AIMS

African Institute for
Mathematical Sciences
SOUTH AFRICA

ANNUAL
REPORT
2019

ABOUT US

The African Institute for Mathematical Sciences (AIMS) is a pan-African network of centres of excellence for postgraduate education, research and public engagement in mathematical sciences. Its mission is to enable Africa's brightest students to flourish as independent thinkers, problem solvers and innovators capable of driving Africa's future scientific, educational and economic self-sufficiency.

AIMS was founded in Cape Town, South Africa, in 2003. Since then AIMS centres have opened in Senegal (2011), Ghana (2012), Cameroon (2013) and Rwanda (2016). The pan-African network of AIMS centres is coordinated by the AIMS Next Einstein Initiative (AIMS-NEI).*

This is the annual report of AIMS South Africa for the period 1 August 2018 to 31 July 2019. It includes an overview of all activities of AIMS South Africa and its associated projects, as well as the financial statements for the 2018 calendar year.

Since AIMS South Africa opened in 2003, 812 students, of which 34% are women, from 38 different African countries have graduated from its core academic programme.

AIMS South Africa has local association with the Universities of Cape Town (UCT), Stellenbosch (SU) and the Western Cape (UWC) and international association with the Universities of Cambridge, Oxford and Paris-Sud.

AIMS South Africa offers:

* An intensive one-year structured Master's in Mathematical Sciences with intakes in August and January.
* Specialised courses as part of regular postgraduate programmes at South African universities.
* A well-established research centre which hosts regular workshops and conferences.
* Professional development programmes for teachers.
* Public engagement activities.

* AIMS Next Einstein Initiative, Kigali, Rwanda, Email: info@nexteinstein.org.
  For further information, see www.nexteinstein.org

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FOREWORD

BARRY GREEN, DIRECTOR

Working at AIMS South Africa one seldom stops to think about the many advantages it enjoys. Its location at the corner of False Bay is a truly beautiful place, with the sea in front and the mountains behind, which is noticed and commented on by every visitor to AIMS. Being close to excellent partner universities, Stellenbosch, Western Cape and Cape Town, and supported nationally and internationally we are privileged to be able to contribute to the South African Mathematical Sciences scene and be part of the broader pan-African AIMS Network.

By the end of this year more than 100 South African students will have completed the AIMS Master's course, and now each year roughly 15 South African students are accepted onto our programme. Together with 45 pan-African students (of whom more than 35% are women), this creates a special and exciting environment. Since AIMS opened in 2003, 812 students have graduated from this centre, with significant achievements after AIMS. This year seven of the 43 lecturers who taught on our programme were AIMS alumni.

I have highlighted some of the special events and notable achievements that took place during the period under review.

A strong focus in Data Science has developed at AIMS South Africa. Dr Bubacarr Bah, who is also chair of the Data Science Committee of the National Graduate Academy for the Mathematical Sciences, organised the third Theoretical Foundations Workshop held at the University of the Witwatersrand (Wits) in December 2018. Prof. Bruce Bassett coordinated the SA-DISCnet Initiative which included the 8-week Data Science Intensive Programme. Eleven of the students on this programme went on to complete internships solving SDG-related problems with local organisations and companies. Prof. Bassett is also Head of Data Science at the Square Kilometre Array (SKA).

The hosting of the Pan-African Mathematics Olympiad, in April. This was organised by the AIMS House of Science together with the South African Mathematics Foundation and attended by 54 contestants from 11 countries. It was a pleasure that Prof. El Yacoubi from Morocco, the current President of the African Mathematics Union, attended this event and coincidentally the top award was won by a Moroccan learner.

The joint expression of interest by AIMS South Africa and the Academy of Science of South Africa (ASSAf) to host a Centre for Education in Science for Africa, the Mediterranean and Europe (CESAME) for teachers in South Africa, came to its realisation in June 2019. AIMSSEC played a vital role in organising an Inquiry-Based Science Education workshop which ran for five days at the Cape Teaching and Leadership Institution which is the teacher professional development arm of the Western Cape Education Department. The workshop, which hosted international participants from Benin, Cameroon, India, Italy, Morocco and Tunisia, was a resounding success.

The third AIMS-ESMT Industry Immersion Programme took place and plans are in place to run this successful programme at another AIMS centre next year.

The staff at AIMS South Africa give freely of their time in many ways: related to the programmes we run, supporting our workshops, outreach and research centre activities, managing and looking after our facilities and IT needs, and taking special care of our finances. It is a pleasure to thank them all, and to mention the appointment of three special colleagues to senior positions at AIMS this year. Ms Deborah Wilsnagh was appointed Chief Operating Officer of AIMS South Africa, Dr Simukai Utete our new Academic Director and Dr Rejoyce Gavhi-Molefe as the AIMS House of Science Manager. The 2018-19 Academic year at AIMS South Africa and the contribution of all involved is presented in this report.
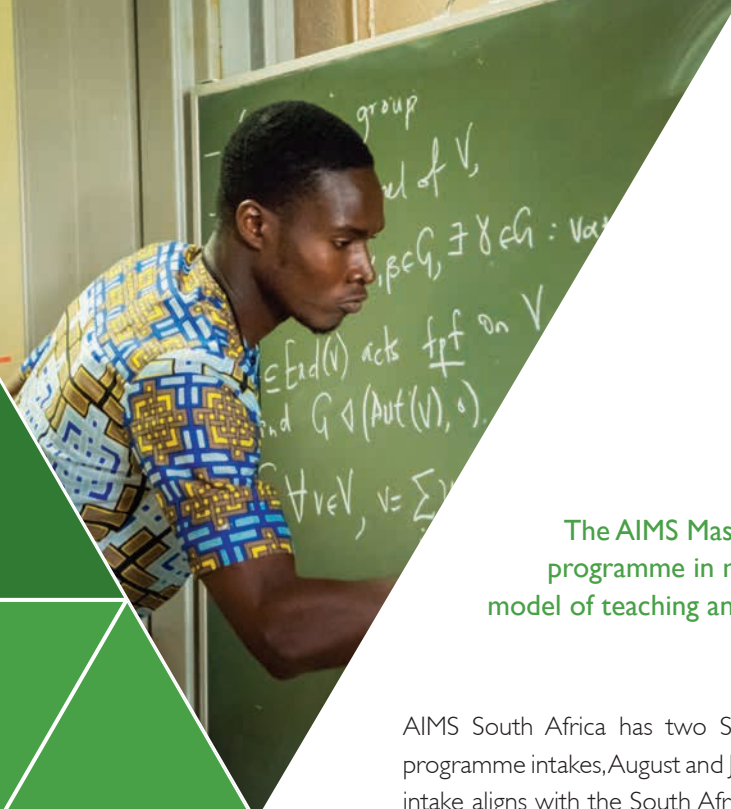
ACADEMIC PROGRAMMES

The AIMS Master's in Mathematical Sciences or Structured Master's is a taught programme in mathematics and the mathematical sciences which uses the AIMS model of teaching and learning, which is highly interactive, tutorial-based and focused on independent thinking.

AIMS South Africa has two Structured Master's programme intakes, August and January. The January intake aligns with the South African academic year. In 2018 this intake had 17 students, including 15 South Africans. These students completed the Master's in November 2018 and graduated at their respective universities in 2019.

The 2018-19 August intake had 40 students from 17 countries across Africa. The January 2019 intake has 19 students, from South Africa, as well as from Nigeria, Kenya and Cameroon. The January students will complete their programme in November 2019.

RESEARCH PROJECTS OF THE JANUARY 2018 INTAKE

Full name	Gender	Origin	Research Project Title	Supervisors
Daniel Ajedamola Ajeleye	M	Nigeria	Determining the effect of developing flow on friction factors and pressure drops over different straight duct geometries	S Fidder -Woudberg, Stellenbosch
Mhlanguleli Boqwana	M	South Africa	Predicting Stock Price Using Random Forests and Artificial Neural Networks	R Becker, AIMS
Vongani Cyril Chabalala	M	South Africa	Decoding Autoencoded Supernovae Spectrum Features	Y Fantaye, AIMS
Zakiena Hoossen	F	South Africa	Enumeration in hexagonal chains	S Wagner, Stellenbosch
Munira Zainab Jowaheer	F	South Africa	Novel Machine Learning Algorithms for Modern Data Science	B Bassett, AIMS
Nadine Charmel May	F	South Africa	Credit Scores using machine learning techniques	Y Fantaye, AIMS & T Simon, Zoona Mobile Transactions
Vukani Mhlongo	M	South Africa	An overview of the cutting edge of the uses and pitfalls of reinforcement learning	J Shock, Cape Town
Sinenhlanhla Mtshali	F	South Africa	A multi-patch mathematical model for highly pathogenic avian influenza (HPAI) H5N8 with environmental contamination	F Chirove, KwaZulu-Natal
Lubabalo Ndobe	M	South Africa	Call Center Optimization-Scheduling Problem	M Ali, Witwatersrand
Ylaney Ramlall	F	South Africa	Solving the Quadratic Knapsack Problem with a New Heuristic	M Ali, Witwatersrand
Phumudzo Lloyd Seabe	M	South Africa	Stock Market Prediction using Artificial Neural Networks and Recurrent Neural Networks	R Becker, AIMS
Phillemon Ntona Senoamadi	M	South Africa	Improving forecast accuracy of wind power output using multi-input LSTM model	N Botha, CSIR, B Bah, AIMS & V Marivate, Pretoria
Tijani Ahmad Sulaimon	M	Nigeria	The Impact of Mosquito Fidelity Behaviour on Transmission of Japanese Encephalitis Virus	J Pulliam, SACEMA
Wanda Tsewu	M	South Africa	A Machine Learning approach for Asset Allocation	P Mashele, North-West
Tumisang Irvin Tshikare	M	South Africa	Probabilistic Machine Learning	M Lochner, AIMS

COMBINED COURSES TABLE

Period	Lecturer	Course	MSc Jan 2018	MSc Aug 2018	MSc Jan 2019	Hons Biomaths 2019
2018						
27 Aug – 23 Nov	Jan Groenewald, AIMS South Africa	Computing and LaTeX		×		
27 Aug – 23 Nov	Noluvuyo Hobana, AIMS South Africa	English and Communication Skills		×		
3 – 21 Sept	Stephan Wagner & Dimbinaina Ralaivaosoana, Stellenbosch	Mathematical Problem Solving		×		
3 – 21 Sept	Jeff Sanders, Martha Kamkuemah, & Jordan Masakuna, AIMS South Africa	Python		×		
24 Sept – 12 Oct	Yae Gaba, African Centre for Advanced Studies	Experimental Mathematics with Sage		×		
24 Sept – 12 Oct	Siaka Lougue, KwaZulu- Natal	Statistics		×		
15 – 26 Oct	Jonathan Marks, GIBS	Entrepreneurial Skills	×	×		
29 Oct – 2 Nov	David Aschman, Cape Town	Concepts and Problem Solving in Physics		×		
12 – 30 Nov	Karin Therese Howell, Stellenbosch	Algebraic Methods		×		
12 – 30 Nov	Fernando Pestana da Costa, Aberta	Differential Equations		×		
3 – 21 Dec	Gareth Boxall, Stellenbosch	Model Theory		×		
3 – 21 Dec	Pete Grindrod, Oxford & Jeff Sanders, AIMS South Africa	Quantum Mechanics		×		
10 – 21 Dec	Ole Klein, Micheal Winckler & Christian Mittlestadt, Helderberg University	Mathematical Optimisation		×		
2019						
7 Jan –	Jan Groenewald, AIMS South Africa	Computing & LaTeX			×	×
7 – 25 Jan	Jeff Sanders, Martha Kamkuemah, & Jordan Masakuna, AIMS South Africa	Python			×	
7 – 25 Jan	Peter Stevenhagen, Tor Vergata & Rene Schoof, Leiden	Algebraic Number Theory		×	×	
7 – 25 Jan	Herbert Huppert, Cambridge & Richard Katz, Oxford	Fluid Dynamics		×	×	×
8 – 26 Jan	Ronnie Becker, AIMS South Africa	Financial Mathematics		×	×	
28 Jan – 15 Feb	Eric Andriantiana, Rhodes	Experimental Mathematics with Sage			×	
28 Jan – 15 Feb	Neville Fowkes, Western Australia	Industrial Modelling		×	×	×
28 Jan – 15 Feb	Stéphane Ouvry, Paris Sud XI	Introduction to Random Systems, Information Theory, and related topics		×	×	
28 Jan – 15 Feb	Herbert Weigel, Stellenbosch	Quantum Mechanics		×	×	
18 – 22 Feb	Eric Andriantiana, Rhodes	Mathematical ProblemSolving			×	
25 Feb – 15 Mar	David Spiegelhalter, Cambridge (video lecture) & Jeff Sanders, AIMS South Africa	Statistics			×	
25 Feb – 15 Mar	Wilson Lamb, Strathclyde	Analytical Techniques in Mathematical Biology		×	×	×
25 Feb – 15 Mar	Stefan Jaehnichen, TU Berlin	Entrepreneurship case studies		×	×	
25 Feb – 15 Mar	Wolfram Decker & Gerhard Pfister, TU Kaiserslautern	Computational Algebra		×	×	
25 Feb – 15 Mar	Costas Zoubos, Pretoria	General Relativity		×	×	
18 Mar – 5 Apr	Patrick Dorey, Durham	Solitons		×	×	
18 Mar – 5 Apr	Elena Dimitrova, Clemson	Algebraic Biology		×	×	×
18 Mar – 5 Apr	Henri Laurie, Cape Town	Julia and differential equations			×	
19 Mar – 6 Apr	David Spiegelhalter, Cambridge (video lecture)	Statistics			×	
15 Apr – 3 May	Juerg Weber, Western Australia	Insurance Economics			×	×
15 Apr – 3 May	Steve Bradlow, Urbana-Champaign	Surfaces			×	
6 – 17 May	Peter Clarkson, Kent & Kerstin Jordaan, Pretoria	Asymptotics & Perturbation Methods			×	×
6 – 17 May	Jeff Sanders, AIMS South Africa	Data Science			×	
20 May – 7 June	Simukai Utete, AIMS South Africa	Distributed Coordination			×	
20 May – 7 June	Justin Munyakazi, Western Cape	Numerical Maths			×	
10 – 28 June	Masood Khalique, North West	Symmetry Analysis of Differential Equations			×	

All students on the Structured Master's programme do three phases of work: compulsory skills courses, elective review courses and a research project, and are registered during their programme at UCT, UWC or SU.

All August students started with compulsory foundational skills courses in Mathematical Problem Solving, Python Programming, Experimental Mathematics with Sage, Statistics and Concepts and Problem Solving in Physics. There are also Computing and Latex courses, run by the IT Manager, Mr Jan Groenewald, and Communications Skills courses throughout the programme, taught by Ms Noluvuyo Hobana, the Language and Communications Teacher. Talks and lectures on the Scientific Environment are held throughout the programme, covering areas including anti-plagiarism, gender and research skills.

The course offers many opportunities in addition to lectures, such as seminars by mathematicians on their research. In October 2018, Prof. Alan Beardon gave a seminar on Pell's Diophantine Equation. All Structured Master's students also do a course on Entrepreneurship.

Structured Master's students have the opportunity to select 11 review courses, in diverse areas of mathematics and the mathematical sciences. The courses offer a balance of subjects across pure mathematics and applied mathematics, statistics, computing and physics.

The 2018-19 class did exceptionally well as a group, with 42% achieving Distinctions for their research projects and the remainder receiving Good Passes. There were no projects assessed as Pass or lower.

The August intake programme finished with a student conference, the AIMS Mathematical Sciences Conference, organised with the assistance of the tutors. The aim of the conference was to provide students with an opportunity to go through the steps of participating in an academic conference, including writing a paper, reviewing work and presenting a paper. AIMS researchers also assisted with reviews. A conference website was set up by the IT Tutor, Mr Leboko Poulo, and EasyChair was used to manage the submissions. Each student produced a two-page extended abstract from their research project work and reviewed one paper in a related area.

The conference took place over two days, 11 to 12 June, at AIMS South Africa. There were two keynote speakers: Dr Ronalda Benjamin from SU, who works in functional analysis, gave the keynote address on 11 June; and Mr Dario Fanucchi, a mathematician and entrepreneur, was the keynote speaker on 12 June. Prizes were awarded by a judging panel, with two awards in each category, for Best Paper: Mr Jean N'dah Kouagou and Ms Abigail Djossou; and for Best Presentation: Mr Thandokuhle Quinton Ndlovu and Ms Sebenele Thwala.

There was also a Students' Choice Best Presentation Award, voted on by the students themselves in an online poll that they set up during the conference. In this category, there was a tie, with the winners being Mr Thandokuhle Quinton Ndlovu and Mr D'Jeff Kanda Nkashama.

Mathematical Science Conference

Dr Ronalda Benjamin

GRADUATE PROFILES

MS MUNIRA JOWAHEER
AIMS South Africa 2018

Ms Munira Jowaheer studied Physics at the University of Mauritius, with a focus on Astrophysics, and her thesis was on higher-dimensional black holes. She graduated from AIMS South Africa in 2018 and was awarded the Ben and Mary Turok Scholarship for Excellent Achievement.

During her time at AIMS she also completed the AIMS-ESMT Industry Immersion Programme (IIP) as well being selected as one of 13 participants to take part in the 8-week Data Science Intensive Programme organised by AIMS South Africa and funded through the UK's Science and Technology Facilities Council-funded 'Data Intensive Science Centre in SEPnet' (DISCnet). The emphasis of this programme was on practical skills in machine learning, big data and AI. She also volunteered as a mathematics tutor for high school students.

Immediately after leaving AIMS she started a data science internship, funded by DISCnet, at an NGO which focuses on youth unemployment. She then moved to a consulting firm specialising in credit risk management and worked there briefly as an analyst. "I have now decided that I want to do 'actual machine learning' and I am working as a consultant on machine vision projects. In my spare time, I am also learning software development. For the next step of my career, I would like to work as a machine learning engineer. I want the experience of not only designing models, but also implementing and scaling them."

She believes that the work she does could be used to alleviate any number of problems. In terms of healthcare, AI can be used to improve the diagnosis of certain ailments. It could also be used to aid learning by suggesting appropriate courses/resources to students based on their needs. It could be used to better detect cases of financial fraud by banks. In another way, with the current heightened interest in machine learning, teaching it to students will provide them with many job opportunities in industry.

MR MAKUOCHUKWU FELIX OGUAGBAKA
AIMS South Africa 2019

Mr Makuochukwu Felix Oguagbaka completed his high school studies at the University of Nigeria Secondary School Enugu Campus and his undergraduate studies in mathematics at the University of Nigeria, Nsukka. He was encouraged to pursue an education in mathematics by Dr Chimere Anabanti, a mathematician and an AIMS alumnus (2012), "He was my private tutor in mathematics during my high school years and he helped me develop an interest in maths and to see its significant role in the study of other science subjects."

During his time at AIMS he vividly recalls and appreciated the "Jeff talks" which cut across different topics and disciplines and also highlighted the application of mathematics to those disciplines. He also participated in the AIMS giveback programme during which he tutored high school students.

The topic for his AIMS research project was, "Near vector space constructions using copies of Zp for p a prime." One of the things he worked on in the course of his research was how to develop computer programmes using Python to construct such near vector spaces. As the world is going digital, he believes that it is very useful to use computer programmes to tackle questions in mathematics.

Mr Oguagbaka is currently an Assistant Lecturer in the Department of Mathematics at the University of Nigeria and he hopes to complete his PhD in Mathematics and continue to actively engage in research.

MS VERONICA MTONGA
AIMS South Africa 2019

Ms Veronica Mtonga is currently an intern at AB Bank in Zambia. She is in the risk department dealing mainly with risks that arise from the banks' operations and credit facilities. Whilst at AIMS she completed the AIMS-ESMT IIP that enabled her to obtain a certificate in business management.

During secondary school her mathematics teacher encouraged her to study mathematics and motivated her to be a part of mathematics club, of which she became the president. "Mathematics excited me so I decided to pursue it in my undergraduate studies and was awarded a Bachelor's degree in Mathematics with Education from the University of Zambia."

Before coming to AIMS she worked as a teacher and Mathematics tutor at her former university. "AIMS was inspiring, motivating, fulfilling and life changing because of the family environment that I experienced. I was privileged to interact with the great minds of different Africans."

Her main interest is in financial mathematics, in particular risk management but she also has a keen interest in data science and statistics. "I am looking into combining these interests and working towards making a difference by increasing my knowledge in these areas." She intends to further her studies in mathematical finance but would also like to focus on climate change. She intends to work on weather derivatives and apply her findings in the agriculture sector.

"I am very passionate about giveback activities especially those that involve women and girls empowerment. I like taking up leadership positions where I get to make a difference and help people realise the great abilities and skills they possess. I like tackling new challenges and I am open to new ideas on how we Africans can help bring about development in communities, individual countries and Africa as a whole."

