



AIMS

African Institute for
Mathematical Sciences
NEXT EINSTEIN INITIATIVE

Annual Report July 2013 - June 2014

Mathematical Sciences the key to Africa's future



EXCELLENCE • RESPECT • PAN-AFRICANISM • INTEGRITY

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AIMS

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***The Vision of AIMS** is to lead the transformation of Africa through innovative scientific training, technical advances and breakthrough discoveries which benefit the whole of society.*

***The Mission of AIMS** is to enable Africa's brightest students to flourish as independent thinkers, problem solvers and innovators capable of propelling Africa's future scientific, educational and economic self-sufficiency.*

Message from the Chair of the Board

In 2003, the doors opened on a dream. Twenty-eight students, from ten African countries, walked across the threshold of a renovated old hotel in a suburb of Cape Town. The African Institute for Mathematical Sciences, AIMS, was born.

There was nothing fancy about the institute, but its aspirations were sky high. To bring the brightest students from across Africa together with the best lecturers in the world, and let the sparks fly. Those first AIMS students, and the 700 who have followed, have entered a pact with the future: to use their minds and their hearts to build a better future for Africa.

AIMS provides a top quality training in mathematical science at Master's level, preparing students for careers in research, teaching, industry, or public service.

Why mathematical science? Because in every modern technical field, from health research to information and communications, from finance and banking to climate forecasting and natural resource management, mathematical skills have become the backbone of modern societies.

With the early success of AIMS' first centre in South Africa, we knew we had more than a dream. We had proven a concept which could catalyze a transformation in Africa. The creation of a pan-African network of highly skilled people, committed to Africa's advancement, would dramatically improve the continent's prospects.

In 2008, we widened the dream and launched the Next Einstein Initiative. Again, it was a simple idea, which captured in a few words a passionate belief that a vast pool of talent – enough talent to allow Africa to assume its rightful place as a scientific and technological powerhouse – lies waiting to be discovered.

Others joined the dream. In 2010, the government of Canada provided visionary support of \$20 million, allowing the AIMS Next Einstein Initiative to open new AIMS centres in Sénégal, Ghana and Cameroon. AIMS has become a pan-African network, spanning and drawing together a too-often divided continent.

The AIMS network has welcomed 741 students, from 42 of Africa's 54 countries. More than a third of them have been women.

Talent has begun to blossom outward from AIMS: in this report you will find profiles of AIMS alumni



who are professors and computer scientists, bankers and epidemiologists, business efficiency experts and energy developers. In them, you can glimpse the many ways AIMS is creating a new generation of African experts tackling Africa's problems.

It has been the privilege of a lifetime to serve as AIMS' founder. I am proud to see what AIMS is doing for the continent of my birth. But from my distant current perch, in Canada, I can also see that AIMS is about much more than Africa. It is about helping Africa become a beacon to the world. Africa has already given the world so much in music, art, and humanity. As a physicist, my dream is that the next Einstein will be African.

And why not? Science doesn't have borders. Its language is mathematics – a shared language that reaches across cultures, genders, beliefs, and indeed across time. Science is the best means we have of creating a better future. Science is about the questions and hopes that humanity holds in common. Science is the best of us.

And AIMS lets the best of us shine.

Sincerely,
Neil Turok

Highlights



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- 1 November 2013, members of Canada's social, political and diplomatic elite came together in Ottawa, Canada to celebrate AIMS on its 10th anniversary
- 2 Official launch of AIMS Cameroon (February 2014)
- 3 Presidential visit to AIMS Sénégal (November 2013)
- 4 AIMS South Africa Recognition Ceremony November 2013
- 5 Meeting with the President of the Republic of Tanzania in Toronto, Canada (May 2014), with a commitment to launch AIMS Tanzania in October 2014.

- 6 AIMS South Africa Graduation June 2014
- 7 AIMS Sénégal Graduation June 2014
- 8 AIMS Ghana Graduation June 2014
- 9 AIMS Cameroon Graduation July 2014

In June and July 2014, AIMS South Africa, AIMS Ghana, AIMS Sénégal and AIMS Cameroon held their graduation ceremonies for the 2013-2014 class. There are now 741 AIMS alumni throughout the world contributing to cutting-edge research, continuing their post-AIMS academic studies or launching progressive careers using their mathematical science training.

Message from the President and Chief Executive Officer

The dream for Africa's brightest students to flourish as independent thinkers, problem solvers and innovators capable of propelling Africa's future scientific, educational and economic self-sufficiency is coming to fruition through the African Institute of Mathematical Sciences.

This report captures this remarkable evolution of AIMS as Africa's first and best network of centres of excellence for training, research and outreach in mathematical sciences. To date, we have trained 741 students from 42 African countries with more than a third women, and have moved beyond a single centre to a network of pan-African institutes in Ghana, Sénégal, South Africa and Cameroon, with our centre in Tanzania set to welcome its first cohort of students in October 2014.

I am pleased to share with you the AIMS Next Einstein Initiative (AIMS-NEI) Annual Report for 2013-2014. In 2014, AIMS celebrated the first class of scholars in Cameroon with a pivotal event in the nation's capital, Yaoundé, featuring Prime Minister Philémon Yang; Professor Jaques Fame Ndongo, Minister of Higher Education; and the Rt. Hon. Michaëlle Jean, former Governor General of Canada and newly elected Secretary General of the International Organization of La Francophonie. Not only did the event put a spotlight on AIMS and our ability to unlock the potential in Africa's youth, on the part of the government of Cameroon their statement and message was clear – they believe in Science, Technology, Engineering and Mathematics (STEM) and the role it has in both national and pan-African transformation.

After the opening of the fifth centre in Tanzania, AIMS-NEI will shift to a due diligence and sustainability phase to ensure our success is guaranteed. We will take the lessons learned to date to plan the next cluster of centres of excellence and develop an unshakeable formula for success for the next wave of centres.

The incredible AIMS story has reached new heights this year as AIMS was a key participant in international fora including the World Economic Forum meeting in Abuja, Nigeria; the International Summit on Maternal, Newborn and Child Health in Toronto, Canada; the International Economic Forum of the Americas in Montreal, Canada; and the University of Michigan STEM-Africa Initiative Third Biennial Conference in Ann Arbor, USA. Our participation at these meetings is drawing in new partners, raising our profile and giving us access to key global decision-makers who are ready to invest and support our plans for a surge in pan-African talent in science and mathematics.

