longitudinal Studies

Prof Emmanuel Lesaffre of the Leuven Biostatistics and Statistical Bioinformatics Centre (L-BioStat), Catholic University of Leuven, Belgium, presented this intensive five-day course at Stellenbosch, under the auspices of SACEMA, in association with the Department of Statistics and Actuarial Science, University of Stellenbosch. The course took place at the Stellenbosch Institute for Advanced Study (STIAS), from 24th to 28th October.



Prof Emmanuel Lesaffre (right) with participants of the Bayesian Analysis course

Discussion group on “How to be a Scientist”

Since the beginning of November, senior SACEMA staff have been running a new weekly discussion group on “How to be a scientist”. The discussion group is intended for SACEMA’s ‘junior’ researchers (i.e., students, postdocs, and academic staff without PhDs) and provides a forum to explore in an interactive way the many different aspects of being a scientist - from doing our best possible scientific work to engaging with the larger scientific community and the public to understanding local and global issues related to scientific funding and the structure of higher education. Thus far, topics have included “How to read scientific papers?”, “Hurdles to scientific publishing”, and “Strategies for searching the scientific literature in an effective way”.

SACEMA Seminars

The following seminars were held between August and December:

- 08 August 2016: Dr David T.S. Hayman: Predicting undiscovered filovirus reservoirs and patterns of disease emergence
- 02 September 2016: Dr Ottar Bjornstad (Penn State College of Agricultural Sciences): Loss of synchrony and changes in spatial dynamics from mass vaccination against measles
- 09 September 2016: Dr Brian Williams (SACEMA): Ending AIDS in Africa: Myth or reality? Or Why do we do what we do?

- 23 September 2016: Prof Wim Delva (SACEMA, Ghent University, Hasselt University and KU Leuven) : Of stars, trees and networks
- 30 September 2016: Prof John Hargrove (SACEMA): The trickery of the cornered cat. Estimating HIV incidence using biomarkers: are we ever going to be able to get this cat into a bag?
- 07 October 2016: Dr Gabriela Blohm (University of Florida): Responding to the Zika virus epidemic in Venezuela: scientific insights and lessons learned
- 12 October 2016: Dr Ibraheem Ademola Adebayo (Ghent University): Acceptance of PrEP and its impact on Condom use among sex workers in urban areas around Cape Town
- 14 October 2016: Prof Wayne M Getz (UC Berkeley and UKZN): Appropriate Complexity Modeling of Zoonotic Disease: Anthrax, Ebola and Zika
- 21 October 2016: Prof Wolfgang Preiser (Stellenbosch University): Viral Hepatitis: An Emerging Challenge for HIV Medicine
- 26 October 2016: Evans Otieno Omondi (SACEMA): A mathematical model for onchocerciasis and its treatment with ivermectin
- 27 October 2016: Dr Rhoda Hawkins and Dr Simon Johnston (University of Sheffield, UK): The role of biopolymers in the immune response to fungal infection
- 04 November 2016: Dr Leigh Johnson (Centre for Infectious Disease Epidemiology and Research, University of Cape Town): Modelling HIV in South Africa's provinces
- 11 November 2016: Khaphetsi Joseph Mahasa (SACEMA): Mathematical modeling of oncolytic potency and reduced virus tumor-specificity in virotherapy
- 18 November 2016: Joseph B. Sempa (SACEMA): The effects of longitudinal HIV viral load exposure on Immune outcomes, Mortality, and Opportunistic infections amongst ART naïve patients in sub-Saharan Africa
- 23 November 2016: Frieda Geldhenhuys (SACEMA): Using Species Distribution Models for spatial conservation planning of African penguins
- 25 November 2016: Prof Alex Welte (SACEMA): The CEPHIA Collaboration: Making sense of competing claims about the meaning and performance of tests for "recent HIV infection"
- 30 November 2016: Masters Defence: Tokpa Darwolo Jamah Jr (SACEMA): Modeling the Economic of Trypanocide and Insecticide-Treated Cattle against Trypanosomiasis within a Multi-host Situation
- 09 December 2016: Dr Elliot Cowan (Partners in Diagnostics, LLC): To thine own test be true: Tracing the risky journey to the approval of the first HIV self-test in the US.

UPCOMING EVENTS:

Individual Based Modelling in Epidemiology: A Practical Introduction 27-31 March 2017

Prof Wim Delva (SACEMA, Ghent University, Hasselt University and KU Leuven) and Dr Lander Willem (Antwerp University) will be presenting an intensive five-day course on Individual-based modelling in epidemiology, organised by SACEMA. The course will run from 9 am to 4 pm daily, 27-31 March 2017, and be held at [STIAS](#) (adjacent to SACEMA) in Stellenbosch. The registration form is available on the SACEMA website www.sacema.org. The deadline for early registration is 31 January 2017. For participants within South Africa, the course fee is R4000 for early bird registration and R4500 for later registration. For international participants, the fee is 400 € for early bird registration, and 450 € for late registration. The fee includes refreshments, lunches, social events, a copy of the textbook, and a non-refundable registration fee (R850 for South African participants, 85 € for international participants).