RESEARCH PROJECTS OF THE AUGUST 2018 INTAKE

Students	Gender	Origin	Research Project Title	Supervisors
Samah Mohammed Osman Mohammed Alamin Abdalrhaman	F	Sudan	Connection between Mixed Integer Non-Linear Programming (MINLP) and Sparse Optimization	EA Kostina, Heidelberg
Ahlam Abdullah Adam Abdulgader*	F	Sudan	The Many Body LMG Model	H Weigel, Stellenbosch
Doreen Atta Aikins*	F	Ghana	Leveraging the human-machine interface for semi-supervised learning	M Lochner, AIMS
Sarah Akyena*	F	Ghana	Forecasting Unemployment with Deep Neural Networks	R Becker, AIMS
Banan Mozher Mohammed Al-Tayeb*	F	Sudan	On Blockchain	J Sanders, AIMS
Godwin Asumadagwine	M	Ghana	Gated Recurrent Unit Models for Predicting Stock Prices	R Becker, AIMS
Oluwapelumi Stephen Awolude	M	Nigeria	Fast Poisson Solvers	N Hale, Stellenbosch
Joram Divène Fransther Bakekolo	M	Republic of the Congo	Macroscopic description of monochromatic waves in a rectangular non-staggered porous medium	GPJ Diedericks & M Cloete, Stellenbosch
Kevin Bosire Basita*	M	Kenya	A critical review of mathematical models for combination cancer therapy	J Malinzi, Eswatini
Faith Neema Benson*	F	Kenya	Implementation of Discrete Element Method Using YADE	EME Ahmed, AIMS
Chabo Bobe*	F	Botswana	Reduced Form Modelling for Optimal Portfolios with Credit Default Swaps: An R implementation	M Kateregga, Mira Networks
Abigail Priscilla Mahugnon Djossou*	F	Benin	Morphology and detection	S Utete, AIMS
Naftali Ndeapo Indongo*	M	Namibia	A Comparison of Recurrent Neural Networks and Variants in Stock Market Prediction	R Becker, AIMS
Salomon Kabenamualu Kabongo*	M	Democratic Republic of the Congo	An empirical investigation into the properties of standard word embeddings	E Barnard, North-West
Hewan Leul Kedane	F	Ethiopia	Multi-objective Optimization Problem with Multiple Decision Makers: Group Preference	SL Tilahun, Zululand
Hillary Kiprop Kosgei*	M	Kenya	Modelling HIV/AIDS infection dynamics in the presence of interfered interventions	F Nyabadza, Johannesburg
N'dah Jean Kouagou	M	Benin	Higher order multi-domain compact finite difference method for solving chaotic systems of differential equations	P Dlamini & S Simelane, Johannesburg
Seth Baah Kusi*	M	Ghana	Distributed Knowledge	J Sanders, AIMS
Jane Mabesa	M	Lesotho	Nonstandard Analysis via Alpha Theory	G Boxall & TP Chalebgwa, Stellenbosch
Tsoanelo Irene Masilo*	F	Lesotho	Spatial analysis of maternal mortality patterns and associated factors in Africa	S Lougue, Institut de recherche en sciences de la santé
Mbuso Khanyani Matfunjwa*	M	Swaziland	Destabilization of Solitons through Quantum Fluctuations	H Weigel, Stellenbosch
Verediana Machele Mbalilo*	F	Tanzania	A Mathematical Model for Listeriosis Dynamics	F Nyabadza, Johannesburg
Nouralden Mohammed*	M	Sudan	Mathematics of Reinforcement Learning and Handling of the Curse of Dimensionality	M Ali, Witwatersrand
Veronica Mtonga*	F	Zambia	Valuation of Credit Default Swaps with Haskell	M Kateregga, Mira Networks
James Muchinga*	M	Zambia	The Hahn Banach Theorem	S Mouton, Stellenbosch
Johane Andre Mutuque*	M	Mozambique	Fourier Spectral Methods	N Hale, Stellenbosch
Mathews Mwansa*	M	Zambia	Stock Price Prediction Using Long Short Term Memory	R Becker, AIMS
Joseph Protas Ndenda	M	Tanzania	On a fractional-order model for Myxomatosis transmission dynamics	JBH Njagarah & CB Tabi, Botswana
Thandokuhle Quinton Ndlovu*	M	Swaziland	Mathematical investigations of a kinetic model for heterogenous catalysis of glycerol hydrogenolysis	FP da Costa, Aberta & ML Shozi, KwaZulu-Natal
Thabani Ngcobo	M	South Africa	Radial Basis Functions	N Hale, Stellenbosch
D'jeff Kanda Nkashama*	M	Democratic Republic of the Congo	Search and Learn Strategies for Game Play	A Courville, Montréal
Irene Claudia Noharinaivo*	F	Madagascar	Backward error for continued fractions	R Corless, Western & N Fillion, Simon Fraser
Berthine Nyunga Mpinda*	F	Democratic Republic of the Congo	Pricing American Options using Least Squares Monte Carlo method	P Mashele, North-West
Makuochukwu Felix Oguagbaka	M	Nigeria	Finite dimensional near vector space constructions using copies of Z_p for p a prime	KT Howell, Stellenbosch, J Böhm, Kaiserslautern & M Marais, Pretoria
Andriamahazosoa Dimbinantenaina Rabearivony	M	Madagascar	Gelfand theory for commutative Banach algebras	S Mouton, Stellenbosch
Haingoharijao Faniriniaina Ramandiamanana	M	Madagascar	The Rogers-Ramanujan Identities	D Ralaivaosaona, Stellenbosch
Emmanuella Sandratra Rambeloson	F	Madagascar	Linear realizability of matroids	J Shareshian, Washington
Andriatina Herilova Ranaivoson*	M	Madagascar	Robot learning by fictitious play and other game forms	S Utete, AIMS
Mohamed Salah Mohamed Alhaj	M	Sudan	The Dynamics of Malevolent Code in a Network of Computers: A Numerical Analysis Approach	VM Magagula, Eswatini, & SN Mungwe, Stellenbosch
Sebenele Sebentile Thwala*	F	Swaziland	Colliding Gravitational Plane Waves	C Stevens, Rhodes

MasterCard Foundation Scholar

January 2019 intake

STUDENTS ON THE JANUARY 2019 INTAKE

Full name	Gender	Country	Previous institution
Saumu Athman Abdallah	F	Kenya	Egerton
Tshenolo Thato Daumas	F	South Africa	Johannesburg
Ghislaine Flore Kabadiang Ngon	F	Cameroon	Yaoundé
Precious Blessing Khumalo	F	South Africa	Sefako Makgatho
Kiprono Elijah Koech	M	Kenya	Jomo Kenyatta
Katlego Lentswe	M	South Africa	North West
Andani Alex Madula	M	South Africa	Venda
Zizipho Maqokolo	F	South Africa	Rhodes
Karabo Vincent Mogotsi	M	South Africa	Sefako Makgatho
Willie Mohlongo	M	South Africa	Witwatersrand
Ramatsimela Lebogang Mphahlele	F	South Africa	Limpopo
Mzwakhe Mandlakhe Mthethwa	M	South Africa	Zululand
Kibidi Alexander David Neocosmos	M	South Africa	Rhodes
Menzi Meerfact Ngcamphalala	M	South Africa	Zululand
Yannick Harisson Nkocko Awountsa	M	Cameroon	Dschang
Star Aduratomi Oje	F	Nigeria	Ilorin
Zainab Olufunke Olukoga	F	Nigeria	Ilorin
Letaldi William Rathaga	M	South Africa	Limpopo
Alungile Sukwana	M	South Africa	Fort Hare

In addition to the two intakes of Structured Master's students, students on the BSc (Honours) in Mathematics with a focus in Biomathematics degree at SU also attend classes at AIMS, during the first two quarters of the calendar year. In 2019, seven Biomathematics Honours students took courses at AIMS.

The students enrolled on this programme were: Ms Nicola Brill; Ms Abigail De Villiers, Mr Dylan Geldenhuys, Mr Richard Gibbs, Ms Priyanka Kooverjee, Mr Stephan Louw and Mr Mandilakhe Mdekazi.

BSc Honours Students

GRADUATIONS
JANUARY 2018 INTAKE

AIMS South Africa acknowledged the success of its seventh group of January intake students at a special Recognition of Achievement Ceremony held on 14 November 2018 at its centre in Muizenberg. Fifteen students (including 13 South Africans) received their certificates. This was a joint ceremony with students from the AIMS-ESMT Industry Immersion Programme (IIP).

The invited speaker was Prof. Wulff Plinke, Founding Dean ESMT Berlin and Co-founder of the AIMS-ESMT IIP. His message to the students included guidelines on how to be successful managers and he ended by noting, "As alumni you should return to the school, help future alumni fellows and do all you can to be good citizens."

Prof. Jeff Sanders, Academic Director of AIMS South Africa presented the certificates to the January intake students and in his address said, "We are confident that you are going to succeed and we believe that you can go out and conquer the world."

Ms Munira Jowaheer was awarded the Ben and Mary Turok Scholarship Award for Excellent Achievement. This award was generously donated by Prof. Neil Turok, the founder of AIMS and Director of the Perimeter Institute for Theoretical Physics in Canada, in recognition of the very generous role Ben and Mary Turok have played in establishing the first AIMS Centre in South Africa and their continued interest and support of this Pan-African project.

For the student address, Ms Zakiena Hoossen said, "This has been an experience we will all never forget, we have learnt so much and together we have become a family and we are now all true Africans."

Students subsequently graduated at their respective university graduation ceremonies.
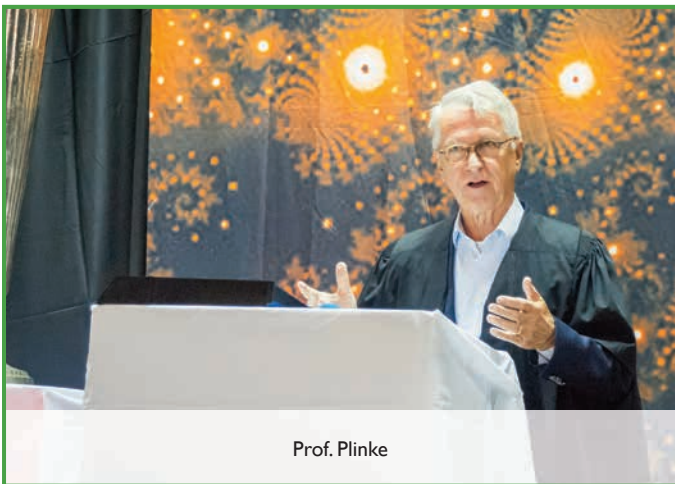
Prof. Plinke

Prof. Green, Ms Jowaheer and Prof. Sanders

Recognition of Achievement Ceremony 2018

AUGUST 2018 INTAKE

The 16th AIMS South Africa Graduation took place on 18 June 2019, 40 students (including 16 women) from 17 African countries were awarded a Master's in Mathematical Sciences.

The invited speaker at the event was Prof. Bernard Slippers, Founding and Current Director Future Africa, University of Pretoria who stated, "The opportunities ahead for everyone in this room are incredible. We live on a continent that is developing rapidly and where the opportunities to change people's lives are all around us."

Prof. Slippers went on to say, "There is a lot of theory to say that leadership and change emerge from within communities, those who are in positions of leadership are often only the manifestation of the group they lead. This theory has an important consequence for us all it means that the change in our society is not the responsibility of someone else. It is our responsibility, yours and mine."

The ceremony was officiated by Prof. Hester Klopper, Deputy Vice-Chancellor, Strategy and Internationalisation, SU; Prof. Maano Ramutsindela, Dean of the Faculty of Science, UCT and Prof. Pamela Dube, Deputy Vice-Chancellor, Student Development, UWC.
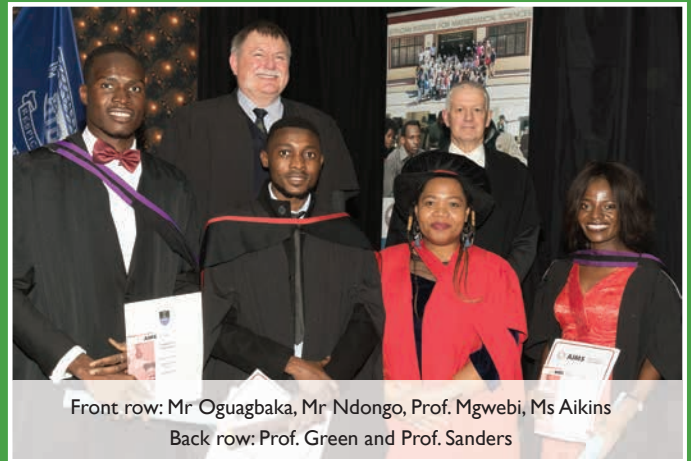
Front row: Mr Oguagbaka, Mr Ndongo, Prof. Mgwebi, Ms Aikins
Back row: Prof. Green and Prof. Sanders

AIMS ENDOWED SCHOLARSHIPS

In the ceremony AIMS Endowed Scholarships were awarded to students who have performed exceptionally well during the course of the year at AIMS. Prof. Thandi Mgwebi, Deputy Vice-Chancellor: Postgraduate Studies, Research, Innovation and Engagement, Tshwane University of Technology and AIMS South Africa Council Member presented the awards:

- The Stephen Hawking Scholarship, named in honour of the world-renowned physicist, went to Ms Doreen Atta Aikins from Ghana.

- The Martin Rees Scholarship, named in honour of Lord Martin Rees, was awarded to Mr Naftali Ndeapo Ndongo from Namibia.

- The Paul G. Allen Scholarship, endowed by the Microsoft co-founder and philanthropist, was awarded to Mr Makuochukwu Felix Oguagbaka from Nigeria.

Prof. Green, also gave a special word of thanks to the outgoing Academic Director Prof. Jeff Sanders. This was combined with special video messages from students and alumni who all thanked Prof. Sanders for being an incredible mentor, academic father and an inspiration to them all.

Prof. Slippers

AIMS South Africa Graduation 2019

POST AIMS: SUPPORT, OPPORTUNITIES AND ALUMNI
AIMS BURSARIES FOR STUDY AT SOUTH AFRICAN UNIVERSITIES

Through the generous support of the South African Department of Science and Technology (DST), and the ForExcellence partners, AIMS South Africa is able to offer matching half bursaries to its students who are accepted for Master's or PhD study at South African universities. This year AIMS South Africa awarded two such bursaries for Master's study. A full bursary was also awarded for a Master's in the AIMS Research Centre. Recipients are asterisked in the table below.

PROGRESS OF RECENT STUDENTS

Students	Gender	Origin	Institution	Programme/Position
Graduates from January 2018 intake				
Daniel Ajedamola Ajeleye	M	Nigeria	Still exploring opportunities	
Mhlanguleli Boqwana	M	South Africa	AIMS-ESMT IIP (2018)/Opti-Num, Johannesburg	Junior Consultant
Vongani Cyril Chabalala	M	South Africa	CSIR	Data Science Trainee
Zakiena Hoossen	F	South Africa	AIMS-ESMT IIP (2018)/	
Munira Zainab Jowaheer	F	South Africa	AIMS-ESMT IIP (2018)/GraiLabs	Data Science Consultant
Nadine Charmel May	F	South Africa	AIMS-ESMT IIP (2018)/ DotModus, Johannesburg	Junior Data Scientist and Software Engineer
Vukani Mhlongo	M	South Africa	Standard Bank Group	CIB Ops Intelligent Automation Learner
Sinenhlanhla Mtshali*	F	South Africa	Witwatersrand	Research Master's
Lubabalo Ndobe	M	South Africa	AIMS-ESMT IIP (2018)/ Hatch	Intern
Ylaney Ramlall	F	South Africa	AIMS-ESMT IIP (2018)/ Team EthiQal at Constantia Insurance	Team Administrator
Phumudzo Lloyd Seabe	M	South Africa	Oasis Crescent	Junior Quantitative Analyst
Phillemon Ntona Senoamadi	M	South Africa	Still exploring opportunities	
Tijani Ahmad Sulaimon	M	Nigeria	SACEMA, Stellenbosch	Research Master's
Wanda Tsewu	M	South Africa	AIMS-ESMT IIP (2018)/ Bowmans Law Firm	Reward Consultant
Tumisang Irvin Tshikare	M	South Africa	Discovery Limited	Data Scientist
Graduates from August 2019 intake				
Samah Mohammed Osman Mohammed Alamin Abdalrhaman	F	Sudan	Al-Neelain University	Lecturer
Ahlam Abdullah Adam Abdulgader	F	Sudan	Still exploring opportunities	
Doreen Atta Aikins	F	Ghana	AIMS-ESMT IIP (2019)/	
Sarah Akyena	F	Ghana	Still exploring opportunities	
Banan Mozher Mohammed Al-Tayeb	F	Sudan	Still exploring opportunities	
Godwin Asumadagwine	M	Ghana	Still exploring research opportunities	
Oluwapelumi Stephen Awolude	M	Nigeria	Radboud University, The Netherlands	PhD
Joram Divène Fransther Bakekolo	M	Republic of the Congo	Cape Town	Research Master's
Kevin Bosire Basita	M	Kenya	Still exploring opportunities	
Faith Neema Benson	F	Kenya	Still exploring opportunities	
Chabo Bobe	F	Botswana	AIMS-ESMT IIP (2019)/	
Abigail Priscilla Mahugnon Djossou	F	Benin	Universite de Sherbrooke	PhD
Naftali Ndeapo Indongo	M	Namibia	University of Namibia	Junior Lecturer
Salomon Kabenamualu Kabongo	M	Democratic Republic of the Congo	Still exploring opportunities	
Hewan Leul Kedane	F	Ethiopia	AIMS-ESMT IIP (2019)/	
Hillary Kiprop Kosgei	M	Kenya	Still exploring opportunities	
N'dah Jean Kouagou	M	Benin	AIMS-ESMT IIP (2019)/ Still exploring research opportunities	PhD
Seth Baah Kusi	M	Ghana	Still exploring opportunities	
Jane Mabesa	M	Lesotho	Still exploring opportunities	
Tsoanelo Irene Masilo	F	Lesotho	Still exploring opportunities	
Mbuso Khanyani Matfunjwa	M	Swaziland	Still exploring research opportunities	
Verediana Machele Mbalilo	F	Tanzania	Stella Maris University	Assistant Lecturer
Nouralden Mohammed*	M	Sudan	Witwatersrand	Research Master's
Veronica Mtonga	F	Zambia	AIMS-ESMT IIP (2019)/AB Bank (Zambia)	Intern
James Muchinga	M	Zambia	Still exploring opportunities	
Johane Andre Mutuque	M	Mozambique	Songo Higher Education Polytechnic Institute, Mozambique	Junior Lecturer
Mathews Mwansa	M	Zambia	AIMS-ESMT IIP (2019)/ EY Zambia	Intern
Joseph Protas Ndenda	M	Tanzania	Still exploring opportunities	
Thandokuhle Quinton Ndlovu	M	Swaziland	Still exploring opportunities	
Thabani Ngcobo*	M	South Africa	AIMS Research Centre/Stellenbosch	Research Master's
D'jeff Kanda Nkashama	M	Democratic Republic of the Congo	AIMS-ESMT IIP (2019)/ MKF Consulting, DRC	Intern
Irene Claudia Noharinaivo	F	Madagascar	AIMS-ESMT IIP (2019)/ AB Bank, Madagascar	Intern
Berthine Nyunga Mpinda	F	Democratic Republic of the Congo	AIMS-ESMT IIP (2019)/ MKF Consulting, DRC	Intern
Makuochukwu Felix Oguagbaka	M	Nigeria	Stellenbosch	Research Master's
Andriamahazosoa Dimbinantenaina Rabearivony	M	Madagascar	Stellenbosch	PhD
Haingoharijao Faniriniaina Ramandiamanana	M	Madagascar	Still exploring opportunities	
Emmanuella Sandratra Rambeloson	F	Madagascar	Still exploring opportunities	
Andriatina Herilova Ranaivoson	M	Madagascar	Still exploring opportunities	
Mohamed Salah Mohamed Alhaj	M	Sudan	Still exploring opportunities	
Sebenele Sebentile Thwala	F	Swaziland	Still exploring opportunities	

THE AIMS-ESMT INDUSTRY IMMERSION PROGRAMME

AIMS-ESMT IIP Recognition of Achievement Ceremony 2018

This year's AIMS-ESMT Industry Immersion Programme (IIP) ran at AIMS South Africa from 24 June to 2 August 2019. This was the programme's third year. The IIP is a partnership between AIMS and the European School of Management Technology (ESMT) Berlin with funding support from the German Federal Ministry for Economic Cooperation (BMZ) through DAAD, the German Academic Exchange Service. The programme provides business skills training for postgraduate mathematicians in order to enhance their employability.

In 2018, there were 25 candidates, including 14 women, on the programme. All successfully completed their internship placements and were given their certificates at the Recognition of Achievement Ceremony held on 14 November 2018.

This year candidates came from 14 countries across Africa and included 17 women out of a group of 28. Candidates on the IIP are drawn primarily from AIMS students and alumni and come from across the continent. However, this year, the programme was also advertised to postgraduate mathematicians from South Africa who were not AIMS alumni.