The media was also keen to tell the AIMS story. We have been featured in stories, on media panels and

prepared opinion editorials on the BBC's *The World Tonight*, Radio France Internationale's *7 Milliards de voisins*, Cameroon Radio and TV's *Globewatch*, in *The Economist*, *Cameroon Tribune*, the *Ottawa Citizen*, the *Globe and Mail* (Canada's National newspaper) and the *Toronto Star*. As our profile grows, AIMS remains passionate and committed to developing a generation of scientific leaders capable of overcoming Africa's most persistent challenges.

This academic year, AIMS graduated a total of 181 students, (54 women) from 34 countries. Our partners, along with the very important funding from our host governments, are essential in enabling AIMS to pursue its vision and realize our mission to enable Africa's brightest students to flourish as innovators who will propel Africa's future scientific, educational and economic self-sufficiency.



AIMS is at the forefront of Africa's educational development providing a foundation in mathematical sciences for our students because the modern technology that Africa needs to transform into a prosperous, stable and sustainable continent demands no less. Our network and programs will create a pan-African community of scholars that can and will provide the leadership in science and development propelling Africa to its rightful place among the developed nations of the world. We look forward to our contribution to the African Union's Agenda 2063 through the Science, Technology & Innovation Strategy for Africa (STISA-2024), as we join this continental body in shaping the course of our youth, the African continent and the global scientific space.

We are grateful for your generous contributions and on behalf of the AIMS staff, students and alumni let me convey my sincere appreciation for your support.

Sincerely,
Thierry Zomahoun

AIMS Theory of Change

AIMS believes that significant investment in mathematical sciences in Africa will put the continent on the fast track to technological catch-up and socio-economic development.

AIMS believes that innovative ideas must be used to facilitate the growth of mathematical sciences as an important tool for African development. AIMS focuses on three main domains of change. These conditions are necessary to facilitate mathematical sciences becoming a viable option for socio-economic development in Africa. They are:

Training

- Build the human capital of knowledgeable and skilled professionals within the mathematical science fields
- AIMS provides a structured Master's program that is enabling a critical mass of African academics, researchers and entrepreneurs on the cutting-edge of STEM

Research

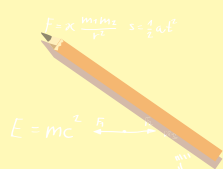
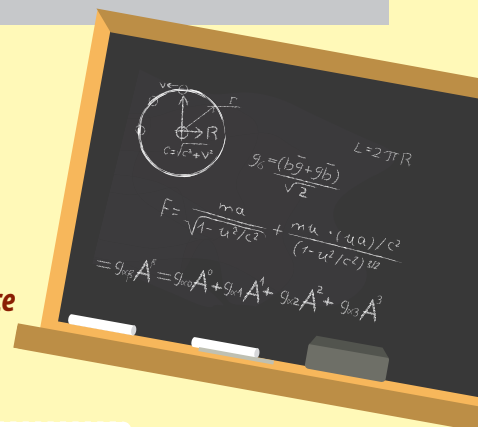
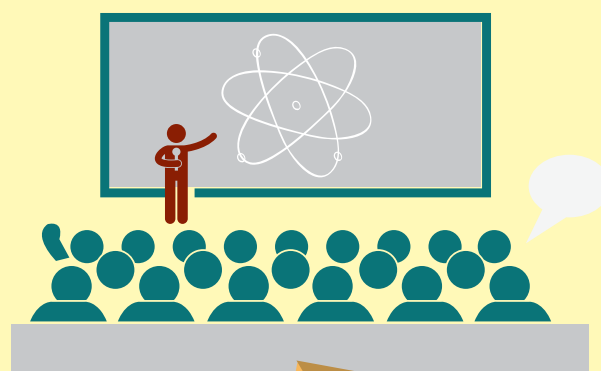
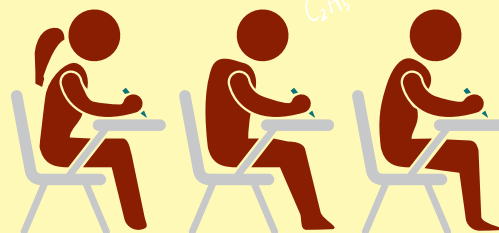
- Promote world-class research in the mathematical sciences, particularly on focused themes, which are practical for development in Africa
- AIMS is facilitating research in Africa, by Africans, that will benefit and nurture Africa's continued industrial growth and socio-economic development

Public Engagement

- Improve perceptions regarding the mathematical sciences and their value as a socio-economic development option
- AIMS is engaging with African governments as a champion for the mathematical sciences as an agent of change in Africa
- Partnerships – AIMS is promoting partnership between stakeholders in the mathematical sciences, including government, the public sector and academics

The domains of change are interrelated and success for any of AIMS' initiatives will be defined as changes in one or more of these domains.

Mathematics, and more generally the mathematical sciences, form the foundation of innovation. Fluency in math is needed to understand science, and science creates the innovations that can solve global development challenges. By strengthening access, quality and relevance of mathematical science education and research, countries provide a more skill-intensive route to industrial growth and development.



{If}

investment in mathematical sciences in Africa is made

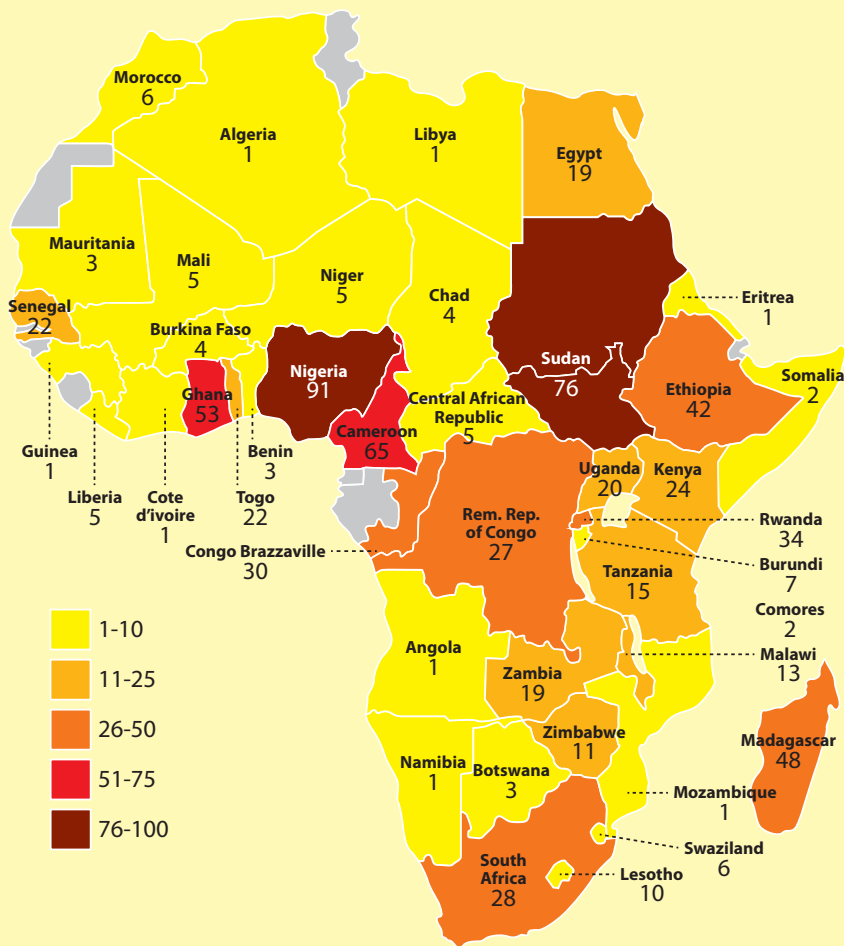
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{Then}

Africa will be on the fastest route to technological and socio-economic growth and prosperity

AIMS Alumni – Countries of Origin

AIMS has a total of 741 Alumni(226 women) from 42 African countries. The highest numbers of AIMS Alumni come from Nigeria (91), Sudan and South Sudan (76), Cameroon (65) and Ghana (53).



AIMS ALUMNI BY NATIONALITY AND GENDER

Nationality	Total (741)	Women (226)	Men (515)
1. Algeria	5	3	2
2. Angola	1		1
3. Benin	3		3
4. Botswana	3		3
5. Burkina Faso	4		4
6. Burundi	7		7
7. Cameroon	65	19	46
8. Central African Republic	5	1	4
9. Chad	4		4
10. Comores	2		2
11. Congo Brazzaville	30	2	28
12. Cote d'Ivoire	1		1
13. Democratic Republic of Congo	27	6	21
14. Egypt	19	5	14
15. Eritrea	1		1
16. Ethiopia	42	9	33
17. Ghana	53	16	37
18. Guinea	1		1
19. Kenya	24	10	14
20. Lesotho	10	2	8
21. Liberia	5		5
22. Libya	1		1
23. Madagascar	48	23	25
24. Malawi	13	2	11
25. Mali	5	2	3
26. Mauritania	3	1	2
27. Morocco	6	4	2
28. Mozambique	1		1
29. Namibia	1		1
30. Niger	5		5
31. Nigeria	91	37	54
32. Rwanda	34	12	22
33. Sénégal	22	3	19
34. Somalia	2		2
35. South Africa	28	8	20
36. Sudan incl. South Sudan	76	40	36
37. Swaziland	6	1	5
38. Tanzania	15	6	9
39. Togo	22	4	18
40. Uganda	20	6	14
41. Zambia	19	2	17
42. Zimbabwe	11	2	9

Promoting Gender Equality

FEATURE

"Equality between women and men (gender equality) refers to the equal rights, responsibilities and opportunities of women and men, girls and boys."

"Equality does not mean that women and men will become the same but that women's and men's rights, responsibilities and opportunities will not depend on whether they are born male or female. Gender equality implies that the needs and priorities of both women and men are taken into consideration, recognizing the diversity of different groups of women and men. Gender equality is not a women's issue but should concern and fully engage men as well as women. Equality between women and men is seen both as a human rights issue and as a precondition for, and indicator of, sustainable people-centred development." (Source: UN Women)

What does Gender Equality Mean for AIMS?

AIMS believes that mathematics is a universal tool and that everyone – women, girls, men and boys – should have equal opportunities to access and utilize mathematics in order to fulfill their own potential and to transform Africa.

Since it opened its doors in 2003, AIMS has maintained the percentage of women graduates at an average of 30%. But AIMS has recognized that more needs to be done to ensure that:

- More young girls and women are entering and succeeding in higher education and research programs in the mathematical sciences;
- More young girls and women are aware and prepared to take advantage of the career opportunities that are available to them in the mathematical sciences; and,
- There is a greater awareness among women, girls, men and boys of the important role of women and girls as equal contributors to African development through the mathematical sciences.

What is AIMS doing to Promote Gender Equality?

To this end, AIMS commissioned an external gender audit in 2013. This process involved a comprehensive gender review of policies, procedures, practices and perceptions of AIMS centres in South Africa, Ghana and Sénégal, and of the AIMS Global Secretariat.

The audit confirmed that AIMS has taken several meaningful steps to create an inclusive and gender sensitive learning and living environment for all its students, with wider impacts for gender equality.

In addition to the gender audit, AIMS has been working proactively to promote gender equality by reaching out to several women science organizations including: Women In Global Science & Technology; AkiraChix; African Women Forum for Science and Technology; the African Centre for Women, Information and Communications Technology; and the Association of South African Women in Science and Engineering. Advertisements for AIMS research, lecturing and study opportunities were made through these organizations to their members. Each AIMS centre conducts visits to local primary and secondary schools to encourage all students, and specifically young girls, to continue their maths and science studies.

AIMS South Africa also hosted the 2nd African Women Mathematicians workshop from July 17 to 19, 2013. This was attended by 33 women scientists and resulted in the creation of an association of African women in mathematics, which AIMS will continue to support and engage with.

"These successes are hard earned and should be celebrated and shared widely so that AIMS is duly recognized as an advocate for gender equality in mathematical sciences."

Gender Audit 2013



ALUMNI PROFILE

Chika Yinka-Banjo, Nigeria

2010 AIMS SOUTH AFRICA GRADUATE

Ms Chika Yinka-Banjo holds Master's and Bachelor's degrees in Computer Sciences from the University of Port Harcourt and Federal University of Technology Owerri. She is passionate about Artificial Intelligence (AI) and Robotics. Ms Yinka-Banjo won the prestigious L'Oreal-UNESCO For Women in Science Sub-Saharan Africa Fellowship Award to the value of €15 000. She is pursuing her doctorate from the Intelligent Systems & Advanced Telecommunications (ISAT) Laboratory of the

Department of Computer Science at the University of Cape Town (UCT). Ms Yinka-Banjo is aiming to develop a behavioural model to guide multi-robots in the pre-safety inspections of underground mines to prevent mine disasters and minimize accidents. "We built the model by implementing two artificial intelligent algorithms and ultimately hybridised the two algorithms. The aim is to save the lives of miners from mining disasters by doing a pre-entry safety inspection of the mine environment." Her interest was piqued while studying at AIMS South Africa and her thesis was

on how to detect and avoid obstacles using autonomous robots. When she isn't studying, she tutors new students in computer skills at UCT and also lecturers at the University of Lagos. She has built her academic career on inspiring the younger generation through teaching computer science most recently at Federal University of Technology, Owerri and University of Port Harcourt. Her aim is to become an academic role model for young African girls in science.