The programme ran in two phases: a coursework phase and an internship phase starting from August 2019. This was a change from the first two years where there had been three phases: five weeks of coursework, an internship for three months, and then a 2-week wrap up phase of courses back at AIMS South Africa. This year there were six weeks of course lectures, followed by the placement or internship phase. Amongst reasons for this change, is that in previous years some companies had indicated that they would prefer candidates to stay on once they had started an internship, rather than taking a 2-week break to complete training courses.

In the coursework phase of the programme, professors from ESMT Berlin gave lectures on a range of business subjects including Data Analytics in Business for Mathematicians, Organisational Behaviour and Culture, Finance and Accounting, Marketing and Strategy. The candidates also received training delivered by Marga Business Simulations, applying knowledge they had gained during the programme in a business simulation. Stellenbosch Careers Service and AIMS provided training to enhance the candidates' workplace readiness. There was also greater involvement of industry representatives in training around workplace readiness this year, with HR managers, and others from business, coming in to speak to candidates about the expectations of the workplace.

During the course phase, a competition was run in which teams had to come up with a plan for a start-up or a give-back programme. This was the second time the competition was run and as in the previous year it was judged by a start-up entrepreneur. The standard of the entries was very high. The focus of the groups was on give-back initiatives, from a women's computer literacy project to a bicycles for schools scheme. Activities around entrepreneurship also included a visit to the Stellenbosch Launch Lab where candidates heard about support provided for entrepreneurs.

Industry partners are key to the internship phase of the programme which follows the course phase. The programme benefits from the participation of companies across the continent that provide placements. Many of the participating companies have been members of the German Chambers of Commerce in East, West and Southern Africa. In addition, each year has seen the involvement of new companies, for example, a number of data analytics firms have been involved recently. In some cases, candidates have moved from internship roles to permanent positions. Some alumni of the programme have even been hired into management roles. As candidate placements come from across Africa, the IIP continues to seek to strengthen and expand the links with potential partner companies across the continent. In doing this, the programme also benefits from assistance with placements from the AIMS Network Industry Initiative.

AIMS-ESMT IIP Recognition of Achievement Ceremony 2019

The Recognition of Achievement Ceremony took place on 1 August. Commenting on this year's programme, Mr Nick Barniville, Associate Dean of Degrees, ESMT and IIP Programme Lead at ESMT noted that the faculty in Berlin have been very impressed with this year's group "particularly for their energy and excitement and the level of preparedness in the classroom."

> " The AIMS ESMT program helped prepare me to undertake a wonderful management internship in my home country with ThyssenKrupp, which is growing in Africa. I played a major role in managing their affairs in Ghana and West Africa by assisting the Regional Manager. I now manage the Ghana office and service business division for the West Africa region. "

– Mr Seth Afari-Boateng – Ghana (AIMS Ghana 2018)

> " I was very excited to follow the two graduates from the 2017 programme who interned with BBraun in Johannesburg, and I was given the chance to intern in my home country. My internship was as a data analyst assisting the team to understand and develop a new country marketing strategy. Now I am the full-time human capital and strategic development manager in Zimbabawe. "

– Ms Hariet Kudakwashe Marima- Zimbabwe (AIMS Senegal 2015)

DAAD BURSARIES FOR DOCTORAL STUDY

This year, DAAD generously awarded three scholarships within the new DAAD/AIMS agreement which was signed in 2018. According to the agreement in-region scholarships are awarded annually based on recommendations by AIMS to students from sub-Saharan Africa (excluding South Africa) for PhD studies in the Mathematical Sciences.

NEW AWARDS FOR 2019 WERE MADE TO:

Students	Gender	Country	University
Funmilayo Lydia Makinde	F	Nigeria	Cape Town
Kayode Olaleye	M	Nigeria	Stellenbosch
Valimbavaka Ranaivomanana	F	Madagascar	Stellenbosch

In addition to the new awards, scholarships of 14 DAAD scholars in their second and third year of study were renewed and six DAAD scholarships holders graduated in 2018.

ALUMNI PROFILES

MR DAVID NIYUKURI
AIMS South Africa 2015

Mr David Niyukuri grew up in Burundi in East Africa and matriculated from Lycee Sainte Famille de Kinama in Bujumbura. After completing a degree in Mathematics at the University of Burundi, he became a teaching-assistant in the Mathematics Department before joining AIMS South Africa.

In 2015, he returned to the University of Burundi as an assistant lecturer. In 2016 he was awarded an NRF-TWAS African Renaissance Doctoral Fellowship and is currently completing his PhD under the supervision of Prof. Wim Delva at SACEMA based at SU. His research focuses on developing new methodologies for HIV prevention studies based on understanding HIV transmission dynamics using bio-behavioural data and phylodynamics.

He a member of the Infection Control Africa Network which is affiliated with the Global Outbreak Alert and Response Network. In times of emergency, the World Health Organisation (WHO) calls upon this network to deploy volunteers with the right technical expertise and skills on the ground where and when they are needed the most. In May 2019, he was part of a team of epidemiologists who assisted the WHO in the Democratic Republic of the Congo to help guide its response to the ongoing Ebola outbreak.

He is also a member of the Next Einstein Forum's Community of Scientists and an alumnus of the Lindau Nobel Laureate Meeting of 2018.

MS MAISSON HASSAN
AIMS South Africa 2008

After completing a BSc at the University of Khartoum, Sudan, Ms Maisson Hassan joined AIMS South Africa in 2007. After graduating she went on to complete a Master's Degree in Nuclear Physics at UCT.

However her passion for handicrafts and social work changed her career path. She started a small business in jewellery design, Fandora, which is an enterprise that utilises local and recycled materials to create beautiful jewellery and accessories. It focuses on environmental education by organising recycling workshops at schools, cultural centres and prisons. Fandora also collaborates with local NGOs in organizing environmental awareness campaigns, women empowerment and prisoner's reintegration programess. Since inception in 2012, Fandora has trained, in cooperation, with the UN and other NGOs, over 400 women and prisoners.

"Instead of waiting for the perfect job, you can create your own. People may be sceptical about the buzz and actual impact of entrepreneurship, but I am a firm believer that it brings good to Africa. New business ideas are especially good for women. They can make their fortunes through non-traditional avenues, and secure livelihoods for their families and communities."

Ms Hassan has also been selected as a Sudan Ambassador to Women's Entrepreneurship Day which is a worldwide movement that carries on throughout the year in support of women entrepreneurs on every continent.

DR MESIAS ALFEUS
AIMS South Africa/SU, 2013

Dr Mesias Alfeus, completed an Honours in Financial Mathematics, jointly offered by AIMS South Africa and SU in 2013. After which he completed his Research Master's in Financial Mathematics at Stellenbosch University under the supervision of Prof. Peter Ouwehand.

"AIMS radically changed my perception of mathematical thinking. I became well rounded and confident on how to have a global influence in mathematics. Even though this programme was very intense, I was always encouraged to see everyone working under immense pressure, solving difficult and beautiful mathematical problems. At AIMS there was a wonderful engaging community where I had the opportunity to interact with people with deep mathematical love and who want to develop new mathematics for practical applications. Mathematics at AIMS is taught in a rigorous manner, and with enthusiasm. AIMS is the most attractive place for people who are passionate about mathematics and I really enjoyed the international atmosphere at AIMS."

Soon after completing his Master's he worked for the Namibian Financial Supervisory Authority, where he was responsible for statistical aspects in model calibrations. He then travelled to Australia to do his PhD in Quantitative Finance.

He is currently a researcher and lecturer at the University of Wollongong and his research focuses on developing stochastic techniques for modelling new risks phenomena and the challenging of old classical assumptions in financial markets.

RESEARCH

The Research Centre is supported by the Department of Science and Technology and the National Research Foundation, South Africa; the German Government (through the BMBF); the Alexander von Humboldt Foundation and the Robert Bosch Foundation. The Research Centre is now 11 years old and hosts researchers working in several focus areas under the theme Mathematical Modelling in a Multidisciplinary Context. Regular conferences and workshops are held in collaboration with other national and international institutions.

On 7 May 2019, AIMS South Africa welcomed Dr Dennis Ikpe, who was appointed as a Research Associate. His research interests include mathematical finance, stochastic control, stochastic filtering and probability theory. Dr Ikpe is currently appointed as a Visiting Professor at Michigan State University, Department of Probability and Statistics. Due to his commitments at Michigan State University he will spend four months per year (2 x 2 month blocks) at AIMS South Africa, over the next two years.

Dr Wilfred Ndifon has taken up a permanent position with the AIMS Network as Director of Research.

Mr Mhlasakululeka Mvubu was appointed for three months as a Data Science Intern in the Data Science Group.

RESIDENT RESEARCHERS

Dr Bubacarr Bah
German Research Chair
Applied mathematics and computer science

Dr Rejoyce Gavhi-Molefe
Resident Researcher
Computational mathematics: subdivision

Prof. Jeff Sanders
Senior Resident Researcher
Theoretical computer science

Prof. Bruce Bassett
Senior Resident Researcher
Cosmology and astrophysics

Prof. Barry Green
Senior Resident Researcher
Pure mathematics

Dr Simukai Utete
Senior Resident Researcher
Robotics

Prof. Ronnie Becker
Senior Resident Researcher
Mathematical finance

Prof. Cang Hui
South African Research Chair
Mathematical and Theoretical Biosciences (SU-AIMS)
Mathematical and theoretical physical biosciences

Dr Mario Santos
South African Research Chair in Cosmology with Multi-Wavelength Data (UWC-SAAO-AIMS)
Cosmology and astrophysics

Prof. Johan De Villiers
Senior Resident Researcher
Analysis and approximation theory

Dr Dennis Ikpe
Research Associate
Mathematical finance

Dr Yabebal Fantaye
AIMS ARETE Junior Chair
Cosmology, Big Data and machine learning

Dr Michelle Lochner
Resident Researcher
Theoretical computer science

ACHIEVEMENTS

- Dr Fantaye was nominated among the World Economic Forum Young Scientists Class of 2018, for his contributions to advancing the frontiers of science and passion for integrating scientific knowledge into society.

- Dr Lochner has been named one of five South African Principle Investigators for the Large Synoptic Survey Telescope (LSST).

- Prof. Hui, has successfully completed his 5-year reappraisal of the Tier 1 South African Research Chair (SARChI) in Mathematical and Theoretical Physical Biosciences (2014-2018). His 2019-2023 research programme has been approved by the NRF, which will allow his team to expand the research in ecological modelling and biodiversity informatics.

- Prof. Bassett and former PhD student, Dr Eli Kasai, are part of the international Dark Energy Survey (DES).

- Mr Mvubu, who was supervised by Prof. Becker and Dr Bah, was given a Kambule Master's Award Honourable Mention for his thesis titled: 'An Error Correction Neural Network for Stock Market Prediction.'

- Mr Sooknunan, who was supervised by Dr Lochner and Prof. Bassett, was awarded a President's PhD Scholarship from Imperial College London.

POSTDOCTORAL FELLOWS

Three new postdoctoral fellowships were awarded during the period under review,

Name	Citizenship	Gender	Start date to end date	Research Field	Supervisor/Host
Shankar Agarwal	India	M	1 April 2018 – 30 June 2020	Data Science	Dr B Bah
Alberto Cazzaniga	Italy	M	1 January 2017 – 31 December 2018	Algebraic Geometry, pure mathematics	Prof. B Green
Daniel Nickelson	Germany	M	1 February – 31 March 2020	Biomathematics	Prof. C Hui
Pietro Landi	Italy	M	1 January 2015 – 31 December 2018	Evolution of time of maturation, fleet and fish stock dynamics, evolution of diapause	Prof. C Hui
Guillaume Francois Raymond Latombe	France	M	1 August 2017 – 31 December 2018	Development of novel measures of biodiversity accounting for the contribution of rare and common species	Prof. C Hui
Henintsoa Onivola Minoarivelo	Madagascar	F	1 January 2016 – 31 December 2018	Ecological and evolutionary dynamics of mutualistic networks	Prof. C Hui
Olugbenga Oluseun Oluwagbemi	Nigeria	M	1 March 2018 – 28 February 2020	The development of mathematical and compartmental models for the control of HIV and for malaria elimination	Prof. C Hui
Dinna Ranirina	Madagascar	F	1 January 2019 – 31 August 2021	Data Science	Dr B Bah
James Gordon Rodger	South Africa	M	1 August 2017 – 31 December 2018	Understanding plant reproduction, especially the effects of plant density	Prof. C Hui
Wolf-Christian Saul	Germany	M	1 April 2017 – 1 March 2019	Novel associations and eco-evolutionary dynamics in invaded myrmecochore seed-dispersal networks in the fynbos biome	Prof. C Hui
Nirina Tahiridimbisoa	Madagascar	M	1 May 2017 – 30 April 2019	Cataloguing African Big Data by use of Machine Learning	Dr Y Fantaye
Milaine Tchamga	Cameroon	F	1 July 2018 – 30 June 2020	Biomathematics	Dr G Mazandu

POSTGRADUATE STUDENTS IN THE RESEARCH CENTRE

The number of students hosted by the AIMS Research Centre and supervised by AIMS resident researchers totalled 46 during the period under review. Twenty of these are doctoral students. The 15 students who have graduated are asterisked in the tables below.

PHD STUDENTS

No.	Name of student	Citizenship	Gender	Study duration	Supervisor/Host	Based at
1	David Attipoe	Ghana	M	1 February 2015 (ongoing)	Dr A Tambue	AIMS/UCT
2	Abdo Elnaser Mahmmod Degoot*	Sudan	M	10 March 2015 – April 2019	Dr F Chirove and Dr W Ndifon	UKZN
3	Emmanuel Dufourq*	South Africa	M	31 May 2015 – July 2019	Prof. B Bassett	AIMS/UCT
4	Nolwazi Dube	Swaziland	F	1 January 2018 (ongoing)	Dr T van Zyl & Dr B Bah	Wits
5	Lesiba Charles Galane	South Africa	M	1 January 2016 (ongoing)	Prof. R Lochowski	Limpopo
6	Buri Gershom	Uganda	M	6 September 2016 (ongoing)	Dr W Ndifon	AIMS/SU
7	Ephifania Geza	Zimbabwe	F	24 August 2015 – July 2019	Dr G Mazandu	AIMS/SU
8	Samantha Jones*	South Africa	F	1 January 2015 – July 2019	Prof. R Becker	UCT
9	Martha Ndeyapeuomagano Kamkuemah	South Africa	F	1 July 2016 (ongoing)	Prof. J Sanders	AIMS/SU
10	Dieudonne Kabongo Kantu	Congo	M	1 November 2015 (ongoing)	Prof. I Durbach	AIMS/UCT
11	Rock Stephane Koffi	Ivory Coast	M	1 February 2015 (ongoing)	Dr A Tambue	AIMS/UCT
12	Irene Kyomugisha	Uganda	F	1 March 2018 (ongoing)	Dr B Bah & Dr G Mazandu	AIMS/SU
13	Vitalis Kimutai Lagat	Kenya	M	1 May 2017 (ongoing)	Prof. C Hui	SU
14	Funmilayo Makinde	Nigeria	F	1 January 2019 (ongoing)	Dr G Mazandu	UCT
15	Jordan Masakuna	Democratic Republic of Congo	M	7 February 2016 (ongoing)	Dr S Utete & Dr S Kroon	AIMS/SU
16	Luthando Mayekiso	South Africa	M	23 May 2017 (ongoing)	Prof. C Hui	SU
17	Samuel Ofosu Mensah	Ghana	M	1 February 2019 (ongoing)	Dr B Bah	AIMS/SU
18	Rakgwahla Jessica Phalafala	South Africa	F	1 January 2018 (ongoing)	Dr B Bah	AIMS/SU
19	Ethan Roberts	South Africa	M	1 March 2018 (ongoing)	Dr N Oozeer & Prof. B Bassett	AIMS/UCT
20	Neil Watson	South Africa	M	1 January 2016 (ongoing)	Prof. I Durbach	UCT

RESEARCH MASTER'S STUDENTS

No.	Name of student	Citizenship	Gender	Study duration	Supervisor/Host	Based at
1	Curtly Blows	South Africa	M	1 January 2018 (ongoing)	Prof. B Bassett	AIMS/UCT
2	Gloria Burengengwa	Burundi	F	1 August 2018 (ongoing)	Prof. C Hui	SU
3	Blake Cunningham*	South Africa	M	1 February 2018 – July 2019	Prof. B Bassett	AIMS/UCT
4	Karimatou Djenabou	Cameroon	F	1 January 2017 (ongoing)	Prof. C Hui	SU
5	Gciniwe Dlamini*	South Africa	F	1 January 2015 – July 2018	Prof. I Durbach	UCT
6	Bantubakuthi Billy Halam*	South African	M	1 July 2018 - June 2019	Prof. I Durbach	UCT
7	Handre Janse van Vuuren	South African	M	1 January 2019 (ongoing)	Prof. C Hui	SU
8	Emmanuel Kabuga	Burundi	M	25 August 2017 (ongoing)	Prof. I Durbach & Dr B Bah	AIMS
9	Mmatlou Kubyana	South Africa	M	1 January 2018 (ongoing)	Prof. C Hui	SU
10	Gilbert Langat*	Kenya	M	1 January 2017 – April 2019	Prof. C Hui	SU
11	Funmilayo Lydia Makinde*	Nigeria	F	25 August 2017 – December 2018	Dr G Mazandu	AIMS
12	Juliana Thomasia Chakirath Marcos	Benin	F	1 October 2018 (ongoing)	Dr S Utete	AIMS/SU
13	Samuel Ofosu Mensah*	Ghana	M	25 August 2017 – December 2018	Dr G Mazandu & Dr S Utete	AIMS
14	Mhlasakululeka Mvubu*	South Africa	M	1 February 2017 – April 2019	Prof. R Becker	AIMS
15	Oarabile Hope Moloko	South Africa	M	1 January 2018 (ongoing)	Dr M Lochner & Prof. B Bassett	AIMS/UCT
16	Alice Nanyanzi*	Uganda	F	15 January 2017 – December 2018	Dr S Utete	AIMS
17	Thabani Ngcobo	South Africa	M	1 July 2019 (ongoing)	Dr N Hale & Dr M Sedjro	SU
18	Kayode Olaleye*	Nigeria	M	15 January 2017 – December 2018	Dr Y Fantaye	AIMS
19	Vhahangwele Cedrick Ramuada*	South Africa	M	1 February 2017 – December 2018	Prof. R Becker	AIMS
20	Rojo Fanamperana Randrianomentsoa	Madagascar	F	1 October 2018 (ongoing)	Prof. J Sanders	AIMS
21	Tremaine W Robertson	South Africa	M	1 January 2018 (ongoing)	Prof. C Hui	SU
22	Yethu Sithole	South Africa	M	1 May 2019 (ongoing)	Dr D Ikpe	UNISA
23	Kameel Sooknunan*	South Africa	M	1 January 2018 – July 2019	Dr M Lochner & Prof. B Bassett	AIMS/UCT
24	Asmaa Tbaeen	Sudan	F	1 October 2017 (ongoing)	Prof. C Hui	SU
25	Josephine Tetteh*	Ghana	F	15 January 2017 – April 2019	Prof. C Hui	SU

HONOURS STUDENT

No.	Name of student	Citizenship	Gender	Study duration	Supervisor/Host	Based at
1	Simon Mokhanda	South Africa	M	1 May 2019 (ongoing)	Dr D Ikpe	UNISA

RESEARCH INITIATIVES

DSI Workshop participants

SA-DISCnet

This is a training network in data science between universities in southern UK and partners in South Africa to help address the Sustainable Development Goals (SDG) and the South African National Development Plan priorities. The cornerstones of this network are the Science and Technology Facilities Council-funded 'Data Intensive Science Centre in SEPnet' (DISCnet) and AIMS South Africa.

In this reporting period the network provided funding for the Data Science Intensive (DSI) Programme which was an 8-week hands on data training programme. It started on 27 August and finished on 19 October 2018. The main goal of the DSI was that participants who successfully completed the programme should be able to add value to any data science team in the world. As a result, the emphasis of the programme was on practical skills in machine learning, big data and AI.

Participants come from seven different African countries. The programme was coordinated by Prof. Bassett and tutors on the programme were Dr Argawal, a postdoctoral fellow and Mr Dufourq, a PhD student in the AIMS South Africa Research Centre.

The invited lecturers included: Dr Haider Raza, a postdoctoral fellow, Dr Ana Matran-Fernandez, Artificial Intelligence Industry Fellow, both from the Institute for Analytics and Data Science, School of Computer Science and Electronic Engineering (CSEE), University of Essex; Dr Sudeep Das, a lead AI researcher from Netflix in the US and Dr Alkistis Pourtsidou from the School of Physics and Astronomy at the Queen Mary University of London.

The programme ended on 19 October 2018 with a final presentation and awards ceremony. The winner of the presentation was Dr Rajin Ramphul, and the overall top achiever of the DSI programme was Ms Annika Brundyn. Additional funding for the programme was provided by the German Research Chair at AIMS and the South African Radio Astronomy Observatory (SARAO).

Following the DSI programme, 11 of the students completed internships solving SDG-related problems with local organisations and companies. On 16 February 2019, the interns attended a one-day workshop held at the Alphen Hotel in Constantia. The wrap up event gave the interns an opportunity to give presentations about the work they have been doing. A discussion was held about the effectiveness of the DSI programme and areas for improvement for any future training sessions.