Training to meet market needs

The AIMS academic model provides the foundational technical skills and knowledge required across essentially all scientific fields – i.e., problem solving, logical thinking, modelling, computing and data analysis.

At the same time, AIMS is strengthening its training curriculum to ensure that the soft skills and knowledge the students develop at AIMS will meet the needs of the current and future job market, thereby setting them apart from other postgraduates. This is being done in the following ways:

- An online resource portal provides useful links with regards to careers in mathematics and science, CV and cover letter writing, and interview preparation. In addition, the resources include constantly updated links and information regarding internship and employment opportunities.

- A detailed training plan on the learning outcomes of a Career, Employability & Development (CED) module that would prepare AIMS students for today's employment market. This module complements the Employability-week (E-week) courses focusing on employability and entrepreneurship skills training that are being offered at all the centres. The new CED content and the engagement of lecturers with industry and entrepreneurship experience will be implemented in all centres in the 2014/2015 academic year.
- Class visits to local businesses, providing students with exposure to the day-to-day operations of a business and the opportunity to interact with business leaders and managers. These visits have opened the door for insightful discussions with industry representatives where AIMS students identify and propose solutions to solve day-to-day industry challenges, using their mathematical science training. Such visits have resulted in the AIMS Industry Initiative's first internships for AIMS alumni.

Mmabatho Mokiti gave a presentation to AIMS South Africa students titled "The Business of Mathematics." This video can be viewed at <https://www.youtube.com/user/AIMSacza>



As an initiative started by AIMS Sénégal, the Employability Club (E-Club) is a means of introducing AIMS students to a professional career within the corporate world. It is designed to introduce the practical uses of mathematics and its potential as a tool for creating a viable business enterprise. The E-Club reaches out to local companies to arrange visits whereby they can discuss challenges where the E-Club may be able to recommend solutions.



ALUMNI IN INDUSTRY

Tabitha Gathoni Mundia, Kenya

2009 AIMS SOUTH AFRICA GRADUATE

After showing an interest in science in her early childhood, Ms Tabitha Mundia applied and got accepted to join AIMS South Africa where she acquired knowledge on mathematical problem solving and programming skills that were most needed to establish a quantitative department in Equity Bank Group (the largest microfinance and retail bank in East and Central Africa by customer base), from which she had taken a sabbatical leave to attend AIMS. When she returned to Equity Bank Group, she immediately began using her newly acquired

knowledge, including taking a lead role in developing the world's first ever mobile money statistical scorecard MKesho that Equity Bank used to grant credit to the unbanked population in Kenya. She also mentored a team of 10 young mathematicians that she led on the statistical techniques used in risk modelling using R programming language, a language that she learned at AIMS. In November 2012, she joined the International Finance Corporation (IFC), the private sector arm of the World Bank Group and arguably the most diverse work place in the world, as a risk analyst, a position she currently holds in

the headquarters of the bank in Washington DC.

Ms Mundia commented: "At IFC I'm part of a highly experienced group of quantitative risk analysts who help drive the mission and vision of the IFC: the end of extreme poverty by 2030 and boost shared prosperity – in every developing country. My day-to-day work revolves around capital projections and economic modelling and validation, using various mathematical tools and statistical packages, skills that were imparted and grounded at AIMS!"

AIMS Industry Initiative

FEATURE

The AIMS Industry Initiative seeks to maximise the opportunities and potential for the mathematical sciences to contribute to Africa's economy through human capital, knowledge transfer and applied research.

One of the goals of the AIMS Industry Initiative is to facilitate internship opportunities not only for current

students, but also alumni. These placements allow students and alumni to put their knowledge and skills into practice in industry. The AIMS Industry Initiative also seeks to engage industry in course and content development to ensure relevance of the curriculum. Part of AIMS' role is to facilitate the application and interview process for the students and alumni.

SINCE THE AIMS INDUSTRY INITIATIVE STARTED IN 2013, 16 INTERNSHIPS HAVE BEEN FACILITATED THROUGH AIMS.

Company	Number of Interns	Job type	Period of Internship
Infinite Potentials Consulting (Germany)	(2)	Analyst (advanced statistical data analysis to ensure the quality, comparability and reliability of third party data)	July - December 2013
AIMS Sénégal	(1)	Operations Assistant	July - December 2013
AIMS Ghana	(1)	Operations Assistant	July - December 2013
Communitech (Canada)	(1)	Analyst	July - December 2013
Ikagel (Sénégal)	(3)	Intern	March – August 2014
World Wide Web Foundation (South Africa)	(1)	Analyst	June – November 2014
GENHY Consulting (Sénégal)	(2)	Intern	Start 2015
Group Sonatel (Sénégal)	(5)	Intern	Start 2015



ALUMNI INTERNSHIP PROFILE

Aby Sall, Sénégal

2014 AIMS SÉNÉGAL GRADUATE

Ms Aby Sall, developed a great interest in renewable energy while studying at AIMS. After impressing the company's management team of Ikagel Exotic

Seafood, a leading fish processing company in Sénégal, during a class visit, she was selected as an intern, where, together with a fellow student from AIMS, she worked on a research project titled, "Transforming Ikagel's waste for energy production based on the methanization process." The project led the company to transform its fish waste into energy and reduced its energy costs in an environmentally friendly way.

The fishing industry plays a vital role in the Sénégalese economy in terms of its contribution to local employment and international trade; it is one of the major export products. However, the industrial fishing operations in the country struggle with high costs and Sénégal, which is an energy poor country, relies heavily on energy imports. The situation necessitates interventions such as the one developed by Ms Sall and her fellow student to not only create but also save energy in order to reduce the production costs.

Talking about her future, she confidently says "I would like to work in the field of renewable or thermal energy, especially solar energy." After submitting a feasibility study, she is eagerly awaiting to hear from Ikagel as to whether she will continue in a full-time position with the company.



ALUMNI INTERNSHIP PROFILE

Dr Siaka Lougue, Burkina Faso

2010 AIMS SOUTH AFRICA GRADUATE

Dr Siaka Lougue completed his PhD in Applied Statistics in Demography and Biostatistics at UWC

in 2013 with the support of a DAAD scholarship. Prior to AIMS, Dr Lougue worked as principal data analyst for the National Institute of Statistics in Burkina Faso and as a consultant for national and international organizations including UNFPA and UNICEF.

As part of the AIMS Industry Initiative, Dr Lougue successfully secured an internship opportunity with the World Wide Web Foundation (WWWF). The WWWF is a non-profit organization devoted to achieving a world in which all people can use the web to communicate, collaborate and innovate freely, building bridges across the divides that threaten our shared future. The WWWF was seeking a mathematical graduate for advanced statistical data analysis to ensure the quality, comparability and reliability of third party data. "It is a great joy to work with the World Wide Web Foundation to achieve such a noble objective," remarks Dr Lougue. "This opportunity also opens doors for academics to use their skills in companies' activities and apply the use of science to make the world a better place for all."

Dr Lougue is deeply convinced that "AIMS is a place for those who really believe and want to be part of the pioneers to use education, mathematics skills and hard work to change the situation of Africa from a continent of war and diseases to a continent of peace, innovation and glory."

Research

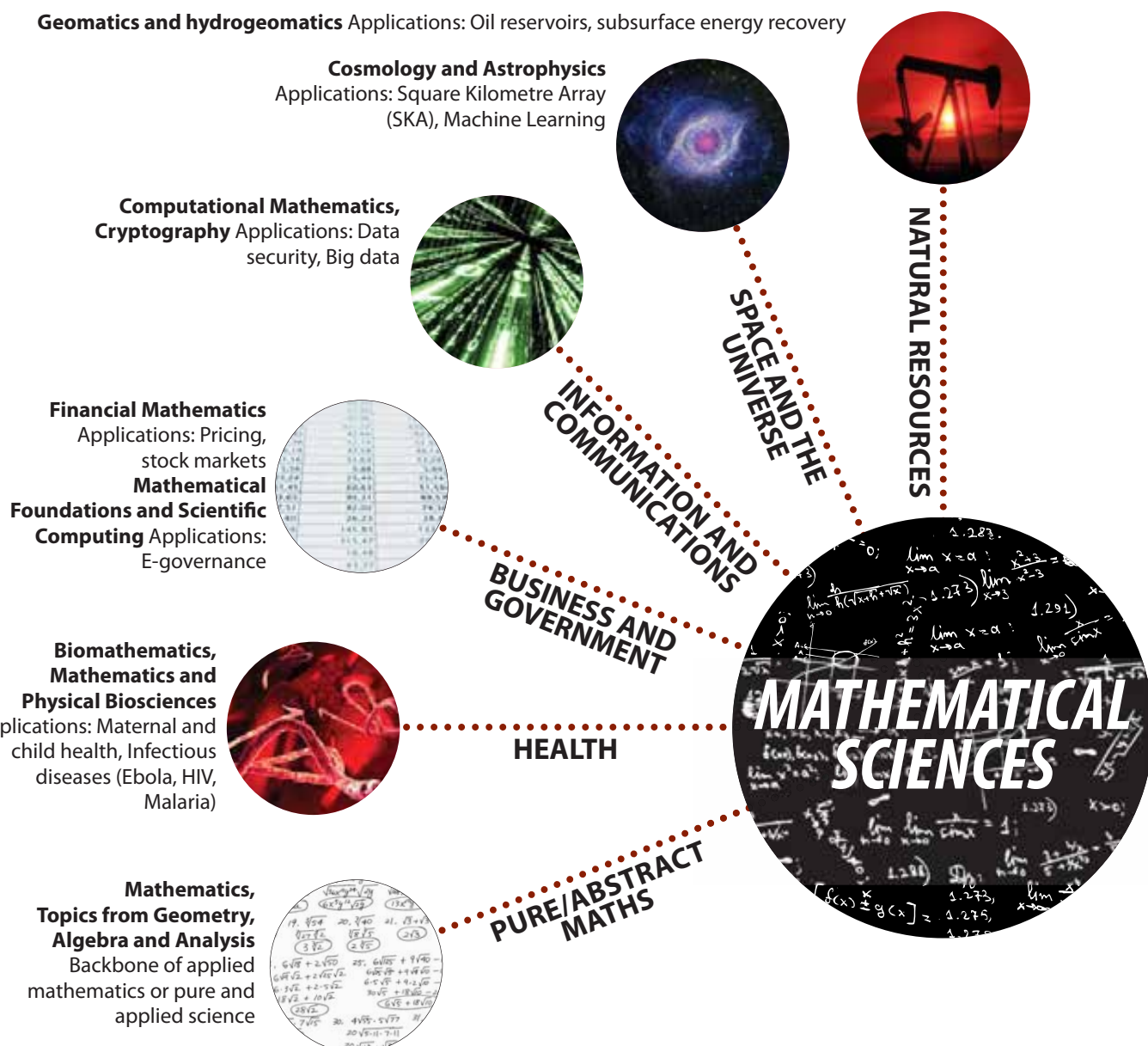
From the use of alternative sources of energy, to information security, food security and health, research plays a pivotal role in the advancement of any given society.

AIMS is contributing to Africa's transformation by supporting outstanding research in the mathematical sciences with emphasis on those areas that promote development and prosperity in Africa. This is being achieved through the establishment of a network of mathematical science research centres across Africa, and positioning these research centres to be recognized for their excellence in applying

mathematical sciences to solve Africa's development challenges.

The AIMS research environment encourages research freedom, with researchers conducting research that will impact humanity; support local and global strategic-driven initiatives; and forecast and respond to emerging challenges and opportunities.

AIMS RESEARCH CONTRIBUTES TO AFRICA'S CHALLENGES AS WELL AS LOCAL AND GLOBAL STRATEGIC INITIATIVES



Ongoing initiatives

Ongoing research initiatives at AIMS includes the AIMS Global Research Chair Program and the small research grants provided to alumni.

The AIMS Global Research Chair Program

The AIMS Global Research Chair program is one of the rapidly growing strategic initiatives across the network. Funded by diverse partners, it provides the opportunity to appoint Research Chairs who will lead a team of students (PhDs and Masters) and postdoctoral fellows. The Chairs are also responsible for knowledge dissemination of their research findings, hosting and attending scientific events, and publications. The AIMS network currently has six Research Chairs and is in the process of recruiting an additional five Chairs over the next few years.

HUMBOLDT FOUNDATION RESEARCH CHAIR

Dr Mouhamed Moustapha Fall was appointed as Alexander von Humboldt Foundation Endowed Chair in "Mathematics and its Applications" at AIMS AIMS Sénégal in 2013. Dr Fall is an Assistant Professor at the University of Dakar. His research interest is the analysis of Partial Differential Equations arising from physical phenomenon and Differential Geometry. This Chair was created to promote higher education and mathematical research in Africa, connect AIMS Sénégal with German higher educational establishments and to foster cooperation of AIMS centres in Africa.



AIMS ARETÉ JUNIOR CHAIRS

in collaboration with the

Robert Bosch Stiftung

Since the establishment of the Research Chair, several workshops and schools have been organized at AIMS Sénégal, bringing more than 200 researchers from around the world to the Centre. Several researchers (from Sénégal, Germany, USA, Italy, etc.) took the opportunity to carry out research stays at AIMS Sénégal and shared their knowledge via seminars, public lectures and AIMS Master's research project supervision.