> "
> Participating as a mentor/lecturer in the DSI programme was an experience I will treasure. I have mentored at several data science training programmes in the US in the past, especially multiple years at the CDIPS initiative at UC Berkeley, and Galvanize Academy in San Francisco, but DSI stands out in a very special way. DSI was more diverse than any of the other programmes, and I felt that it was designed and structured very effectively so that the participants learned faster, picking up only the most relevant skills required to be successful data scientists.
>
> *– Dr Sudeep Das* "

SKA Research Fellowships

The South African Radio Astronomy Observatory (SARAO) spearheads South Africa's activities in the Square Kilometre Array Radio Telescope, commonly known as the SKA, in engineering, science and construction. In this reporting period SARAO appointed AIMS South Africa to host three data science research fellows. The three fellows appointed were Dr Ramphul, Dr Theophilus Ansah Narh and Mr Kameel Sooknunan.

The fellows made technical contributions to key SKA projects including RFI detection, anomaly detection and transient classification.

PRESENTATIONS AT WORKSHOPS AND CONFERENCES

Throughout the year, AIMS Researchers and students attended various conference and workshops to present their work. These included the following:

- The **Deep Learning Indaba** was held at SU from 9 to 14 September 2018. Various members of the AIMS Research Centre attended the event. Dr Bah was an Organising Committee member and arranged the Data Science Session. Dr Fantaye, gave a talk titled: 'Probabilistic Thinking' and Prof. Bassett attended the event. AIMS Research students who attended included Ms Phalafala and Mr Olaleye who were the winners of the Google Cloud Platform Award. Mr Masakuna, also attended the event.

- Dr Fantaye, attended the **UNESCO-NGO Liaison meeting** in Moscow from 25 to 28 November 2018. He went on a research visit to University of Rome Tor Vergata from 5 to 13 December and gave an invited talk at the 11th **International Conference on Computational and Methodological Statistics** held from 13 to 16 December at Pisa University.

- Prof. Bassett was part of a panel discussion at the **Computational Neuroscience Imbizo** held in January 2019.

- Dr Lochner, gave an invited talk titled: **'Big Data Challenges for Next Generation Astronomy'** at the Machine Learning Summer School held in January 2019 in Stellenbosch.

- Ms Marcos, attended the ICTP Workshop on **Rapid Prototyping of Internet of Things (IoT) Solutions for Science** held in Trieste, Italy from 21 January to 1 February 2019.

- From 15 to 25 February 2019, Dr Bah visited Dr Edinah Ngang at the Applied Mathematics and Statistics Department of John Hopkins University, Baltimore and also attended the **February Fourier Talks (FFT2019)** held from 21 to 22 February 2019 at the Mathematics Department of the University of Maryland, College Park.

- Mr Masakuna presented a poster on 'A Coordinated Search Strategy for Solitary Robots' at the **IEEE International Conference on Robtic Computing,** held in Naples, Italy, from 25 to 27 February 2019.

- **DataCon 2019** was held at the Cape Town International Convention Centre from 13 to 14 March 2019. Prof. Bassett was one of the guest speakers. He hosted two think tank sessions on 'Bridging the gulf between AI Research & Production Data Science.'

- Dr Lochner gave an invited talk at the conference **'Cosmology on Safari'**, an international cosmology conference in Kwazulu-Natal held from 3 to 9 March 2019. The conference was well attended by both local and international researchers. Her talk was titled 'Cosmology with LSST' about her work on the Large Synoptic Survey Telescope.

- The **43rd SANUM Conference** took place at the University of Pretoria from 27 to 29 March 2019. Dr Bah was a plenary speaker and chaired a special Data Science session. Ms Kyomugisha, gave a presentation titled: 'Machine Learning in Genomics Research.'

- Prof. Bassett was a keynote speaker at the **Deep Learning Indaba X** which was held in Durban from 14 to 17 April 2019. He gave a talk titled: 'An AI Play In 3 Parts: Jacuzzis, Research and AGI.'

- Prof. Bassett formed part of the DST South African delegation to participate in the **3rd Meeting of the BRICS Working Group on ICT and HPC** held from 12 to 15 May 2019 in Foz do Iguaçu, Brazil.

- Dr Bah, attended the **'Approximation, sampling, and compression in high dimensional problems'** workshop held at the Isaac Newton Institute for Mathematical Science in Cambridge, UK from 17 to 21 June 2019.

- In June, Dr Ikpe presented a talk at Lagos State University on 'Climate change Finance and Risk Management' and from 10 to 11 June 2019 he attended and gave a talk at the Federal University of Technology Akure during the **World Academy of Sciences (TWAS) Young Affiliates Network (TYAN) International Thematic Workshop and 1st African Symposium on Big Data, Analytics and Machine Intelligence for Financial, Health and Environmental Inclusion in Developing Countries.**

- Prof. Bassett was one of the scientific organisers of the **Astroinformatics Conference** in Caltech held from 24 to 27 June 2019, where the formation of the International AstroInformatics Association (IAIA) was announced. Prof. Bassett is part of the executive committee of the IAIA.

- On 9 July 2019, Dr Bah gave a plenary talk at the **Sampling Theory and Applications (SampTA) 2019** conference held at the University of Bordeaux, France. The title of his talk was 'Combinatorial Compressed Sensing.'

- Dr Bah co-organised a 5-day workshop on **Data Analysis, Theory and Applications (DATA2019)** with Dr Olivier Pamen at AIMS Ghana. The workshop which was held at AIMS Ghana from 28 July to 3 August 2019, was jointly funded by the two German Research Chairs. There were 65 participants from 15 African countries, mostly researchers and academics. There were two lecturers from academia and three from industry, who presented on the theory and applications of Data Science. Four plenary talks covered topics ranging from Statistics to Data Science to Financial Mathematics.

- The **African Women in Mathematics Conference** was held from 2 to 5 July 2019 at SU. Attendees from AIMS South Africa included Ms Oje, Ms Kyomugisha, Ms Makinde, Ms Daumas, Ms Kabadiang, Ms Olukoga, Ms Randrianomentsoa and Ms Marcos. Ms Randrianomentsoa gave a talk on her work at AIMS: 'Formalizing Auctions'. Dr Tchamga, representing the African Women in Mathematics Association gave a talk titled: 'Overview of analysis models in genomic medicine.'

Prof. Bassett, DataCon 2019

SEMINARS

The Journal Club is the internal forum for presentation of research in the Research Centre. The idea is that researchers, research visitors and research students present on work in progress. Blackboard talks are encouraged.

During the reporting period, the Journal Club hosted several talks, from AIMS Research Centre members and visitors, as well as from external speakers. The talks covered a wide range of disciplines and subject areas. A sample of talks is given below.

The sessions opened in September 2018, with a talk by Dr Dimbinaina Ralaivaosaona from SU on his research on Conditioned Galton-Watson Trees. In October, talks included a presentation by Mr Benji Meltzer, CTO and Co-Founder of Aerobotics. He gave a talk entitled 'Learning when labels are expensive: weak and partial supervision', highlighting some of the computer vision and machine learning problems that underpin the work done by Aerobotics. The talks also included researchers from across the AIMS network. In October 2018, during a research visit to AIMS, Ms Augustina Frimpong, from the University of Ghana, spoke on 'Phenotypic analysis of T cell diversity in paediatric malaria infection'. Dr Marc Sedjro, German Research Chair at AIMS Tanzania made a research visit to AIMS during which he gave a talk entitled 'On some asymmetric flows'.

A number of AIMS tutors spoke during the reporting year: Dr Kenneth Dadedzi, spoke on 'The ancestral matrix of rooted trees'; Dr Taboka Chalebgwa, presented on 'Algebraic values of certain entire functions of order less than one'; Dr Elbasher Ahmed gave a talk on 'Axial segregation of granular flows in rotating drums'.

In April 2019, Dr François Renaud, who was visiting UCT, gave an introduction to category theory, in a talk entitled, 'Mathematics with categorical aesthetics'. On 16 April 2019, Ms Samar Elsheikh, a PhD student in the Computational Biology Group at UCT spoke on her research in bio-informatics in a talk entitled, 'Genetic Association Study of Brain Connectivity Changes for Alzheimer's Disease'.

Lecturers for the Structured Master's programme also gave talks while at AIMS. These included Prof. Stefan Jaehnichen, from Technical University Berlin, who spoke in March 2019 on 'Comparing models of centralised and de-centralised accounting' and Dr Eric Andriantiana, from Rhodes University, who spoke on 'Extremal trees with fixed degree sequence'.

Dr Fantaye gave two talks in one session, speaking about 'A beautiful theory', in a talk on his research in differential geometry. In the second part of his session, he spoke about 'High performance and cloud computing'.

Cosmology Group Seminars:

- On 21 January 2019, Prof. John Skilling, Director of Maximum Entropy Data Consultants Limited and affiliated to the University of Cambridge, gave two talks titled: 'Bayes!' and 'Searching in Big Spaces'.

- On 8 August 2019, Dr Theo Narh, an AIMS SKA Research Fellow gave a talk titled: 'Using LSTMs with Variational Autoencoders to model time series with missing data'.

Data Science Group Seminars:

- On 5 April 2019, Mr Rendani Mbuvha, a PhD candidate in Artificial Intelligence at the University of Johannesburg, gave a talk titled: 'Automatic Relevance Determination Bayesian Neural Networks for Credit Default Modeling.'

Other Seminars:

- On 5 September 2018, Dr Ogujiuba Kanayo Department of Statistics, UWC gave a seminar to AIMS Research Master's and PhD students titled: 'The how to's of research.'

- On 15 and 16 October 2018, Prof. Alan Beardon gave two seminars which were titled: 'Pell's Diophantine equation $X^2-NY^2 = 1$' and 'The negative Pell equation $X^2 -NY^2 = -1$'.

- On 17 May 2019, Dr Ikpe, gave a talk titled: 'A Lévy Regime-Switching Temperature Dynamics Model for Weather Derivatives.' The talk formed part of a weekly seminar series hosted by CoE-MaSS and was screened on Vidyo.

- On 27 June 2019, there were two short talks. The first was by Prof. Lijun Zhang, College of Mathematics and Systems Science, Shandong University of Science and Technology, China. He gave a talk titled: 'Traveling wave solutions to a class of higher-order nonlinear wave equations.' The second was by Dr Anum Shafiq, International Institute for Symmetry Analysis and Mathematical Modelling, Department of Mathematical Sciences, North-West University, Mafikeng Campus. His talk was titled: 'Third-grade fluid over a vertical exponentially stretched plate: Statistical analysis.'

Prof. Jaehnichen

Dr Ikpe

RESEARCH PROFILES

DR DENNIS IKPE

Research Associate

Dr Dennis Ikpe is currently a research associate at AIMS South Africa. His current research interests are on infinite horizon market models finance, insurance, agricultural economics, data science approaches to climate change finance and weather index insurance, probability theory, stochastic analysis, and optimal stopping problems. He has supervised seven masters and two PhD students to graduation.

He was a Presidential Scholar at the University of Michigan, USA, conducting research on information-based models for pricing credit risky assets and the use of Webwork in designing mathematics curriculum. He is a recipient of the prestigious Thuthuka Grant (NRF Rating Funding Track for 2019-2021) by the NRF.

Before joining AIMS South Africa, Dr Ikpe was a visiting professor at Michigan State University, Department of Probability and Statistics, where he taught Statistical Methods and Probability theory to both undergraduate and graduate students and graduated one Master's student. Dr Ikpe taught several courses as a senior lecturer in the Mathematical Sciences Department at the University of South Africa, including Numerical Analysis, Stochastic Analysis, Optimal Control, and Financial Risk Management and served as a supervisor to honours students, Master's and PhD students in the area of Financial Mathematics and Risk Management. Dr Ikpe worked as a quantitative analyst for Stanbic IBTC Bank in Lagos, Nigeria. He was the founding director of Maths Edge, a flagship project at the University of South Africa aimed at demystifying and creating awareness on the real-life applications of Mathematics to young students.

Dr Ikpe earned his PhD from UCT, a BSc Honors in Mathematics from the the Michael Okpara University of Agriculture Umudike, a Second BSc. Honors in Advanced Mathematics of Finance from the University of the Witwatersrand, a Master's in Stochastic Analysis from the University of South Africa, and a Certificate in Technologies and Design of Online Instructional Material from the University of Maryland.

"Working at AIMS has set me on the path of realising my dream of creating a community of young African researchers with strong expertise in mathematics, data science, climate change modelling, and finance"

MR GERSHOM BURI

PhD Student

Mr Gershom Buri is originally from Uganda, where he completed his undergraduate studies in Mathematics with Education in 2013. He then joined AIMS Ghana, graduating in 2014. Under supervision of Dr Wilfred Ndifon, as the pioneering student of the AIMS Ghana research centre, he completed a Research Master's in computational Biology in 2016. He then registered for a PhD in applied mathematics at Stellenbosch University with support from SACEMA/NRF and the AIMS South Africa Research centre.

His research is focused in computational immunology where particularly, his main goal is to mathematically quantify the aging of the immune system, with potential applications in cancer therapy and personalised medicine.

During his stay at AIMS Mr Buri has been involved in many activities, including teacher training with AIMSSEC, volunteer tutoring of students from the townships, coordinating activities of the National Science Week, Africa Code Week and the Deep Learning Indaba X workshop.

"It was only at AIMS that it all made sense. Having spent some time at three AIMS centres, I have been fortunate to sit in on many classes spanning diverse mathematical concepts and taught by leading experts in the field. This enabled me to make connections between areas that I previously perceived as unrelated, leading to greater appreciation and curiosity for Mathematics. Besides academics, I have benefited from life-long connections from across the world and have gained and honed important social and leadership skills. I will definitely leave AIMS feeling whole."

MS FUNMILAYO LYDIA MAKINDE

PhD Student

Ms Funmilayo Lydia Makinde, from Nigeria, completed her BSc Honours in Mathematical Science at the University of Jos, Nigeria. In 2016, she enrolled on the structured Master's degree programme at AIMS South Africa. After graduation she was awarded an AIMS Research Master's bursary. Her Research Master's thesis was titled 'Systems level cancer disease target identification using tumour micro environment dynamics' and she graduated with distinction from SU in 2018.

She was awarded a DAAD In-Region Scholarship is currently busy with a PhD in Bioinformatics at UCT in collaboration with AIMS South Africa Research Centre, under the supervision of Dr Gaston K Mazandu. Her doctoral research is based on designing a meta-analysis enhanced machine intelligence tool for automated clinical planning and decision-making based on genomics knowledge.

In addition to focusing on academic research, Ms Makinde has been involved in various activities, including coordinating the STEM Workshop for scholars at AIMS in 2018 and mentoring on the AIMS Women in Stem (AIMSWIS) mentoring programme. She is also a committee member of AIMSWIS.

"AIMS has made me a better person, a better researcher and a great leader through the amazing experience and inspirations gained from the AIMS community."

VISITING RESEARCHERS

In 2018/19 the Research Centre hosted 27 visiting researchers. During their stay, visiting researchers collaborate with the AIMS resident researchers, interact with AIMS students and give talks in the AIMS Journal Club. Some of the visiting researchers are participants in the conferences or workshops held at AIMS.

No	Name	Country of origin	Gender	Affiliation	Research Area	Dates of visit
1	Abdo Elnaser Degoot	Sudan	M	University of KwaZulu–Natal	Applied Mathematics	6 July – 14 August 2018
2	Zacharie Djoufack	Cameroon	M	University of Dschang	Physics	31 October – 21 December 2018
3	Nolwazi Dube	Swaziland	F	University of the Witwatersrand	Pure Mathematics	2 June – 20 July 2018
4	Ian Durbach	South Africa	M	St Andrews University	Multi–criteria optimisation	16 July – 16 August 2019
5	Yae Ulrich Gaba	Benin	M	Institut de Mathematiques et de Sciences Physiques (IMSP)	Topology	3 May – 31 July 2019
6	Lesiba Galane	South Africa	M	University of Limpopo	Financial Mathematics	7 – 13 March 2019
7	Rhoda Hawkins	United Kingdom	F	University of Sheffield	Theoretical Physics	22 – 26 July 2019
8	Kerstin Jordaan	South Africa	F	University of Pretoria	Special functions; orthogonal polynomials; approximation theory	30 April – 5 My 2019
9	Peter Jung	Germany	M	Technical University Berlin	Data Science	15 – 26 October 2019
10	Abdul Hamid Kara	South Africa	M	University of the Witwatersrand	Differential Equations	14 – 21 December 2019
11	Rafal Marcin Lochowski	Poland	M	Warsaw School of Economics, Poland	Stochastic processes and their application in Mathematical finance	7 – 13 March 2019
12	Dephney Mathebula	South Africa	F	University of Venda	Biomathematics	20 June – 7 July 2018
13	Olivier Menoukue Pamen	Cameroon	M	AIMS Ghana	Financial Mathematics	8 – 23 November 2018
14	Farai Mhlanga	South Africa	M	University of Limpopo	Financial Mathematics	7 – 13 March 2019
15	Hassan Mohamed	Sudan	M	Sudan University of Science & Technology	Non–Newtonian Fluid Dynamics	29 July – 20 September 2019
16	Mogtaba Mohammed	Sudan	M	University of Gezira	Homogenization of Stochastic linear Hyberbolic equations	31 May – 16 August 2019
17	Zouhair Mouayn	Morocco	M	Sultan Moulay Slimane University	Harmonic Analysis & Partial Differential Equations	1 – 30 October 2018
18	Osman Musa	Unknown	M	Technical University Berlin	Machine Learning	14 – 26 October 2018
19	Wilfred Ndifon	Cameroon	M	AIMS–NEI	Population dynamics of CD4+ T cells	6 July – 23 August 2018
20	Calistus Ngonghala Ngeh	Cameroon	M	University of Florida	Biomathematics	2 March – 14 April 2019
21	Motee Phorah	South Africa	M	Tshwane University of Technology	Cosmology	21 – 25 January 2019
22	Marc Sedjro	Togo	M	AIMS Tanzania	Applied Mathematics	26 October – 10 November 2018
23	Anum Shafiq	Unknown	F	North–West University	Applied Mathematics	10 – 28 June 2019
24	Antoine Tambue	Cameroon	M	Department of Mathematics, University of Bergen, Norway	Applied Mathemtics and Fluid Dynamics	5 – 25 July 2018
25	Stephan Waldchen	Germany	M	Technical University Berlin	Physics	15 – 26 October 2018
26	Lijun Zhang	China	F	Shandong University of Science and Technology	Differential Equations	10 – 28 June 2019
27	Hans–Georg Zimmermann	Germany	M	Fraunhofer IBMT	System Identification and neural networks	16 October – 2 November 2018, 18 January – 6 March 2019