AIMS ARETÉ JUNIOR CHAIRS PROGRAM

The AIMS ARETÉ Junior Chairs program provides high-profile and pioneering academic positions to young African scientists. The program, a collaboration between AIMS-NEI and the Robert Bosch Stiftung (Germany), offers an opportunity for African scientists currently studying or working overseas, to return to Africa to continue their research work and contribute to Africa's growth through research and teaching.

The goal of the AIMS ARETÉ Junior Chairs program is to build a community of motivated and talented scientists who will undertake international-class scientific work on the African continent.

The program awards 5-year Junior Chair positions to AIMS alumni currently residing outside of Africa who have interest in both performing research while also contributing to the scientific development of Africa.



AIMS ARETÉ JUNIOR CHAIR PROFILE

Dr Antoine Tambue, Cameroon 2007 AIMS SOUTH AFRICA GRADUATE

Dr Antoine Tambue has a proven track record of exceptional research experience and numerous publications in peer-reviewed journals. His main interest lies in Partial Differential Equations (PDEs). Key applications of his research, particularly in Africa, are oil and gas recovery from hydrocarbon reservoirs, groundwater contamination and sustainable use of groundwater resources, storing greenhouse gases (e.g. CO₂), radioactive waste in the subsurface or mining heat from geothermal reservoirs. His goal is to accurately forecast energy production in oil, gas and geothermal reservoirs or predict the spatial and temporal spread of pollution in groundwater reservoirs. Dr Tambue's achievements will directly feed into efforts not only for environmental protection and waste management but also potentially open up new opportunities for African countries to develop their own industries, including petroleum exploration.

Dr Tambue completed his undergraduate degree at the University of Dschang, Cameroon, and thereafter obtained a Master's degree (by coursework), a Secondary High Teacher Diploma and Master's degree (with coursework and thesis) in Mathematics at the University of Yaounde I, Cameroon. He completed the AIMS Postgraduate Diploma in Mathematical Sciences in 2007 and obtained his PhD in Applied Mathematics from Heriot Watt University, UK, in 2010. Before accepting the ARETÉ Chair position, he worked as a researcher at the University of Bergen (Norway) and as a research fellow at the Norwegian University of Science and Technology. Since 2013, he has qualified as an Associate Professor at Norwegian universities and university colleges.

As the ARETÉ Junior Chair, Dr Tambue's interest lies in the application of mathematical skills to understand subsurface energy production (fossil fuels energy and geothermal energy) and quantify the uncertainty in production due to

uncertain reservoirs data. The African continent has great energy potential (fossil energy, hydroelectric, wind power, solar power and geothermal energy). However, statistics from the World Bank indicate that about 25 of the 54 nations on the continent are in energy crisis as energy development has not kept pace with rising demand. So energy research and the establishment of alternative sources of energy is the first prerequisite for the development of the African continent. Through his Chair, he will contribute in training young African scientists who will be able to investigate and make contributions to Africa's energy production. These students will be able to use their mathematics skills to understand subsurface energy production and quantify the uncertainty in the production due to uncertain reservoir data. Additionally, his group will build new numerical techniques for scientific computing with application in computational finance and subsurface energy.

The Chair holders will be based at an AIMS research centre and provided with adequate resources for a fully functional and high performing research team, including equipment and travel allowance to visit national and international partner institutions.

The name of the program, ARETÉ, refers to the Greek meaning of excellence, virtue and realization of potential, and stands for African Research, Education and Teaching Excellence.

Dr Antoine Tambue was appointed as the first AIMS ARETÉ Junior Chair. He will be based at both AIMS South Africa and the Centre for Research in Computational and Applied Mechanics (CERECAM) at UCT. His research will focus on mathematical methods for subsurface energy recovery and uncertainty quantification.



JOINT AIMS CAREER
DEVELOPMENT CHAIRS PROFILE

**Dr Wilfred Ndifon,
Cameroon**

Dr Wilfred Ndifon started his post-secondary career at the University of Buea, Cameroon, where he

majoried in mathematics and computer science, with a minor in physics. He is a biology graduate of Morgan State University (USA) where he received a Regents' Scholarship (offered to students with the highest scores in the SAT), and at Towson University, USA (2000-2001), where he was a Baltimore Collaborative for Environmental Biology Honors Scholar. He completed his Master's degree in 2007 and his PhD degree in 2009 at Princeton University, USA, where he was a Burroughs-Wellcome Training Fellow in Biological Dynamics. He was a postdoctoral research fellow at the Weizmann Institute of Science, Israel (2009-2012) and was a visiting research fellow at AIMS South Africa in 2014

Dr Ndifon's research interest is in elucidating the organizing principles of T-cell diversity in health and disease, with the ultimate goal of developing new approaches (including diagnostics) to controlling various communicable and non-communicable diseases such as malaria. Malaria causes about one million human deaths annually, most of which occur in sub-Saharan Africa. In addition, it causes substantial morbidity, contributing to decreased economic productivity and increased poverty levels. A highly effective malaria vaccine will reduce such mortality and morbidity, and also alleviate their economic impacts. Children under five years old are the biggest victims of malaria. In addition, pregnancy-associated malaria is an important cause of death among pregnant women in sub-Saharan Africa. Therefore, his work has significant implications for improving maternal, newborn, and child health.

One of the key challenges that his work addresses is that of developing a highly effective malaria vaccine. Traditionally, this challenge has been approached from a pathogen-centred viewpoint, which focuses on finding altered forms of a malarial parasite (including parasite-derived proteins) that can induce a protective immunity in susceptible individuals. His work employs a very different but complementary, immune-centred approach, which focuses on profiling, using both experimental and computational means, the immune system of malaria patients in order to discover determinants of protective immunity that can be artificially elicited in susceptible individuals. This approach has the potential to greatly speed up the discovery of novel malaria vaccine candidates.

**JOINT AIMS CAREER
DEVELOPMENT CHAIRS**

Research Collaboration between AIMS centres is important to build an interconnected research network. With support from the International Development Research Centre (IDRC), the Joint Career Development Chairs will facilitate and strengthen this interconnectedness through collaboration between the research centres at AIMS South Africa and AIMS Ghana.

Dr Wilfred Ndifon and **Dr Gaston Mazandu** were appointed as the two researchers who will collaborate as Joint AIMS Career Development Research Chairs in Quantitative Immunology and Bioinformatics, a research area with relevance to some pertinent diseases in Africa like Ebola, influenza, tuberculosis and malaria. To further build on the existing partnerships between AIMS and Canada, both Chairs



JOINT AIMS CAREER
DEVELOPMENT CHAIRS PROFILE

**Dr Gaston Mazandu,
Democratic Republic
of Congo**

2004 AIMS SOUTH AFRICA GRADUATE

Dr Gaston Mazandu is a graduate in mathematics and an AIMS South Africa alumnus (2004). He undertook a research Master's degree in computer science at Stellenbosch University (SU) and completed his PhD and Postdoctoral research at UCT in 2011 and 2013, respectively.

Through his research, Dr Mazandu has learnt a great deal about molecular biology and life sciences, particularly with respect to microbial pathogens at the Computational Biology group at the Institute for Infectious Disease and Molecular Medicine in the Department of Clinical Laboratory Sciences, Faculty of Health Sciences, UCT. He is also well grounded in several aspects of Bioinformatics applied to health sciences. Dr Mazandu has been lecturing in Bioinformatics at UCT since February 2014 and in the past years contributed to the AIMS Structured Master's program as a tutor and lecturer. He has published his research findings in the Biomedical Research International, Bacteriology and Parasitology journals

Similar to his co-Chair Dr Ndifon, Dr Mazandu's research interest is also in the field of Biomathematics. .

His current research focus is on integrating complex functional genomics data for analyzing the factors that contribute to human susceptibility to infectious diseases in relation to the bacterial pathogen. More specifically, he is investigating relationships between susceptibility to infectious diseases and the use of existing drugs for new therapeutic applications, commonly referred to as drug repositioning.

Using these different biological data, he is investigating the complex relationships between drugs, targets and diseases at the systems level to possibly find new uses for drugs beyond their initial medical prescription for an efficient and effective therapy. Understanding disease at the systems level may enable targeted interventions using more effective drug combinations and lead to optimal drug therapies that overcome the possible issue of adverse drug reactions or drug side-effects and others, such as pathogen diversity and other mutations susceptible to compromise the effectiveness of potential drugs.

This is particularly relevant in resource poor countries, such as those on the African continent, as factors such as adverse drug reactions can lead to extended hospital stays, placing an unnecessary burden on family or national health budgets.

will work closely with a Canadian partner institution.

Through their joint efforts and working closely with Canadian partners, both Dr Ndifon and Dr Mazandu will be well placed to position their research group within the academic communities in Ghana, South Africa and globally.

SOUTH AFRICAN RESEARCH CHAIRS

AIMS South Africa continues to build and contribute to the AIMS Global Research Chair program through the appointment of Research Chairs to its centre. In January, **Professor Cang Hui** commenced his appointment as a Chair in Mathematical and Theoretical Biosciences under the South African government Research Chair Initiative (SARChI). This is a joint appointment between AIMS South Africa and Stellenbosch University's (SU) Department of Mathematical Sciences. Prior to this appointment, Professor Hui held a research position in the core team of the South African Department of Science and Technology – National Research Foundation (DST-NRF), Centre of Excellence for Invasion Biology at SU. He is an Adjunct Professor, of the Research School of Arid Environment and Climate Change at Lanzhou University (China). He is on the editorial boards of several journals in the biological sciences, and one in applied mathematics and computational sciences. He has published extensively in these areas and in 2011 received the NRF President's Award as an excellent young researcher.

The research focus of this Chair is to develop novel methods in mathematics, statistics and theoretical physics for unlocking the processes and mechanisms behind real emergent patterns in biology. Its aim is to establish the multidisciplinary field of Mathematical and Theoretical Physical Biosciences as a distinct research strength in South Africa. This would strengthen the existing research activities in mathematical sciences and

theoretical physics at SU and at AIMS South Africa, and stimulate interaction between them. Specific goals include: promoting academic excellence by producing well-cited innovative research outputs, and engaging in multidisciplinary relevant research projects; building knowledge and research partnerships in South Africa between the fundamental disciplines of mathematics and theoretical physics and the experimental biosciences; playing an active role in South Africa's research and development by supporting experimental research in the traditional biosciences since it is increasingly recognized that complex nonlinear interactions (on the cellular, sub-cellular and molecular levels) arising in biological systems will best be understood through mathematical and theoretical physical models; building scientific and intellectual capacity in Africa by developing and helping appoint human capital in mathematical sciences and theoretical physical sciences which are areas where skills are scarce but extremely important; promoting institutional diversity by providing highly-talented, well-trained doctoral graduates from all over Africa.

Professor Romeel Davé

continued as the SARChI Chair in Cosmology with Multi-Wavelength Data, which is a joint appointment between AIMS South Africa, UWC and the South African Astronomical Observatory (SAAO). His research work is related to the Square Kilometre Array (SKA) project. The SKA is one of the major strategic initiatives taken by the government of South Africa to build human capacity in Southern Africa on topics related to computational astrophysics and fundamental science. The overall goal is to engage South Africans in utilizing the data from the SKA and its precursors, through internationally competitive science projects done within South Africa. Through this Chair, AIMS is making contributions to the South African government's strategic initiatives while positioning itself as key player in global science initiatives.



Members of the AIMS South Africa Research Centre.

AIMS Small Research Grant Program

AIMS launched the “Research for Africa” project in 2014 with support from IDRC. This project aims to catalyse, strengthen and grow the current AIMS Network research programs, while at the same time enhancing postgraduate opportunities for AIMS alumni, and increasing their probability of contributing to Africa’s self-sufficiency through applied or industry research activities.

As part of the Research for Africa project, the AIMS Alumni Small Research Grant (AASRG) targets AIMS alumni interested in mathematical science research, including applied, interdisciplinary or industry mathematical science research. A total of five grants are allocated annually.

The small research grant program has been designed with some unique features which will further enhance the skills of the grantees and extend AIMS’ research network:

- The program will familiarize AIMS students and alumni with grant application and management processes, an important skill for those seeking future careers in research.

- Grants are tenable in any academic or research institution although grantees will be expected to spend at least 10% of their research time at an AIMS research centre of their choice. This is expected to boost inter-institutional collaboration and collaboration between AIMS centres.
- It is expected that research activities and domains will rapidly be embraced in new AIMS centres, while existing AIMS centre research activities will be strengthened through interaction with the grantees.
- It is expected to leverage additional research funding from within the local and global scientific community, particularly with partners within the Canadian research community.

In 2014, five alumni were recipients of an AIMS Small Research Grant: **Dr Emile Chimusa Rugamika**, Postdoctoral Researcher, Department of Clinical Laboratory Sciences, UCT, South Africa; **Mr Kouakep Tchaptchie Yannick**, PhD student in Applied Mathematics at the University of Ngaoundere, Cameroon; **Mr Diogene Vianney Pongui Ngoma**, PhD student at University Marien Ngouabi, Republic of Congo; **Mr Rock Stephane Koffi**, PhD student in the faculty of Commerce at UCT; and **Mr David Attipoe**, Mathematical Finance, UWC, South Africa.