LIST OF PUBLICATIONS

Authors	Title	Year	Source title	Volume	Issue	Art.No.	Pages
Up to August 2019 (45)							
Adabor ES, Acquaah-Mensah GK	Machine learning approaches to decipher hormone and HER2 receptor status phenotypes in breast cancer	2019	Briefings in Bioinformatics	20	2		504-514
Bingham J, Landi P, **Hui C**	Prejudice, privilege, and power: Conflicts and cooperation between recognizable groups	2019	Mathematical Biosciences and Engineering	16	5		4092-4106
Böhm J, **Marais MS**, Steenpaß A	The classification of real singularities using SINGULAR Part III: Unimodal singularities of corank 2	2019	Journal of Symbolic Computation.				
Broussard A, Gawiser E, Iyer, K, Kurczynski P, Somerville RS, **Dave R**, Finkelstein S, Jung I, Pacific C	Star Formation Stochasticity Measured from the Distribution of Burst Indicators	2019	Astrophysical Journal	873	1		
Dark Energy Survey Collaboration (**Bassett B** et al).	Cosmological Constraints from Multiple Probes in the Dark Energy Survey	2019	Physical Review Letters	122	17	171301	
Dark Energy Survey Collaboration (**Bassett B** et al).	First cosmology results using Type IA supernovae from the dark energy survey: effects of chromatic corrections to supernova photometry on measurements of cosmological parameters.	2019	Monthly Notices of the Royal Astronomical Society	485	4		5329-5344
Dark Energy Survey Collaboration (**Bassett B** et al).	First Cosmology Results Using Type Ia Supernovae from the Dark Energy Survey: Photometric Pipeline and Light-curve Data Release	2019	Astrophysical Journal	847	1	106	
Dark Energy Survey Collaboration (**Bassett B** et al).	First Cosmology Results Using SNe Ia from the Dark Energy Survey: Analysis, Systematic Uncertainties, and Validation	2019	Astrophysical Journal	874	2	150	
Dark Energy Survey Collaboration (**Bassett B** et al).	First Cosmology Results using Type Ia Supernovae from the Dark Energy Survey: Constraints on Cosmological Parameters	2019	The Astrophysical Journal Letters	872	2	L30	9pp
Degoot AM, **Adabor ES**, Chirove F, **Ndifon W**	Predicting Antigenicity of Influenza A Viruses Using biophysical ideas	2019	Scientific Reports	9	1	10218	
Djoufack ZI, Nguenang, JP, Kenfack-Jiotsa A	Quantum breathers and modulational instability in quantum zigzag spin chains with alternative combination ferromagnetic and antiferromagnetic interactions in an external magnetic field	2019	Journal of Magnetism and Magnetic Materials	469		165385	
Duque J, Buzzelli A, **Fantaye Y**, (...), Schwartzman A, Vittorio N	Point source detection and false discovery rate control on CMB maps	2019	Astronomy and Computing	28		100310	
Durbach IN, Montibeller, G	Behavioural Analytics: Exploring judgments and choices in large data sets	2019	Journal of the Operational Research Society	70	2		255-268
Espinaze MPA, **Hui C**, Waller L, Dreyer F, Matthee S	Parasite diversity associated with African penguins (Spheniscus demersus) and the effect of host and environmental factors	2019	Parasitology				
Espinaze MPA, **Hui C**, Waller L, Matthee S	The efficacy of a modified Berlese funnel method for the extraction of ectoparasites and their life stages from the nests of the African Penguin Spheniscus demersus	2019	Ostrich				
Etémé, AS, **Tabi CB**, Mohamadou A	Firing and synchronization modes in neural network under magnetic stimulation	2019	Communications in Non Linear Science and Numerical Simulations	72			432-440
Gavhi-Molefe MR, De Villiers J	On Interpolatory Subdivision Symbol Formulation and Parameter Convergence Intervals	2019	Journal of Computational and Applied Mathematics	349			354-365
Gouba L, Govaerts J	The 1 + 1 dimensional Abelian higgs model revisited: Non-perturbative Dynamics in the Physical Sector	2019	Proceedings of the 5th International Workshop on Contemporary Problems in Mathematical Physics, COPROMAPH 2007				159-163
Gouba L, Govaerts J, Hounkonnou MN	The 1 + 1 dimensional Abelian higgs model revisited: Physical sector and solitons	2019	Proceedings of the 5th International Workshop on Contemporary Problems in Mathematical Physics, COPROMAPH 2007				164-169
Hui C, Richardson DM	Network Invasion as an Open Dynamical System: Response to Rossberg and Barabas	2019	Trends in Ecology and Evolution	34	5		386-387
Hui C, Richardson DM	How to Invade an Ecolocical Network	2019	Trends in Ecology and Evolution	34	2		121-131
Keet J-H, Ellis, AG, **Hui C**, Le Roux JJ	Strong spatial and temporal turnover of soil bacterial communities in South Africa's hyperdiverse fynbos biome	2019	Soil Biology and Biochemistry	136		107541	
Koffi, RS, Tambue, A	A Fitted Multi-point Flux Approximation Method for Pricing Two Options	2019	Computational Economics				
Latombe G, Canavan S, Hirsch H, (...), **Hui C,** Yannelli FA, Richardson DM	A four-component classification of uncertainties in biological invasions: implications for management	2019	Ecosphere	10	4	e02669	
Latombe G, Roura-Pascua, N, **Hui C**	Similar compositional turnover but distinct insular environmental and geographical drivers of native and exotic ants in two oceans	2019	Journal of Biogeography				
MacFadyen S, **Hui C**, Verburg PH, Van Teeffelen AJA	Spatiotemporal distribution dynamics of elephants in response to density, rainfall, rivers and fire in Kruger National Park, South Africa	2019	Diversity and Distributions	25	6		880-894
Masakuna JF, Utete SW, Kroon S.	A Coordinated Search Strategy for Solitary Robots in Proceedings	2019	3rd IEEE International Conference on Robotic Computing, IRC 2019			8675622	433-434
Mazandu GK, Kyomugisha I, Geza E, Seuneu M, **Bah B,** Chimusa ER	Designing Data-Driven Learning Algorithms: A Necessity to Ensure Effective Post-Genomic Medicine and Biomedical Research	2019	Machine Learning in Medicine and Biology				
Mbongwa NA, **Hui C**, Pulfrich A, von der Heyden S	Every beach an island - deep population divergence and possible loss of genetic diversity in Tylos granulatus, a sandy shore isopod	2019	Marine Ecology Progress Series	614			111-123
Mnika K, **Mazandu GK**, Jonas M, Pule GD, Chimusa ER, Hanchard NA, Wonkam A	Hydroxyurea-Induced miRNA Expression in Sickle Cell Disease Patients in Africa	2019	Fronteirs in Genetics	10			
Mukam JD, **Tambue A**	Optimal strong convergence rates of numerical methods for semilinear parabolic SPDE driven by Gaussian noise and Poisson random measure	2019	*Computers and Mathematics with Applications*				

Authors	Title	Year	Source title	Volume	Issue	Art.No.	Pages
Muller E, Shock JP, Bender A, Kleeberger J, Hogen T, Rosenfelder M, **Bah B**, Lopez-Rolon A	Outcome prediction with serial neuron-specific enolase and machine learning in anoxic-ischaemic disorders of consciousness	2019	Computers in Biology and Medicine	107	February		145-152
Nnakenyi C, Traveset A, Heleno R, Minoarivelo H, **Hui C**	Fine-tuning the nested structure of pollination networks by adaptive interaction switching, biogeography and sampling effect in the Galápagos Islands.	2019	Oikos Journal				
Ogden NH, Wilson JRU, Richardson DM, **Hui C**, (...), Saul W-C, Pulliam JRC	Emerging infectious diseases and biological invasions: A call for a One Health collaboration in science and management	2019	Royal Society Open Science	6	3	181577	
Pico-Perez M, Ipser J, **Taylor P**, Alonso P, Lopez-Sola C, Real, E, Segalas C, Roos A, Menchon, JM, Stein DJ, Soriano-Ma, C	Intrinsic functional and structural connectivity of emotion regulation networks in obsessive-compulsive disorder	2019	Depression and anxiety	36	2		110-120
Rafieferantsoa M, **Davé R**, Naab T	MUFASA: Time-scales for HI consumption and SFR depletion of satellite galaxies in groups	2019	Monthly Notices of the Royal Astronomical Society	486	4		5184-5196
Rivi M, **Lochner M**, Balan ST, Harrison I, Abdalla FB	Radio galaxy shape measurement with Hamiltonian Monte Carlo in the visibility domain	2019	Monthly Notices of the Royal Astronomical Society	482	1		1096-1109
Shi P, Zhao L, Ratkowsky DA, (...), **Hui C**, L, B-L.	Influence of the physical dimension of leaf size measures on the goodness of fit for Taylor's power law using 101 bamboo taxa	2019	Global Ecology and Conservation	19		e00657	
Steidinger BS, Crowther TW, Liang J, (...) **Hui C**, Zhu Z-X, Zo-Bi IC	Climatic controls of decomposition drive the global biogeography of forest-tree symbioses	2019	Nature	569		7756	404-408
Tambue A, Mukam JD	Strong convergence of the linear implicit Euler method for the finite element discretization of semilinear SPDEs driven by multiplicative or additive noise	2019	Applied Mathematics and Computation	346			23-40
Vafaei Sadr A, Vos EE, Bassett BA, (...), **Oozeer N, Lochner M**	DeepSource: Point source detection using deep learning	2019	Monthly Notices of the Royal Astronomical Society	484	2		2793–2806
Vicente JR, Kueffer C, Richardson DM, Vaz, AS, Cabral JA, **Hui C**, et al	Different environmental drivers of alien tree invasion affect different life-stages and operate at different spatial scales	2019	Forest Ecology and Management	433			263-275
Yu ., Shi, P, **Hui C**, (...), Zhang Q, Feng C	Effects of salt stress on the leaf shape and scaling of Pyrus betulifolia Bunge	2019	Symmetry	11	8	991	
Zhao Z., **Hui C**., Plant RE, (...), Li Z., Carey JR	Life table invasion models: spatial progression and species-specific partitioning	2019	Ecology	100	5	e02682.	
Zhao ZH, **Hui C**, Reddy GVP, Ouyang F, Men XY, Ge F	Plant Species Richness Controls Arthropod Food Web: Evidence From an Experimental Model System	2019	Annals of the Entomological Society of America	112	1		27-32

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Authors	Title	Year	Source title	Volume	Issue	Art.No.	Pages
Adabor E, Ndifon W	Bayesian inference of antigenic and non-antigenic variables from haemagglutination inhibition assays for influenza surveillance	2018	Royal Society Open Science	7			180113
Agarwal S, Dave R, **Bassett BA**	Painting galaxies into dark matter haloes using machine learning	2018	Monthly Notices of the Royal Astronomical Society	478	3		3410-3422
Broeckhoven C, De Kock C, **Hui, C**	Sexual dimorphism in the dermal armour of cordyline lizards (Squamata: Cordylinae)	2018	BIOLOGICAL JOURNAL OF THE LINNEAN SOCIETY	125	1		30-36
Broeckhoven C, Mouton P, Lle Fras N, **Hui C**	Proximate causes of variation in dermal armour: insights from armadillo lizards	2018	Oikos	127	10		1449-1458
Camilo F, Scholz P, Serylak M, ….. **Oozeer N**, et al.	Revival of the Magnetar PSR J1622-4950: Observations with MeerKAT, Parkes, XMM-Newton, Swift, Chandra, and NuSTAR	2018	Astrophysical Journal	856	2	180	
Degoot AEM, Chirove F, Ndifon W	Trans-allelic model for prediction of peptide: MHC-II interactions	2018	Frontiers in Immunology	9			1410
Di Valentino E, Melchiorri A, Fantaye Y, Heavens A	Bayesian evidence against the Harrison-Zel'dovich spectrum in tensions with cosmological data sets	2018	Physical Review D	98	6		
Diedericks G, Henriques, R, von der Heyden S, Weyl OLF, **Hui C**	Sleeping with the enemy: introgressive hybridization in two invasive centrarchids	2018	Journal of Fish Biology	93	2		405-410
Djoufack ZI, Tala-Tebue E, Fotsa-Ngaffo F, Tsajio ABD, Kapche-Tagne F	Quantum breathers associated with modulational instability in 1D ultracold boson in optical lattices involving next-nearest neighbor interactions	2018	Optik	164			575-589
Djoufack ZI, Tala-Tebue E, Nguenang J.-P	Quantum breathers and intrinsic localized excitation associated with the modulational instability in 1D Bose–Hubbard chain	2018	Communications in Nonlinear Science and Numerical Simulation,	69			134-147
Dufourq E, **Bassett BA**	Text Compression for Sentiment Analysis via Evolutionary Algorithms	2018	2017 Pattern Recognition Association of South africa and Robotics and Mechatronics (PRASA-ROBMECH)				116
Ebert PA, Smith M, **Durbach I**	Lottery judgments: A philosophical and experimental study	2018	Philosophical Psychology	31	1		110-138
Ekengoue CM, **Kenfack SC**, Fotué AJ, Fobasso MFC, Bawe GN, JR, Fai LC	Decoherence of cooled and trapped polariton under magnetic field	2018	Computational Condensed Matter	14			106-113
Finlator K, Keating L, Oppenheimer BD, **Dave R**, Zackrisson E.	Reionization in Technicolour	2018	Monthly Notices of the Royal Astronomical Society	480	2		2628-2469
Gallien L, Landi P, **Hui C**, Richardson DM	Emergence of weak-intransitive competition through adaptive diversification and eco-evolutionary feedbacks	2018	Journal of Ecology	106	3		877-889
Gavhi-Molefe MR, De Villiers J	On Interpolatory Subdivision Symbol Formulation and Parameter Convergence Intervals	2019	Journal of Computational and Applied Mathematics	349			354-365
Gill Z, Nieuwoudt M, **Ndifon W**	The Hayflick Limit and Age-Related Adaptive Immune Deficiency	2018	Gerontology	64	2		135-139
Hassan S, **Davé R**, Mitra S, Finlator K, Ciardi B, Santos MG	Constraining the contribution of active galactic nuclei to reionization	2018	Monthly Notices of the Royal Astronomical Society	473	1		227-240
Hui C, Minoarivelo HO, Landi P	Modelling coevolution in ecological networks with adaptive dynamics	2018	Mathematical Methods in the Applied Sciences	41	18		8407-8422
Hui C, Vermeulen W, Durrheim G	Quantifying multiple-site compositional turnover in an Afrotemperate forest, using zeta diversity	2018	Forest Ecosystems	5			
Ipser JC, Uhlmann A, **Taylor P**, Harvey B.H, Wilson D, Stein DJ	Distinct intrinsic functional brain network abnormalities in methamphetamine-dependent patients with and without a history of psychosis	2018	Addiction Biology	23	1		347-358
Jarden M, **Ramiharimanana NC**	Solving embedding problems with bounded ramification	2018	Proceedings of the London Mathematical Society				

Authors	Title	Year	Source title	Volume	Issue	Art. No.	Pages
Katsikopoulos KV, **Durbach IN,** Stewart TJ	When should we use simple decision models? A synthesis of various research strands	2018	Omega (United Kingdom)	81			17-25
Kemajou-Brown E, Mohammed SE, **Tambue A**	A stochastic Delay Model for Pricing Debt an Loan Guarantees: Theoretical Results	2018	International Journal of Evolution Equations	10			
Kunin WE, Harte, He F, **Hui C**, Jobe RT, et al.	Upscaling biodiversity: estimating the species–area relationship from small samples	2018	Ecological Monographs	88	2		170-187
Landi P, Vonesh JR, **Hui C**	Variability in life-history switch points across and within populations explained by Adaptive Dynamics	2018	Journal of the Royal Society, Interface	15			148
Latombe G, Richardson, DM, Pyšek P, Kučera T, **Hui C**	Drivers of species turnover vary with species commonness for native and alien plants with different residence times	2018	Ecology	99	12		2763-2775
Lin S, Shao L, **Hui C**, Sandhu H.S, Fan T, Zhang L, Li F, Ding Y, Shi P	The effect of temperature on the developmental rates of seedling emergence and leaf-unfolding in two dwarf bamboo species	2018	Trees - Structure and Function	32	3		751-763
Lin S, Shao L, **Hui C**, Song Y, Reddy GVP, Gielis J, Li F, Ding Y, Wei Q, Shi P	Uswhy does not the leaf weight-area allometry of bamboos follow the 3/2-power law?	2018	Frontiers in Plant Science	9		583	
Łochowski RM	A new inequality for the Riemann-Stieltjes integrals driven by irregular signals in Banach spaces	2018	Journal of Inequalities and Applications	2018		20	
Łochowski RM, Perkowski N, Prömel DJ	A superhedging approach to stochastic integration	2018	Stochastic Processes and their Applications				
Lord GJ, **Tambue A**	A modified semi–implicit Euler–Maruyama scheme for finite element discretization of SPDEs with additive noise	2018	Applied Mathematics and Computation	332			105-122
MacFadyen S, Zambatis N, Van Teeffelen AJA, **Hui C**	Long-term rainfall regression surfaces for the Kruger National Park, South Africa: a spatio-temporal review of patterns from 1981 to 2015	2018	International Journal of Climatology	38	5		2506-2519
Mohammed MMA, Landi P, Minoarivelo HO, **Hui C**	Frugivory and seed dispersal: Extended bi-stable persistence and reduced clustering of plants	2018	Ecological Modelling	380			31-39
Mukam JD, **Tambue A**	Strong Convergence Analysis of the Stochastic Exponential Rosenbrock Scheme for the Finite Element Discretization of Semilinear SPDEs Driven by Multiplicative and Additive Noise	2018	Journal of Scientific Computing	74	2		937-978
Mukam JD, **Tambue A**	A note on exponential Rosenbrock–Euler method for the finite element discretization of a semilinear parabolic partial differential equation			76	7		1719-1738
Narayan G, Zaidi T, Soraisam MD, Wang Z, **Lochner M** et al.	Machine-learning-based Brokers for Real-time Classification of the LSST Alert Stream	2018	Astrophysical Journal Supplement Series	236	1		
Planck Collaboration (**Fantaye Y** et al.)	Planck intermediate results XV. A study of anomalous microwave emission in Galactic clouds (vol 565, A103, 2014)	2018	Astronomy and Astrophysics	610			
Planck Collaboration (**Fantaye Y** et al.)	Planck intermediate results LIV. The Planck multi-frequency catalogue of non-thermal sources	2019	Astronomy and Astrophysics	619			
Planck Collaboration (**Fantaye Y** et al.)	Planck intermediate results LIII. Detection of velocity dispersion from the kinetic Sunyaev-Zeldovich effect.	2018	Astronomy and Astrophysics	617			
Rafieferantsoa M, **Davé R**	MUFASA: The strength and evolution of galaxy conformity in various tracers	2018	Monthly Notices of the Royal Astronomical Society	475	1	stx3293	955-973
Ranirina D, and de Villiers J	On Hermite vector splines and multi-wavelets	2018	Journal of Computational and Applied Mathematics				
Rodger JG, Landi P, **Hui C**	Heterogeneity in local density allows a positive evolutionary relationship between self-fertilisation and dispersal	2018	Evolution International journal of Organic Evolution	72	9		1784-100
Rutherford, KD, Mazandu, G, Mulder, NJ	A systems-level analysis of drug-target-disease associations for drug repositioning	2018	Brief Funct Genomics	17	1		34-41
Vafaei Sadr AV , Movahed SMS, Farhang M, Ringeval C, Bouchet FR	A multiscale pipeline for the search of string-induced cmb anisotropies	2018	Monthly Notices of the Royal Astronomical Society	475	1	stx3126	1010-1022
Saha P, and **Taylor P**	The Astronomers' Magic Envelope: An Introduction to Astrophysics Emphasizing General Principles and Orders of Magnitude.	2018	The Astronomers' Magic Envelope: An Introduction to Astrophysics Emphasizing General Principles and Orders of Magnitude.				
Sako M, **Bassett B**, Becker AC, Brown PJ, Campbell H, Wolf R, Cinabro D, D'Andrea CB, Dawson et al.	The Data Release of the Sloan Digital Sky Survey-II Supernova Survey	2018	Publications of the Astronomical Society of the Pacific	130	988		
Salako IG, Jawad A, Moradpour H.	Anisotropic compact stars in non-conservative theory of gravity	2018	International Journal of Geometric Methods in Modern Physics	15	6	1850093	
Shi P, Gao J, Song Z, Liu Y, **Hui C**	Spatial Segregation Facilitates the Coexistence of Tree Species in Temperate Forests	2018	Forests	9	12		768
Soufbaf M, Fathipour Y, Harvey, JA, **Hui C**	Finish line plant-insect interactions mediated by insect feeding mode and plant interference: a case study of Brassica interactions with diamondback moth and turnip aphid	2018	Insect Science	25`	4		690-702
Stanishev V , Goobar A , Amanullah R Bassett B , **Fantaye YT** , Garnavich P, Hlozek R , Nordin J, Okouma PM , Ostman L , Sako, M , Scalzo R, Smith M	Type Ia supernova Hubble diagram with near-infrared and optical observations	2018	Type Ia supernova Hubble diagram with near-infrared and optical observations	615		A45	
Tabi C	Dynamical analysis of the FitzHugh Nagumo oscillations through a modified Van der Pol equation with fractional-order derivative term	2018	International Journal of Non-Linear Mechanics	105			173-178
Toich JTF, **Taylor PA**, Holmes MJ, Gohel S, Cotton MF, Dobbels E, Laughton B, Little F, Van Der Kouwe AJW, Biswal B, Meintjes EM	Functional connectivity alterations between networks and associations with infant immune health within networks in HIV infected children on early treatment: A study at 7 years	2018	Frontiers in Human Neuroscience	11		635	
Vafaei Sadr A, Farhang M, Movahed SMS, **Bassett B**, and Kunz M	Cosmic string detection with tree-based machine learning	2018	Monthly Notices of the Royal Astronomical Society	478	1		1132-1140
Warton FL, **Taylor P,** Warton CMR, Molteno D, Wintermark P, Lindinger NM, Zöllei L, van der Kouwe A, Jacobson JL, Jacobson SW, Meintjes EM	Prenatal methamphetamine exposure is associated with corticostriatal white matter changes in neonates	2018	Metabolic Brain Disease	33	2		507-522
Zambou S, Azeutsap FM, Nuessl R, Magunje B, Walton SD, Jonah EO, Zekeng S, Ndjaka JM, Harting M, Britton DT	Switching alternating current (AC) using a fully screen-printed current-driven transistor	2018	IET Power Electronics	11	1		168-174

WORKSHOPS AND CONFERENCES

During the period under review AIMS researchers hosted nine workshops and conferences with six of these being held at AIMS. Many of these were held in collaboration with other organisations including: DISCnet, UK; Wits; SACEMA and SU.

Data Science Intensive Programme (DSI)

The 8-week DSI programme ran from 27 August to 19 October 2018. The 16 participants tackled four consecutive real-world data science projects in teams and was primarily funded by the SA-DISCnet grant which is a collaborative data science training network between AIMS South Africa and universities in southern UK.

The main goal of the DSI was that participants who successfully completed the programme should be able to add value to any data science team in the world. As a result, the emphasis of the programme was on practical skills in machine learning, big data and AI. Participants came from seven different African countries and many were AIMS alumni. The programme was coordinated by Prof. Bassett. (Please see page 18 for more information.)

SEAMS Workshop participants

Software Engineering for Applied Mathematical Sciences (SEAMS) Workshop

This workshop was held at AIMS South Africa from 26 November to 7 December 2018. The 15 participants included students and researchers with existing code that needed improvement (for distribution, to address new questions etc.) The workshop was organised by Dr Carl Pearson, University of Florida and funding was provided by AIMS South Africa and the German Research Chair, Dr Bah.

Theoretical Foundations Workshop

The 3rd part of the year-long PhD preparatory programme for students who are either contemplating registering for or in the first year of doctoral study in Data Science took place at Wits from 3 to 6 December 2018. There were 11 participants. The workshop was coordinated by Dr Bah and Prof. Loyiso Nongxa (Wits). Prof. Montaz Ali was the lecturer for the week.

Theoretical Foundation Workshop participants

AIMS-IWR "Advances in Mathematical Optimization" Compact Course and Summer School

The Compact Course was held from 10 to 14 December followed by the Summer School, which ran from 17 to 21 December 2018. The course and school focused on important modern methods in the field of mathematical optimisation. The 37 participants which included AIMS Master's students wanted to deepen their knowledge of the methods that play a crucial role in solving demanding optimisation problems in many application domains in science and engineering, economics, medicine, data analysis and increasingly in industrial and societal problems. The school covered fundamental concepts, latest innovations and many practical applications of continuous, discrete and mixed-integer optimisation as well as optimal control and game theory.

AIMS-IWR participants

Mathematics in Industry Study Group (MISGSA) 2019

A Mathematics in Industry Study Group is a 5-day workshop at which academic researchers and graduate students work collaboratively with representatives from industry on research problems submitted by local industry. Study Groups have been organized for over forty years in many countries around the world. The first Study Group in South Africa was held in 2004. This year the workshop took place at AIMS South Africa. The graduate workshop was held from 9 to 11 January, and the study group from 14 to 18 January 2019. In total there were 62 participants. The problems covered in this year's workshop were related to wildlife management, urban and rooftop farming, rogue waves, water pollution, and carbon capture and storage.

The organisers were: Prof. David Mason, Prof. Montaz Ali, and Dr Ashleigh Hutchinson, Wits and Prof. Masood Khalique, North West. Invited guests included Prof. Neville Fowkes, University of Western Australia, Prof. Colin Please, University of Oxford, Prof. Tim Myers, Centre de Recerca Matematic, Prof. Philip Broadbridge, La Trobe University, Prof. Graeme Hocking, Murdoch University, Dr Denis Ndanguza, University of Rwanda, Dr Sheila Bishop and Dr Patience Adamu, both from Covenant University.

MISGSA 2019 participants

SU-AIMS Number Theory Conference

This biennial conference has been running for more than 20 years now, attracting leading scholars from the field to the Western Cape contributing to the Number Theory Group here. This year it was held from 14 to 18 January at SU, but one conference day (16 January) was spent at AIMS where a survey talk was presented by Prof. Peter Stevenhagen (Leiden) as well as two talks by AIMS alumnus Dr Darlison Nyirenda, a lecturer at Wits, and Dr Taboka Prince Chalebgwa who is currently a tutor at AIMS South Africa. Four AIMS alumni all with PhDs and positions in South Africa and Uganda attended the event.

SU-AIMS Number Theory

DSI Programme Intern Workshop

On 16 February, eleven interns that were on the DISCnet DSI Internship placements attended a 1-day workshop held at the Alphen Hotel in Constantia. The wrap up event gave the interns an opportunity to give presentations about the work they have been doing. A discussion was held about the effectiveness of the DSI Programme and areas for improvement for any future training sessions. This was followed by a presentation by Prof. Bassett about the future landscape of Artificial Intelligence which lead to discussions about this and its impact on Africa.

DSI Programme Intern Workshop participants

Data Science Group Workshop

The AIMS Data Science Group had a workshop at Fynbos Estate from 22 to 26 April. The main purpose of the workshop was to share knowledge in the principles and practice of modern machine learning and artificial intelligence. Team members included Dr Bah, Ms Kyomugisha (PhD student), Ms Makinde (PhD student), Mr Mensah (PhD student), Mr Mvubu (Data Science Intern), Mr Kabuga (Research Master's student) and Dr Agarwal (Postdoctoral fellow).

MMED participants

Clinic on the Meaningful Modeling of Epidemiological Data

The 10th annual Clinic on the Meaningful Modeling of Epidemiological Data (MMED) was held from 27 May to 7 June at AIMS South Africa. MMED is a 2-week modelling clinic that emphasizes the use of data in understanding infectious disease dynamics. Participants conducted modeling projects informed by epidemiological data that addressed practical questions in a meaningful way. The target audience for the clinic was including mathematicians, statisticians, computer scientists, and infectious dis-ease epidemiologists with strong quantitative backgrounds. There were 45 participants at the clinic including seven AIMS January intake students.

AIMS SCHOOLS ENRICHMENT CENTRE (AIMSSEC)

PROFESSIONAL DEVELOPMENT

Mathematical Thinking Courses

AIMSSEC ran a 10-day Mathematical Thinking residential course at Makerere University in Kampala from 2 to 12 January 2019. The 52 teachers and teacher trainers studying on this course from Uganda, Kenya, Tanzania and Rwanda, also engaged in a 3-months distance learning phase of the course. The course was made possible by generous and significant donations from three British families that paid for 52 bursaries, and the time given by four of the AIMSSEC International Team who voluntarily wrote most of the teaching materials and taught on the course.

In South Africa the Mathematical Thinking (MT) course has been presented 31 times over a 16-year period, seeing 2 039 teachers successfully going through it. The MT course is endorsed by the South African Council of Educators (SACE), with 20 professional development points.

The MT30 course was held from 17 to 26 March 2019 at the Cape Academy for Mathematics, Science and Technology, in Constantia, Cape Town. Seventy-six teachers from the Eastern Cape (46), Limpopo (20), KwaZulu-Natal (6), and the Western Cape (4) provinces attended the 10-day residential part of the course.

The venue for the MT31 course which ran from 17 to 25 June, was Stellenbosch High School. Sixty-eight teachers from from the Eastern Cape (35), Limpopo (18), KwaZulu-Natal (4) and the

Western Cape (11) provinces attended the 9-day residential part of the course.

The newly incorporated AIMSSEC course on "Language and communication in developing mathematics concepts" was set rolling together with the MT31 course. It started with 16 teachers, drawn from the Intermediate Phase. The Phase group representatives highly commended the course as evidenced by their feedback remarks after the session.

Language & Communication course participants with staff

MT31 Participants
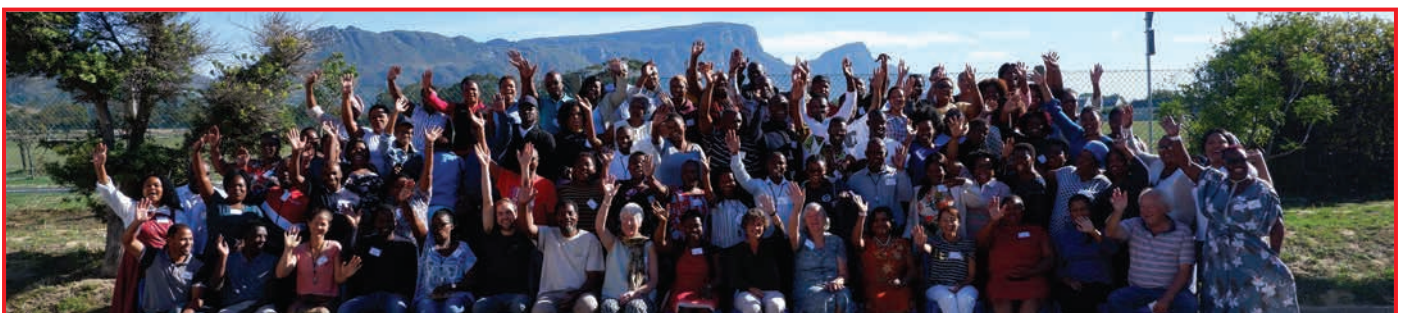
MT30 Participants

WORKSHOPS AND CONFERENCES

Inquiry-Based Science Education (IBSE) Workshop

The joint expression of interest of AIMS South Africa and Academy of Science of South Africa (ASSAf) to host a Centre for Education in Science for Africa, the Mediterranean and Europe (CESAME) for teachers in South Africa, with its inception dated as far back as October 2017, finally came to its realisation in June 2019. AIMSSEC played a vital role in organising an IBSE workshop which ran for five days at the Cape Teaching and Leadership Institution which is the teacher professional development arm of the Western Cape Education Department (WCED). The workshop, which hosted international participants from Benin, Cameroon, India, Italy, Morocco and Tunisia, was a resounding success.

The workshop was facilitated by two French Trainers from La main à la pâte: Mr Gilles Cappe and Ms Isabella Pierre-Bes.

CESAME forms part of the broader African, Mediterranean and European project with the shared goal to support and improve school science and mathematics education from Grade 1 to 9. The objective is to build up a network of international centres for the professional development of in-service educators. As such, the South African CESAME will provide teacher training on inquiry-based learning for the Sciences (including Mathematics) in collaboration with like-minded institutions within and across the South African borders.

The positive contributions of the WCED towards this workshop cannot go unmentioned; they played a pivotal role in organising, funding and above all, taking care of the logistics of the event.


IBSE Workshop participants

The 25th AMESA Annual National Congress

This Annual Congress took place at the University of KwaZulu-Natal, from 1 to 5 July. The theme of the Congress was: Developing Deep Mathematical Thinking through Mathematical Teaching, and 1700 people registered their attendance.

At the Special Interest Group: Teacher Training chaired by Mr Gary Powell. Dr Barrie Barnard, AIMSSEC Manager, had a chance to tell attendees about the work of AIMSSEC and gave handouts about the 7-course sequence. AIMSSEC's presentation was on the last day. Mr Gary Powell, Mr Andre Lamprecht and Dr Barnard facilitated a workshop on an inquiry-based activity in measurement for the intermediate and senior phases.

COMMUNITY SERVICE
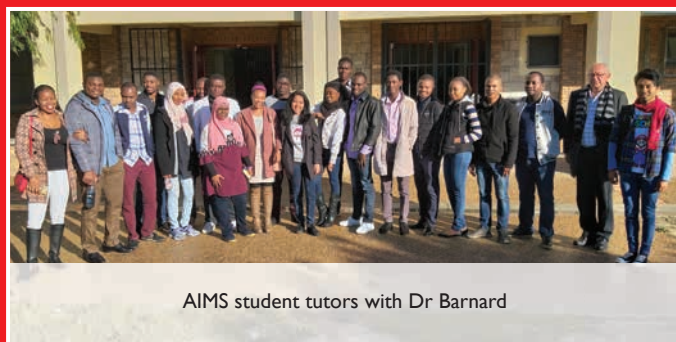
AIMS student tutors with Dr Barnard

Saturday Maths Tutoring Project

In January 2019 AIMSSEC received a donation from GrandWest SED towards the AZ Berman High School Maths Intervention Programme for 200 Grade 8 learners and AIMSSEC coordinated this project. A group of 21 AIMS South Africa Master's students conducted tutor sessions with these learners; they diligently executed their duties as tutors throughout all the 12 pre-planned Saturday sessions. On 8 June 2019 an awards ceremony day was held and all the Master's students and their learners attended.

AIMSSEC trained 21 Master's students to ensure good delivery of relevant content to the learners. In addition, AIMSSEC conducted a needs analysis with AZ Berman High School staff to ensure that relevant content was taught to the learners. AIMSSEC staff, Dr Barnard and Mr Mxolisi Bhengu were present to ensure the smooth running of the mathematics sessions. Mr MacDonald Chapwanya, former AIMSSEC IT specialist and currently a Learning Hub Manager at SU Business School gave a motivational talk to inspire the learners.

AIMS students are expected to give back 20 hours of their time to community service. This activity was the right opportunity for them to render some of their quality time towards community service. Overall, the project was evaluated as a success. The learners' results improved dramatically, with the top ten learners getting between 73% and 88%.

MEETINGS

On 13 August 2019, a meeting between AIMSSEC and Inclusive Education South Africa took place. Ms Charlene Petersen succinctly described the role of this organisation and how they can work with AIMSSEC to transform education in South Africa. Their approach is a whole-school transformation, making sure that 'All children have the right to meaningful participation in education' as is noted in their Vision Statement. There may be some collaboration during the upcoming MT32 course and there is a possibility of making some of their information available on the AIMING HIGH website.
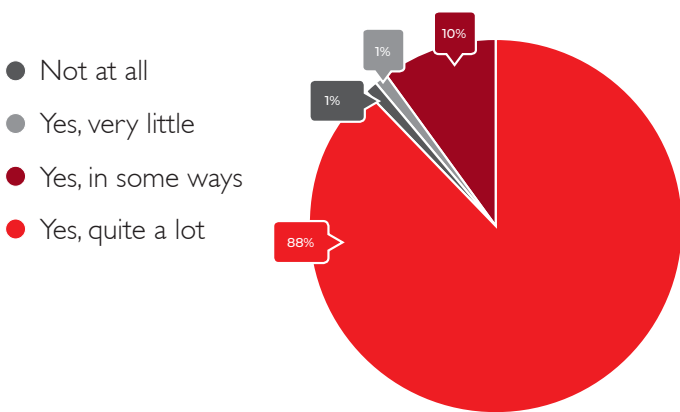

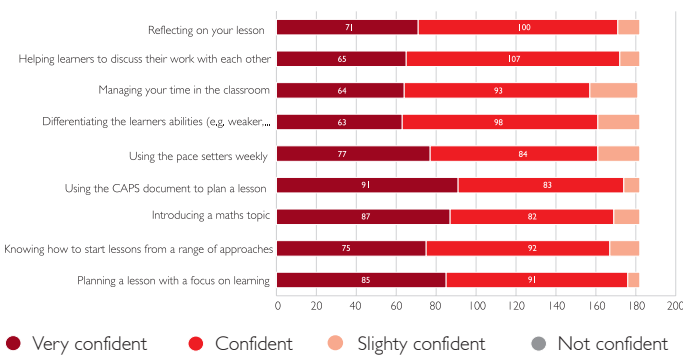Meeting participants

IMPACT SURVEY

AIMSSEC was established in 2003 to play a key role in the extension of educational opportunities for disadvantaged and rural communities in South Africa. The AIMSSEC courses were designed to improve the quality of teaching and learning of mathematics i.e. improve content knowledge and pedagogical approaches of teachers in order to spark excitement of the learners about mathematics and science careers. The courses aim to empower mathematics teachers with classroom teaching skills in line with international standards. AIMSSEC courses promote learners centred approaches, allowing learners to think freely and independently in the classroom.

The graphs capture the important findings of this survey:

Did AIMSSEC course(s) change the way you think about mathematics?

- ● Not at all
- ● Yes, very little
- ● Yes, in some ways
- ● Yes, quite a lot

10%
1%
1%
88%

Confidence levels in

Reflecting on your lesson	71	100
Helping learners to discuss their work with each other	65	107
Managing your time in the classroom	64	93
Differentiating the learners abilities (e.g, weaker....	63	98
Using the pace setters weekly	77	84
Using the CAPS document to plan a lesson	91	83
Introducing a maths topic	87	82
Knowing how to start lessons from a range of approaches	75	92
Planning a lesson with a focus on learning	85	91

0 20 40 60 80 100 120 140 160 180 200

● Very confident   ● Confident   ● Slighty confident   ● Not confident

What has AIMSSEC changed for your learners?

Helped them enjoy mathematics more	64%
Helped them learn to talk about mathematics better	59%
Helped them achieve better in examinations	55%
Helped them make more sense of mathematics	53%
Helped them think about mathematics better	50%
Changed their interest in mathematics	47%
Helped them make better links in mathematics	40%
Not changed anything	1%

20 20 40 60 80 100 120 140

AIMSSEC courses are tailored to three phases, namely: the Intermediate Phase (IP), the Senior Phase (SP) and the Further Education and Training (FET). From the survey responses of 182 participants, these managed to influence at least 2 000 other teachers and at least 14 000 learners through those teachers. From the statistical graphs above, it can be seen that AIMSSEC courses have changed the way teachers view mathematics as a subject. Participants indicate elevated confidence levels and enhanced understanding of teaching mathematics. All participants have experienced positive change in at least one area of teaching.

The survey aimed to measure the impact of the AIMSSEC courses over the years as well as get further suggestions from its past participants on what could be improved or introduced to further develop the teaching career in South Africa.

FUTURE PLANS

To address the many social challenges faced by learners and teachers in Africa, AIMSSEC has designed a series of seven courses to develop subject leadership in mathematics. Crucial educational issues affecting school mathematics will be addressed throughout, but each module has a specific focus:

1. Mathematical thinking, problem solving and technology

2. Language, communication and mastery of mathematical concepts where English is little used outside school

3. Inclusion and provision for students of all abilities

4. Development of competences to equip students for the 4th industrial revolution

5. Progression and transitions in education

6. Action research

7. Running workshops and mentoring other teachers.

The aim is to empower teachers, in rural as well as township areas, to train other teachers, and to improve the life chances of school students, by devotion to raising standards of education, character and competence development, and by promoting a better understanding of subject content, and the ability to use and apply it.

PUBLIC ENGAGEMENT

Public engagement with mathematical sciences has always been integral to the vision and mission of AIMS.

HOUSE OF SCIENCE

November 2018 saw the launch of House of Science, the coordination hub of AIMS South Africa's public engagement activities. This initiative aims to address the need for a coordinated inclusive and sustainable public engagement framework that will encompass African capacity-building and engender pan-African partnerships across the continent to grow the footprint, profile and visibility of the AIMS public engagement programmes. The new framework seeks to align with the strategies developed at AIMS as well as the national and international policies and strategies that place science, technology, innovation and engagement at the heart of the country's socio-economic development.

Objectives

- To build capacity and train AIMS students, researchers, academics and alumni so that they are better enabled, skilled and confident in undertaking public engagement activities, initiatives and community outreach.

- To promote mathematics and science engagement with the broader community in Africa, showcasing mathematical sciences and its research applications conducted at AIMS.

- To stimulate young people's interest to pursue careers in science, technology, engineering and mathematics (STEM) and become the next generation of scientists, leaders and problem solvers.

- To improve the participation, progression and retention rates of women and girls in STEM-related fields.

- To conduct research studies on various topical issues on science/maths communication and gender in STEM in Africa.

These objectives are critical, given the pressing developmental challenges in South Africa and on the continent and the imperative to close the knowledge gaps that exist at all levels, and which impact on the pace of development in the country and on the continent. In South Africa, at the policy level, the recently published 2019 DST White Paper on Science, Technology and Innovation (STI) notes that public science engagement is mandatory for individual scientists and organisations who receive public funding for conducting scientific research.

South Africa' Science Engagement Strategy and AIMS House of Science

The development of the Science Engagement Strategy (SES) by the DST in 2015 and the SES Implementation Plan in 2017 shows the commitment that the South African Government has to support and promote public engagement with science in the country. The SES seeks to develop a society that is knowledgeable about science, critically engaged and scientifically literate to address the country's developmental challenges.

Institutional frameworks such as the House of Science framework have a pivotal role to play not only in the promotion of the mathematical sciences within the broader community but with the implementation of the SES. It is also an imperative that the framework should be enabled, aligned and sustained within the core pillars of AIMS South Africa's research and capacity building frameworks in order to demonstrate viable and strategic alignment between the operations of AIMS South Africa and those of the national government's mission, vision and objectives including the transformation agenda of the National System of Innovation.

Achievements

Dr Mpfareleni Rejoyce Gavhi-Molefe was appointed as the House of Science Manager to provide leadership, direction and drive on the public engagement landscape; and Ms Mangakane Karabo Makola was appointed as an intern to assist her.

House of Science signed a Memorandum of Understanding (MOU) with African Gong - The Pan-African Network for the Popularization of Science & Technology and Science Communication to further enhance the programmatic delivery of the House of Science framework. This partnership allows joint delivery and implementation of specific programmes, namely:

* Africa Scientifique - a unique Training and Capacity-building programme designed for young and emerging African scientists, scholars and researchers (Master's and PhD students), to advance research expertise and capacity on the continent, and to build advanced skills, expertise and practice of science communication and research dissemination with the public in Africa;

* Women Advancement Forum International Exchanges, Research & Academia (WAFIRA) - a capacity-building programme for female academics and researchers;

* The Ishango Workshops on Mathematics Communication in Africa - "Communicating the 'M' in STEM in Africa".

Building stakeholder relationships has been crucial in ensuring the development of an effective, inclusive, responsive and sustainable public engagement programme. Formal and informal face-to-face meetings and the use of platforms such as academic and science communication conferences, workshops and science events were used to engage stakeholders. Dr Gavhi-Molefe consulted with AIMS Rwanda, AIMS Ghana as well as the AIMS Network to discuss public engagement strategic plans across all the AIMS centres and the House of Science framework. Other stakeholders such as the DST, African Gong, National Research Foundation (NRF), South African Agency for Science and Technology Advancement (SAASTA) and IMAGINARY - Open Mathematics were consulted for deeper insight into the public science engagement landscape, strategies and good practice exemplars in South Africa, Africa and beyond.

House of Science organised, co-hosted or participated in the following activities: The Public Lecture Series; SAMF training camp, Pan-African Mathematics Olympiad 2019; AIMS Women in STEM; IMAGINARY Conference; Academic Mentoring Retreat; Pi-day Celebration in Rwanda; Cross-Pollination in Mathematics Education Workshop in Ghana; National Science Week 2019 Planning Workshop; SAWMSA Launch and Workshop; and the National Science Week 2019 Launch.

ACTIVITIES

SAMF training camp

From 25 to 29 March the South African Mathematics Foundations held a training camp for 16 South African learners at AIMS South Africa in preparation for the up-coming mathematics olympiads. The first of which was the Pan African Mathematics Olympiad.

SAMF Training Camp participants

Pan-African Mathematics Olympiad (PAMO)

PAMO 2019 took place from 31 March to 6 April 2019 and was hosted by AIMS South Africa in collaboration with the South African Mathematics Foundation (SAMF).

PAMO 2019, which was sponsored by Old Mutual and Swiss Re, saw a gathering of the brightest young minds in mathematics, from 11 different African countries and observers from 2 different countries. The Olympiad had a total of 54 contestants, 22 of which were girls. A total of 27 medals were awarded for the PAMO 2019 main competition, and a total of 11 medals were awarded for PAMO-G (PAMO for girls).

Morocco was ranked the top team, followed by host country South Africa and Tunisia in second place and third place respectively. Other participating countries, in no particular order, were Botswana, Ghana, Malawi, Tanzania, Togo, Uganda, Zimbabwe and Nigeria.

PAMO participants

SAWMSA Launch and Workshop

Despite improvements over the past decades, women in South Africa continue to be underrepresented in tertiary studies and professional careers in the field of mathematical sciences. This has triggered many initiatives, among them workshops, such as the South African Women in Mathematical Sciences Association (SAWMSA) Launch and Workshop, held from 6 to 7 June 2019. The workshop was hosted by the University of South Africa (UNISA). It was aimed at harnessing the leadership and agency of women in the field. At least 55 emerging and established women in the fields of mathematical and statistical sciences and mathematics education from local universities, schools, government departments, as well as neighbouring countries gathered at this first and unique capacity building workshop for women mathematicians in South Africa.

The workshop featured several thought-provoking and informative keynote presentations by dynamic African women who are STEM leaders, researchers, academics and entrepreneurs.

The workshop was jointly organised by AIMS South Africa and UNISA. It was organised by Dr Gavhi-Molefe, Ms Makola and Prof. Zingiswa Jojo, associate professor at UNISA's College of Education and AMU Commision-South African Chapter. It was generously supported by grants from the International Mathematical Union Commission for Developing Countries and the NRF.

Workshop participants

2019 National Science Week Launch

On 27 July, AIMS joined over 70 science, technology, and innovation (STI) exhibitors from across the country at the official Launch of the 2019 National Science Week (NSW). The theme was 'Facing the harsh realities of climate change'. The theme served as a call to the public to act to protect the planet. The launch took place at the Mittah Seperepere International Convention Centre in Kimberley. The keynote speaker was the Minister of Higher Education, Science and Technology, Dr Blade Nzimande, who officially launched the week-long event.

This year's launch attracted 2000 school learners from around the Northern Cape as well as members of the public. Also present were government officials, as well as officials from science councils and universities across the country.

The NSW is an annual nationwide week-long celebration of STI and one of the many DST-led activities to build a South African society that is knowledgeable about science, critically engaged and scientifically literate. NSW 2019 was celebrated from 29 July to 3 August 2019 throughout the country.

Mr Mvubu interacting with scholars at NSW launch

AIMS WOMEN IN STEM (AIMSWIS) INITIATIVE

The mentoring programme for the 2018-2019 academic year kicked off in October with a 'meet and greet' event which aimed to introduce students (both male and female) to the initiative.

The objectives of the mentoring programme are to:

- create a safe space where female students can obtain support from caring senior students who listen to them, serve as good role models and help them develop their life skills, and build self-confidence and self-esteem;

- provide a diverse environment for networking with successful female professionals in STEM including AIMS alumni;

- provide a platform for AIMS South Africa (both male and female) students to engage in the community by mentoring at local schools;

- regularly provide information to students outlining career and funding opportunities; and

- encourage women and girls to pursue careers in STEM.

On 10 November a mentoring event titled: 'The Next Einstein is Female! She needs a support system and a conducive environment in order to flourish' was held. Thirty-five women attended (including current students, alumni, ESMT students, researchers, tutors, staff and external guests).

Workshop participants

followed by Dr Utete who spoke about 'Opportunities while at AIMS'.

This was followed by a panel discussion, moderated by Ms Makinde. The panellists included Ms Kyomugisha, Ms Hoossen, Ms Kamkuemah, Dr Sergine as well as Ms Phalafala. The discussion took an interesting twist as the panellists shared intimate details of their lives covering a wide range of topics including personal growth, making it in industry, the work-life balance and studying in a foreign language, to name but a few.

Other mentoring activities:

- On 11 May, in celebration of the first-ever International Women in Mathematics Day, AIMS South Africa held a roundtable discussion to celebrate women's achievements in the field of mathematics. It attracted emerging young women mathematics researchers at AIMS South Africa, who came to inspire and motivate each other. International Women in Mathematics Day is celebrated on 12 May in honour of the birthday of late acclaimed Iranian mathematician, Prof. Maryam Mirzakhani. who was the first and only woman to win the prestigious Fields Medal, which is considered the highest honour in mathematics. The event was coordinated by Dr Milaine Sergine Seuneu Tchamga, African Women in Mathematics Association (AWMA) communications officer.

- AIMSWIS hosted two mentoring lunches aimed at providing AIMS women students and researchers with an informal opportunity to discuss their career journeys and developments, share life experiences as women scientists, and establish relationships with women scientists visiting AIMS. Dr Elena Dimitrova, a faculty member at Clemson University, South Carolina facilitated two sessions on 26 March and 2 April and Dr Tendai Mugwagwa, a senior infectious disease modeller and health economist at Public Health England (PHE) and visiting Research Fellow at Imperial College, London led the session on 6 June.

OTHER ACTIVITIES

Dr Gavhi-Molefe participated in the following activities during the reporting period:

- SciCOM 100 Conference 2018: Science communication and democratic SA prospects and challenges which took place at Stellenbosch from 2 to 7 November 2018.

- IMAGINARY Conference on Open and Collaborative Communication of Mathematical Research which took place in Montevideo, Uruguay from 5 to 8 December 2018. Dr Gavhi-Molefe participated in two round tables, namely, IMAGINARY Universe and Women in Mathematics where she talked about the maths communication and women in maths: progress, challenges and opportunities. The Women in Math panel was co-organized jointly with the event Matemáticas en el Cono Sur (Mathematics in the Southern Cone).

- A 3-day Academic Mentoring Training on leadership, mentoring and career planning that took place from 16 to 18 January in Bloemfontein. The event was part of the University of the Free State Qwaqwa Campus' new mentorship initiative to help boost the presence of black women in academia, particularly in fields where they remain strongly under-represented.

- The Pi-day (3.14) celebration event that took place on 14 March 2019 at the University of Rwanda. The main purpose of Dr Gavhi-Molefe's visit to Rwanda was to engage and consult with AIMS Rwanda and AIMS-NEI regarding the public engagement strategic plans across all the AIMS centres and the new House of Science framework. There, she also excited the students with her research on the math behind animated movies.

- The workshop on Cross-Pollination in Mathematics Education took place from 29 April to 3 May at AIMS Ghana. The goal of the workshop was to provide a platform for educators from across the African continent to discuss the implementation, sustainability, scalability, impact, good practices and challenges for a range of maths education initiatives. Another reason for Dr Gavhi-Molefe's visit was to engage and consult with AIMS Ghana regarding the public engagement strategic plans and the new House of Science framework. During her visit, she also organised a Women in STEM mentoring session aimed at providing female students with the opportunity to meet, interact and build relationships with established and dynamic women scientists who were attending the workshop.

- The National Science Week 2019 planning meeting that took place on 13 May 2019. The goal of the meeting was to brief different role players and stakeholders on the implementation of the NSW 2019.

PUBLIC LECTURE SERIES

Held regularly, the Public Lectures Series provides an opportunity for scientists to showcase their research ideas and results and engage with the broader community. During the period under review, AIMS South Africa presented a series of public lectures. They were attended by members of the public and AIMS students and researchers.

On 23 October, Prof. Emmanuel Derman, Columbia University presented a talk titled: 'A Stylized History of Quantitative Finance.'

On 11 December, Dr Thomas Hladish, Assistant Research Scientist, University of Florida gave a talk titled: 'Designing effective control of mosquito-borne diseases by combining interventions.'

On 7 May, Dr Michelle Lochner, Resident Researcher, AIMS South Africa, presented the talk: 'Ways in which Machines help us to understand the Universe.'

On 10 June, Dr Simon Singh, physicist, popular science author, journalist and television producer presented a talk titled: 'The science of secrecy and the mathematics hidden in the Simpsons and Futurama.'

On 9 July, Mr Munsanje Mweene, Senior Data Scientist, Aerobotics, SA, gave a talk titled: 'Artificial Intelligence That Respects Your Right to Privacy.'

On 6 August, in celebration of Women's Month, Prof. Mike Bruton, Exhibition Consultant and Imagineer gave a talk about his new book, 'Curator and Crusader, the Life and Work of Marjorie Courtenay-Latimer.' She was an important pioneer of museums and environmental education in South Africa, and also a prominent early botanist, palaeontologist and ornithologist in her day.

STAKEHOLDER ENGAGEMENT

Meetings

The South African Department of Science and Technology, alongside the African Open Science Platform (AOSP) Advisory Council, hosted a high-level stakeholder meeting on 3 and 4 September 2018. The meeting brought together individuals discussing a proposed Phase 2 of AOSP: The African Open Science Platform – The Future of Science and Science for the Future. Prof. Green attended this meeting to give insights in lessons learned from the AIMS perspective.

On 29 November Prof. Green had a meeting with Dr Hans Hagen, Deputy Director Institut Pasteur Center for Global Health, Chargé de Mission, Department of International Affairs - Institut Pasteur International Network, in which they discussed possible joint interactions between their respective institutes.

The DAAD Young Scholars in Africa Conference was held from 1 to 3 March in Nairobi, Kenya. The intention of the conference was to throw light on the ways of overcoming system-related deficits and in promoting scholarly careers in Africa and to draw a roadmap towards overcoming major challenges which young African scholars are facing help them live up to their full potential. Prof. Green was one of the speakers at the event.

Prof. Green attended the UNESCO Math Day for Development held in Paris on 15 March. The event was aimed at raising awareness about the importance of mathematics regarding development issues.

From 27 to 28 June, Prof. Green, in his capacity as President of CIMPA attended the CIMPA General Assembly and Governing Board meetings held in Paris.

In October 2018, AIMS South Africa and the University of Zululand signed an MOU which will facilitate cooperation between the two institutions with respect to academic exchanges and enhancing educational opportunities for students.

Visitors

On 27 August, Ms Claudia Fritelli, Program Office, International Program Carnegie Corporation of New York visited AIMS South Africa. It provided an opportunity for Ms Fritelli to visit an AIMS centre as well as have discussions with Prof. Green about the Research Chairs that the Carnegie Corporation is funding at AIMS' pioneering Quantum Leap Africa (QLA) Research Centre in Rwanda.

CPA visitors

On 3 September a delegation from the Canadian Branch of the Commonwealth Parliamentary Association (CPA) visited AIMS South Africa. The CPA were on a bilateral visit to South Africa to strengthen relations between Canada and South Africa. The delegation included Ms Yasmin Ratansi, MP, Chair of the Commonwealth Parliamentary Association, Canadian Branch, Mr Kerry Diotte, MP, Member of the Association, Mr Anthony Rota, MP, Assistant Deputy Speaker and Assistant Deputy Chair of Committees of the Whole, Member of the As-sociation, Mr Rémi Bourgault, Secretary of the CPA, Canadian Branch, Ms Thida Souksanh, Second Secretary for Political affairs and Ms Pamela Moore, Counsellor (Political and Economic Affairs).

On 12 September 2018, Mr Thierry Zomahoun, President & CEO of AIMS-NEI, visited AIMS South Africa. During his visit he welcomed the new August intake and encouraged all the students to enjoy their stay and take advantage of all the opportunities available to them.
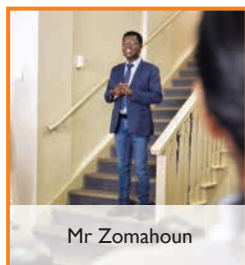
Mr Zomahoun

On 6 November Prof. Anthony Forster, Vice-Chancellor, Prof. Dominic Micklewright, Dean for Partnerships, Prof. Alan (Zig) St Claire Gibson, Deputy Dean Research, Faculty of Science & Health, Ms Vanessa Cuthill, Director of Research & Enterprise, Prof. Maria Fasli, Director, Institute for Analytics and Data Science and Mr Ivan Hutchins, Head of International Collaborations & Mobility visited AIMS South Africa.

University of Essex visitors

They met with Prof. Green, Prof. Bassett, Dr Bah, Dr Utete and Dr Fantaye. During the meeting a MOU between the University of Essex and AIMS South Africa was signed to encourage further collaboration between the two institutions.

On 19 November, Prof. Annie Raoult, Vice President of CIMPA, and Prof. Ludovic Rifford, Director of CIMPA, visited AIMS South Africa. They gave a presentation on CIMPA and opportunities for researchers to get involved, as well as an overview of their research areas.

Canadian visitors

On 22 November Ms Tsitsi Fungurani, Senior Development Officer at the Canadian High Commission in Pretoria and Dr Nalan Yuksel, Deputy Director visited AIMS South Africa. They were joined by Ms Karen Sutherland, Director, Monitoring & Evaluation, AIMS-NEI. The met with Prof. Cang Hui, Dr Utete and Dr Gavhi-Molefe. During the meeting AIMS tutor, Ms Josephine Teetteh, gave a talk about her research in climate science.

German Delegation (7 February)

On 7 February, a delegation consisting of Ms Dagmar Freitag, Chairwoman of the Sports Portfolio Committee & Member of the Foreign Affairs Committee, Ms Ulla Schmidt, Member of the Foreign Cultural Policy Portfolio Sub-Committee, Mr Matthias Hansen, Consul General and Mr Stefan Buchholz, DAAD visited AIMS South Africa. They had a meeting with Prof. Green, Dr Utete, Ms Wilsnagh, Dr Bah and Ms January to discuss the German Research Chairs programme, DAAD activities and to have a general discussion about AIMS.

German delegation (27 February)

On 27 February 2019, Parliamentary State Secretary to the Federal Minister of Education and Research, BMBF, Mr Thomas Rachel, visited AIMS South Africa. Other members of the delegation included. Mr Frithjof A. Maennel, Deputy Director General, 'International Cooperation in Education and Research', Federal Ministry of Education and Research, BMBF, Mr Matthias Hansen, Consul General, Mrs Anja Kangli Schubert, Advisor, Cooperation with Africa and the Middle East, BMBF, Dr Kerstin Silvestre Garcia, Project Management Agency, European and International Cooperation, Dr Lisette Andreae, Head of Education, Science, Research and Technology at the Embassy of the Federal Republic of Germany, Pretoria, Ms Pauline Plaff, Assistant to Head of Education, Science, Research and Technology at the Embassy of the Federal Republic of Germany, Pretoria, and Mrs Vivien Baganz, Personal Assistant to Mr Rachel. They had a meeting with Prof. Green, Dr Utete and Dr Bah and were also joined by the Research Master's students who gave them an overview of their research activities.

Prof. Peter Olver, Head of Department of Mathematics and his colleague Dr Samuel Mukasa, from the office of the Executive Vice-President and Provost of the University of Minnesota, visited AIMS South Africa from 17 to 19 March as a stopover on their way to visit AIMS Rwanda. They gave a talk to the students about opportunities available for them at the University of Minnesota.

On 20 March, Ms Audrey Cheng, the CEO and Co-Founder of Moringa School in Kenya visited AIMS South Africa with Ms Sutherland, AIMS-NEI Director, Monitoring & Evaluation. They met with Prof. Green and Dr Utete.

Ms Sarah Siekermann from the Alexander von Humboldt Foundation and Prof. Reiner Klemd from the University of Nurenberg visited AIMS South Africa from 16 to 20 May to conduct a review of the German Research Chair at AIMS South Africa, the position held by Dr Bah.

On 17 May, retired mathematician Dr Duncan Martin visited AIMS South Africa and kindly donated a fine collection of mathematical books in his area of interest, Differential Geometry and Optimisation.

THE AIMS NETWORK
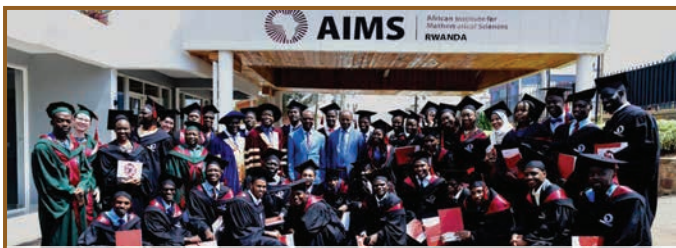
44 students from 10 African countries graduated from AIMS Rwanda on 22 June.

AIMS Cameroon graduated their 4th cohort of students on 23 June. 46 students (16 females and 30 males) from 13 African countries graduated.

36 students from 14 African countries graduated from AIMS Senegal on 22 June.

On 1 July, AIMS Ghana graduated 47 students (including 18 women) from 19 African countries

AIMS alumni are working in academia and industry the others have progressed to Research Master's and PhD studies as outlined in the table below.

POST AIMS STUDIES

Post AIMS Studies						
Status	PhD			Research Master's		
	Female	Male	Total	Female	Male	Total
Completed	57	196	253	164	361	525
In progress	93	214	307	65	116	181

GRADUATIONS

In June, 173 students (including 52 women) across the AIMS network from their respective centres. This brings the total number of alumni to over 1 800, with 32% of them women from 43 African countries.

NETWORK UPDATES

African Master's in Machine Intelligence (AMMI)

AMMI is a novel one-year intensive foundational Master's programme that provides brilliant young Africans with state-of-the-art training in Machine Learning and its applications.
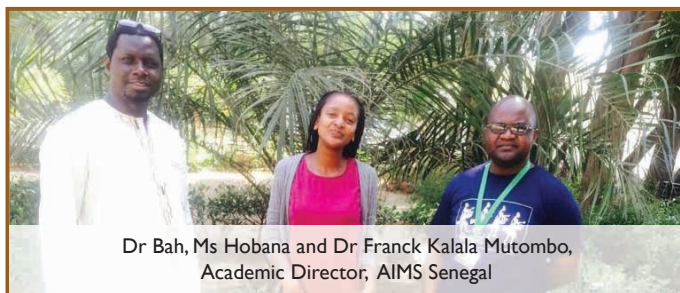
Reportedly, the first of its kind in Africa, the programme is supported by tech giants, Facebook and Google and was officially launched in Rwanda in October 2018. "We chose Rwanda because the programme aligns with the country's goals to become a hub for innovation," said Prof. Moustapha Cissé, Founder and Director of the AMMI at AIMS and Head of the Google AI Centre in Ghana.

The first cohort of 35 students, 44% of them women graduated in June 2019. This year the programme will be offered at AIMS Rwanda and AIMS Ghana.

Visit to AIMS Senegal

Dr Bah visited AIMS Senegal from 15 to 16 January. Dr Bah took the opportunity to meet with his student who he is supervising for the AIMS Master's research project. He also gave a talk titled: 'Learning distance preserving embedding of large data sets.'

Dr Bah, Ms Hobana and Dr Franck Kalala Mutombo,
Academic Director, AIMS Senegal

From 7 to 18 January, Ms Hobana was at AIMS Senegal teaching the Language and Communication course to the Master's students. The focus was on preparing students for industry as well as providing them with the necessary tools to become dynamic and confident presenters.

Network Meeting

From 23 to 24 April 2019 the AIMS Programs & Grants and Academic Departments Joint Workshop was held in Rwanda. This was attended by Academic Directors from the AIMS Centres as well as the member of the Programmes and Grants Department of the Secretariat. Prof. Green attended the workshop and Dr Utete, joined via Skype. The aim of the workshop was to review the current student selection process, including recruitment efforts, with consideration of the donor-required criteria (social-economic background, leader-ship potential, and commitment to giveback), while up-holding the academic merit of all students accepted to AIMS. As well as to review the AIMS Master's curriculum and academic environment and identify recommendations for introducing a greater focus on transferable and leadership skills and consolidating what's already being done at Centres to ensure greater consistency across the network.

AIMS partners with the AfDB

On 15 July, AIMS and the African Development Bank (AfDB) signed an MOU to collaborate on growing mathematical sciences expertise and accelerate leading research and innovation across key areas of the continent's development challenges. Speaking at the signing, AfDB Vice President for Agriculture and Human Development, Ms Jennifer Blanke stressed the strong partnership between the Bank and AIMS-NEI. "The MOU gives us a framework for the operationalization of the partnership," she said. The partnership sets the framework for collaboration between the two institutions on enhanced mathematical research and innovation in key areas of the continent's development challenges. It will also facilitate the design and implementation of new projects and programmes and further cooperation in events related to science and technology.

AIMS and Germany sign agreement for five new Research Chairs

On 31 July, AIMS and the Federal Ministry of Education and Research of the Federal Republic of Germany (BMBF) signed an agreement for the support of a further five research chairs at AIMS centres in Rwanda, Ghana, Cameroon and a new AIMS centre to conduct world class mathematical research.

"The German Research Chair programme at AIMS is one of the strategic initiatives aimed at attracting talented researchers who are able to establish research groups within the mathematical sciences and its applications at AIMS centres. It is geared at supporting excellent young scientists and enhancing research on the African continent," said Mr Thierry Zomahoun, President and CEO of the AIMS Global Network.

Next Einstein Forum announces new cohort of 25 Fellows

On 5 August, the Next Einstein Forum (NEF) announced its third Class of NEF Fellows, 25 strong scientists, all under 42 years, whose research and innovations are contributing to solve Africa's and the world's most pressing challenges.

"I am excited to announce the third class of NEF Fellows for two reasons. The first is that we are almost at parity, with 11 women in the class. The second is the variety of fields and countries from where the Fellows come from. The selected Fellows are doing cutting-edge research in renewable energy, nanomaterials and nanotechnology, food security, precision medicine, health systems, climate science and urban planning. Also a first for the Fellows cohort is the two social scientists selected in this class. We strongly believe their current and future discoveries will solve global challenges and we are excited to introduce you to them," said Mr Zomahoun, Founder and Chair of the Next Einstein Forum and President and CEO of AIMS.

An initiative of AIMS, the NEF will award the NEF Fellows at its NEF Global Gathering 2020 in Nairobi, Kenya on 10 March 2020, under the patronage of President Uhuru Kenyatta. The NEF Fellows will continue the tradition of presenting their ground-breaking research at the global gathering.

NEF Fellows are selected by an International Scientific Program Committee, using a rigorous process that comprises academic and scientific merit, a strong publication record, patents, awards and a track record of funds independently raised for research. Fellows are also required to demonstrate the relevance of their research or innovations to humanity's grand challenges, as well as a passion for raising Africa's scientific profile and inspiring the next generation of scientific leaders.

GOVERNANCE AND ADMINISTRATION

TRUST

The AIMS Trust meeting took place on 1 February 2019 with trustees, Ms Nasima Badsha, Prof. Fritz Hahne, Prof. Ben Turok, Prof. Neil Turok and Prof. Daya Reddy in attendance. Prof. Barry Green (ex-officio) and Ms Deborah Wilsnagh were also in attendance.

COUNCIL

The AIMS South Africa Council meeting took place on 1 February 2019. Council members in attendance included Prof. Daya Reddy (Chair), Prof. Neil Turok, Prof. Balazs Szendroi, Prof. Stéphane Ouvry, Prof. Louise Warnich, Prof. Grae Worster (via skype), Dr Thandi Mgwebi and Prof. David Holgate. They were joined by Prof. Green and Ms Wilsnagh.

ADVISORY BOARD

The AIMS South Africa Advisory Board which advises on strategic and academic aspects of the AIMS programme, in particular, its integration with existing courses and research projects in South African and other African universities, is still under revision.

EXECUTIVE TEAM

The AIMS South Africa Executive Team assists the director and academic director with the selection of students for the Master's programme and facilitates the relationship between AIMS and the three participating universities. Members during this period were Dr Hannes Kriel and Prof. Ingrid Rewitzky (SU), Prof. Nicola Mulder and Prof. Jessie Ratzkin (UCT), and Prof. Kailash Patidar and Dr Sylvain Halindintwali (UWC).

STAFF

Prof. Barry Green, Director, is assisted by the Management Team consisting of Dr Barrie Barnard (AIMSSEC Manager), Ms Linda Camara (Communications Manager), Mr Jan Groenewald (IT Manager), Mr Igsaan Kamalie (Facilities and Logistics Manager), Dr Rejoyce Gavhi-Molefe (House of Science Manager), Prof. Jeff Sanders and Dr Simukai Utete (Academic Directors) and Ms Deborah Wilsnagh (Chief Operating Officer).

From 1 January 2019, Ms Wilsnagh, who previously held the position of Finance and HR Manager, was appointed as Chief Operating Officer. From 1 February 2019, Dr Utete was appointed as the incoming Academic Director. There was an overlapping period between Prof. Sanders (the former Academic Director) and Dr Utete until June 2019, in order to ensure a smooth transition. From July 2019, Prof. Sanders moved to the Research Centre, where is mentoring Research Master's and PhD students, alongside his own research work.

Recently AIMS South Africa launched the House of Science Project, to coordinate its public engagement and outreach activities. The project is led by Gavhi-Molefe, House of Science Manager who was appointed from 1 January 2019. Ms Karabo Makola was appointed as a communications intern to assist her. Her internship started on 1 April 2019 and will run to 31 March 2020.

AIMS South Africa Council Meeting

At AIMSSEC, Mr Mxolisi Bhengu was appointed as a Teaching Assistant from 1 March 2019 and Mr Kwethemba Michael Moyo as a Mathematics Education Lecturer and Senior Programme Coordinator from 1 August 2019.

TUTORS

Tutors are an important part of the AIMS teaching model. There were eight tutors during the reporting period, Dr Elbasher Ahmed, Ms Lila Chergui, Mr Rock Stephane Koffi, Mr Jordan Masakuna, Mr Lebeko Poulo (IT Tutor), Dr Dinna Ranirina (postdoctoral researcher and tutor), Dr Taboka Chalebgwa and Dr Kenneth Dadedzi, who was Head Tutor for the year.

INFORMATION TECHNOLOGY

In the period under review, the AIMS South Africa IT department's focus was operating system upgrades and standardisation. The last four legacy servers from 2012 were containerised. The server setup of 16 onsite and two offsite servers were standardised and central configuration management is in progress. Data and container backups were upgraded to zfs. Extensive support was also provided to researchers and workshops, such as SEAMS, IWR, PAMO, and MMED.

Tutor Mr Lebeko Poulo assisted in the IT department and with teaching duties, and Mr Jonathan Carter continued as Systems Architect. Mr Carter attended both FOSDEM and DebConf conferences in 2018-19. Mr Kyle Robbertze returned for an internship in January 2019. AIMS Rwanda IT manager Mr Emmanuel Kanamugire visited AIMS South Africa in July 2019, when AIMS South Africa campus desktop software was upgraded in preparation for the same upgrades at AIMS Rwanda.

International internet connectivity remains at 24.17M. A third file server was purchased, all server memory increased and fast USB disks added for read and write caches. The main copier/scanner/colour printer was replaced. The door access tag server software was upgraded and an original controller from 2003 replaced. Various network ports around the campus were repaired. AIMSSEC staff laptops were replaced.

A High Performance Computing machine with a GPU for the data science group is hosted at Stellenbosch University's data centre, and is in process of being configured. After a short bout of load shedding, two UPSes were repaired and a new one purchased, enabling staff to have connectivity during load shedding. Desktop replacement is starting immediately following this period of reporting and is expected to take 2-3 years.

Classes in Computing and LaTeX, AIMS Desktop, online collaboration, revision control, and in the software development with Python were taught to the AIMS South Africa August and January intakes.

COMMUNICATIONS REPORT

For the period under review we have continued to expand our reach through social media. Our YouTube channel has grown by 1.6k subscribers to a total of 7 973k subscribers. Within this period we've had 169.9k views with a majority of the demographic age group being 18-34 (same as in the previous year).

Next up on our subscribers ranking is our Facebook page with 4 023 people liking our page. Our top performing posts were about applying to the AIMS Structured Master's Degree (12,7k people reached), applying for the January intake (10k people reached), and searching for Africa's Next Einstein (9.1k people reached). On Facebook most of our content reaches people in South Africa (790 followers). The gender discrepancy lies at 68% male and 32% female. We furthermore have a substantial following of 2 231 followers on Twitter with 300-450 profile visits each month. Our youngest platform, Instagram, stands at 319 followers.

In July 2019, for the third year in a row the New Media Specialist and the Communications Teacher teamed up to facilitate and coach at the AIMS-ESMT IIP. In their workshop sessions they provided the students with essential communication skills for the job interviews, as well as training leadership and team building skills targeted at entrepreneurship, re-emphasising their understanding of themselves as a brand and as an asset for their next employer/business.

Among our ever-growing archive of professional photographs during this period were special events such as PAMO (Pan African Mathematics Olympiad), the AIMS-ESMT IIP, and the School Stem Workshop just to highlight a few. Then there are of course also the portraits of staff, graduation portraits, corporate headshots of the students for employability purposes. All images are of high quality and are distributed with a download link to relevant staff members and on a monthly basis distributed to everyone on campus.

Newsletters continue to be sent out on a monthly basis and other marketing literature such as posters, websites, certificates etc. have been created to support workshops and events at the centre. A new student handbook was developed in collaboration with the AIMS Network Communications Team.

Ms Camara, also attended a Communications Training Workshop hosted at AIMS-NEI in Rwanda from 8 to 12 July 2019.

FACILITIES

For the year under review the AIMS properties remain as is with general maintenance working taking place as and when required.

FINANCIAL OVERVIEW

By formal agreement, Stellenbosch University provides financial management services to AIMS South Africa. An independent trust was established in 2002, called The AIMS Trust, whose financial information has also been consolidated into these financial statements.

Figure 1: Total income per main component

Other income
2019: 5%
2018: 7%

Profit on sale of assets
2019: 0%
2018: 1%

South African Government grants
2019: 55%
2018: 56%

Private donations, grants and contracts
2019: 39%
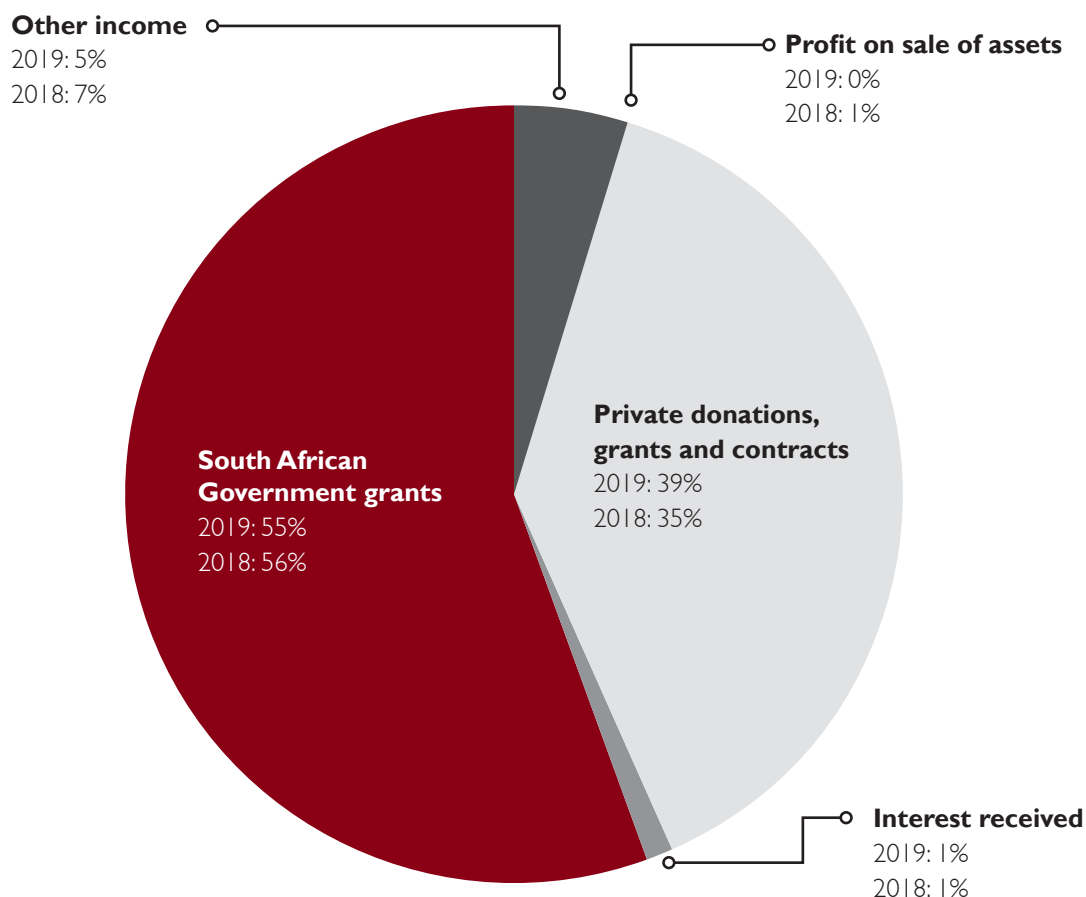2018: 35%

Interest received
2019: 1%
2018: 1%

Figure 1: shows the comparison of AIMS South Africa's income per main component as well as the relative ratio to total income

Total income for 2019 is essentially unchanged at R38,316 million compared to R38,323 million in 2018.

South African Government grants for the 2019 and 2018 years are as follows:

Department	Programme	2019	2018
Department of Higher Education and Training	Academic Programme	R 5 844 000	R 5 526 000
Department of Science and Technology	Academic Programme, Research Programme and Post AIMS Bursaries	R 4 067 857	R 3 469 643
National Research Foundation	Research Programme	R 5 383 499	R 6 325 750
National Skills Fund	Teacher Training Academic Programme, South African Taught Masters and Teacher Training bursaries	R 5 953 151	R 5 978 824
Total South African Government Grants		**R 21 248 507**	**R 21 300 217**

Private donations, grants and contracts, is comprised mainly of funding from The Mastercard Foundation towards the Taught Master's Programme, The Robert Bosch Foundation towards the second ARETÉ Junior Chairs and grant from The Alexander Von Humboldt Foundation towards the German Research Chair.

Private donations, grants and contract income for the 2019 and 2018 years are as follows:

Department	Programme	2019	2018
IDRC Research Grant	Research Programme	R -	R 906 467
The Mastercard Foundation	Taught Masters Programme and Teacher Training Bursaries	R 4 205 646	R 3 824 722
The Alexander Von Humboldt Foundation	German Research Chair	R 2 181 771	R 1 980 436
The Robert Bosch Foundation	Research Programme	R 1 356 427	R 1 308 429
The Oppenheimer Memorial Trust	Teacher Training Programme	R 300 000	R 600 000
DAAD	Bursaries/Scholarships	R 1 974 437	R 2 415 457
Other private donations	Taught Master's, ESMT and DISCnet and Teacher Training Programmes	R 4 881 732	R 2 511 786
Total Private donations, grants and contract income		**R 14 900 013**	**R 13 547 297**

Figure 2: Total expense per main component

Bursaries
2019: 14%
2018: 14%

Personnel expenses
2018: 43%
2018: 45%

Other operating expenditure
2019: 40%
2018: 39%

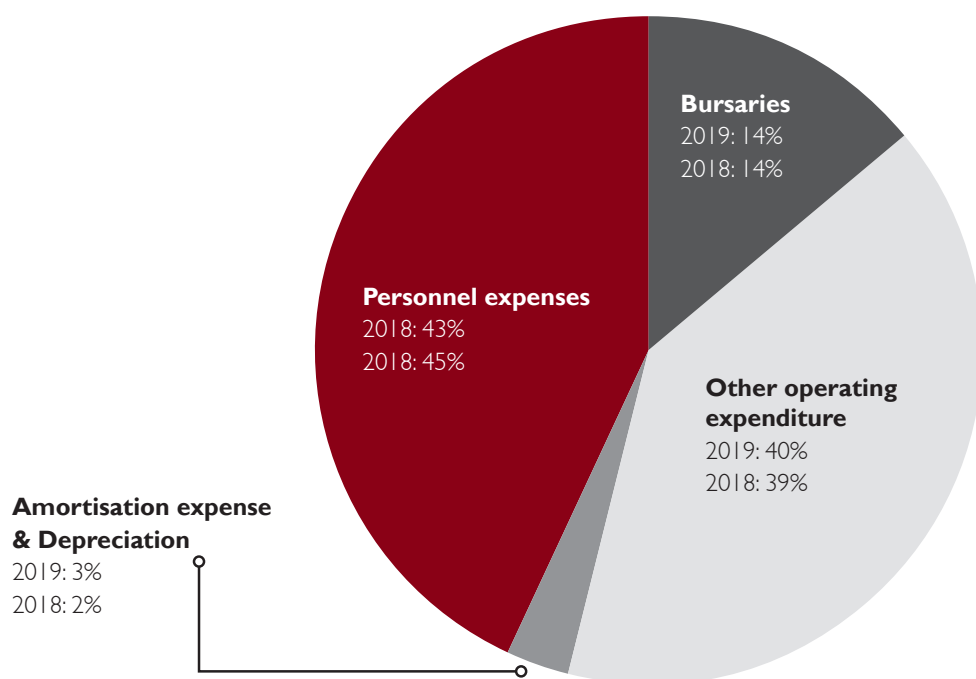**Amortisation expense & Depreciation**
2019: 3%
2018: 2%

Figure 2: shows the comparison of AIMS South Africa's expenditure per main component as well as the relative ratio to total expenditure

Total expenditure for 2019 remains more or less unchanged at R41,465 million compared to R41,473 million in 2018.

Bursaries comprises bursaries to AIMS Research Centre students, DAAD and post AIMS bursary recipients.

Other operating expenditure includes all costs related to the Taught Master's Programme.

A 6.3% annual cost of employment adjustment was approved for all qualifying staff, however, overall personnel costs decreased by 4% due to employment contracts ending and the timing of new appointments for the research and teacher training programmes.

Expenditure is monitored carefully, within prescribed limits, determined by funder regulations and requirements.

The deficit for the year is attributed to the change in accounting policy for the depreciation on property, plant and equipment, as well as network budget approved funding not received within the 2018/19 Financial Year.

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES - SOUTH AFRICA

CONSOLIDATED STATEMENT OF FINANCIAL POSITION AT 30 JUNE 2019

	2019 R	2018 R
ASSETS		
NON-CURRENT ASSETS	34 646 784	35 702 472
Property, plant and equipment	30 269 651	31 155 633
Intangible Assets	7 093	-
Available-for-sale financial assets	4 370 040	4 546 839
CURRENT ASSETS	7 579 775	8 435 786
Cash and cash equivalents	132 940	1 265 319
Trade and other receivables	4 736 323	4 395 540
Stellenbosch University receivable	2 710 512	2 774 927
TOTAL ASSETS	**42 226 559**	**44 138 258**
FUNDS AND LIABILITIES		
FUNDS AND RESERVES	35 283 716	38 649 299
Accumulated funds	30 382 560	33 076 761
Restricted reserve: endowment fund	1 925 260	1 862 562
Restricted reserve: other	508 358	1 025 699
Fair value reserve	2 467 538	2 684 277
CURRENT LIABILITIES	6 942 843	5 488 959
Trade and other payables	6 942 843	5 488 959
TOTAL FUNDS AND LIABILITIES	**42 226 559**	**44 138 258**

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES - SOUTH AFRICA

CONSOLIDATED STATEMENT OF COMPREHENSIVE INCOME FOR THE YEAR ENDED 30 JUNE 2019

	2019	2018
	R	**R**
Government grants	21 248 507	21 300 217
Donations Income	14 900 013	13 547 297
Other income	1 848 936	2 851 683
Gross Income	**37 997 456**	**37 699 197**
Operating expenses	(41 464 722)	(41 473 181)
Operating deficit	**(3 467 266)**	**(3 773 984)**
Profit on sale of assets	-	354 486
Finance income	318 423	268 944
Deficit for the year	**(3 148 843)**	**(3 150 554)**
Other comprehensive income:		
Item that may be subsequently reclassified to profit or loss		
Change in value of available-for-sale financial assets	(216 739)	1 893
Total comprehensive deficit for the year	**(3 365 582)**	**(3 148 661)**

See notes on pages 41 and 42.

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- Neil Turok
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- Victor Rothschild Memorial Fund

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- The National Skills Fund (NSF)
- Department of Science and Technology (DST)
- National Research Foundation (NRF)

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University of Pretoria

University of the Western Cape

University of Illinois at Urbana-Champaign (Depts of Mathematics, Physics and the Graduate College)

US Fulbright Specialist Program

AIMS South Africa would like to thank the following lecturers for donating their honoraria to AIMS in this period:
- Steve Bradlow
- Richard Katz

For a list of all AIMS South Africa supporters, please visit: https://www.aims.ac.za/en/support/supporters

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The ForExcellence Program finds fitting ways for academic partners to support Africa's most promising mathematical science students. These include: faculty guest-lecturers at AIMS Centres; scholarships to support AIMS students; post-graduate students providing teaching support at AIMS centres; funding to support research and operation of centres; collaborations on research projects, internships and other employment opportunities for graduates.

For more information please visit www.nexteinstein.org/connect/for-excellence-program/

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