AIMS ALUMNI SMALL RESEARCH GRANT RECIPIENT PROFILE

Dr Emile Chimusa Rugamika, Democratic Republic of Congo

2008 AIMS SOUTH AFRICA GRADUATE

Dr Emile Rugamika is a Postdoctoral Researcher in the Department of Clinical Laboratory Sciences at UCT.

He received his BSc in Applied Mathematics at the University of Kinshasa, after which he joined the Independent Electoral Commission (IEC) for the United Nations mission in the Democratic Republic of Congo (DRC), as a Software Developer and Database Administrator. He completed his PhD at UCT in Bioinformatics and Computational Biology in 2012; during his last year, he re-connected with AIMS as an IT and teaching assistant.

Dr Rugamika is a mathematical population geneticist whose main focus of research is “Medical Population Genetics and Computational Statistics methods for mapping complex diseases”. His research applies computational and statistical

methods for understanding both the genetics and environment architecture of genetic diseases. He is interested in investigating methodologies for improving the analysis of large scale genomic studies such as genome-wide association studies or fine-mapping studies and analyzing genome wide patterns of variation within and between species. This will contribute to addressing fundamental questions in biology, anthropology, and medicine. He is currently investigating the heritability of disease traits using DNA sequence data of both parents and children, particularly new-born babies (family-based) (1) to understand the fraction of phenotypic (traits or diseases) (2) to predict genetic architecture of complex traits (such TB and HIV), and variation in drug/treatment responses at early stage in children, and (3) to optimise prescription and usage of medicines to

effectively manage and treat infectious and non-communicable diseases in sub-Saharan African populations.

His project will develop important skills, further job opportunities and tools required for medical population genetic research in sub-Saharan and South Africa. A wide variety of other disciplines stand to benefit from this research, including the pharmaceutical, biotechnology, computational biology, biostatistics and diagnostic areas.

Dr Rugamika has trained, supervised and co-supervised several AIMS students. He is one of the first recipients of the grant which is serving as a “push” for his early scientific career and it is also supporting him to build research capacity of AIMS students through supervision.

Workshops and Conferences



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- 1 2nd African Women Mathematicians Workshop
- 2 3rd Edition of "Doctoriales"
- 3 The Working Session on Graph Theory
- 4 7th Summer School in Mathematical Finance

- 5 Machine Learning Workshop
- 6 Meaningful Modelling of Epidemiological Data
- 7 Solar panel workshop
- 8 I-CAMP 14 Summer School

Knowledge Exchange and Collaboration

All centres hosted a number of relevant workshops and conferences for students, researchers and other members of the scientific community. These events focus on raising awareness on the applications of mathematical sciences and provide networking opportunities for students and alumni.

The following workshops and conferences took place in the period under review:

- 2nd African Women Mathematicians Workshop held from July 17 to 19, 2013 at AIMS South Africa
- CIMPA Research School 22: Evolutionary equations with applications in natural science held from July 22 to August 2, 2013 as a collaborative effort of AIMS South Africa and CIMPA
- 1st Workshop on Mathematical Structures 2013 held from December 2 to 7, 2013 at AIMS South Africa in collaboration with the Department of Mathematical Sciences at SU
- The Working Session on Graph Theory held from December 9 to 13, 2013 at AIMS South Africa
- 3rd Edition of "Doctoriales" held on December 20, 2013 at AIMS Sénégal in partnership with the Doctorate School of Mathematics of the University Cheikh Anta Diop of Dakar (UCAD)
- Workshop on software carpentry held from February 8 to 20, 2014 at AIMS Ghana in collaboration with ICTP
- 7th Summer School in Mathematical Finance held from February 20 to 22, 2014 at AIMS South Africa
- Machine Learning Workshop held on April 12, 13 and 26, 2014 at AIMS South Africa
- South African Symposium on Numerical and Applied Mathematics 2014 held on April 22, 2014 at AIMS South Africa
- The 16th Abdus Salem Lectures on Modelling, Simulation and Optimization held from April 28 to May 3, 2014 at AIMS Ghana in collaboration with ICTP
- Mathematical Tools for Understanding and Managing Fisheries: Synthesizing and Refining Data and Models held from May 7 to 9, 2014 at AIMS Sénégal co-financed by the German Academic Exchange Service and Humboldt Foundation
- Meaningful Modelling of Epidemiological Data held from June 2 to 14, 2014 at AIMS South Africa in collaboration with South African Centre for Epidemiological Modeling and Analysis

- ICTP-NLAGA School in Dynamical Systems and Ergodic Theory held from June 4-14, 2014 at AIMS Sénégal co-financed by the ICTP, the Senegal Ministry of High Education and Research and the Humboldt Foundation
- Solar panel workshop held from June 23 to 27, 2014 at AIMS Ghana in collaboration with The Lightyear Foundation
- I-CAMP 14 Summer School (last two days), June 26 to 27, 2014 held at AIMS South Africa
- Biophysics Symposium held from June 28 to 29, 2014 at AIMS South Africa

Research Output

Scientific publications are integral to knowledge dissemination, the formulation of new concepts and ideas and to scientific innovation. The first AIMS Research Centre was opened in South Africa (2008) and subsequently research centres have opened in Sénégal and Ghana.

Researchers within the AIMS network including AIMS alumni have contributed to the growing number of research publications within the mathematical sciences emanating from Africa.

From January 2013 to December 2014, approximately 82 peer reviewed articles were published by researchers affiliated to the AIMS research centres.

The published articles address various topics in the field of biomathematics, computational mathematics, cosmology, financial mathematics, geomatics and statistics amongst others.

More specifically the research outputs have contributed to answering questions related to the following:

- The universe, space and galaxies;
- Big data and machine learning;
- Levy processes, pricing, optimal portfolio management, capital allocations;
- Health issues related to economically important diseases in Africa such as tuberculosis, HIV, malaria;
- Computer security, secure routing protocols for mobile and ad hoc networks;
- Mathematics related to animated movie production,
- Alternative sources of energy such as subsurface energy production (fossil fuels energy and geothermal energy);
- Partial differential equations and differential geometry etc.

SNAPSHOT OF AIMS CENTRES' RESEARCH OUTPUTS (2013 AND 2014)

Number	AIMS Centre	Launch of the Research Centre (Year)	Number of Researcher Chairs	Number of Resident Researchers	Number of Post Docs, PhDs and Research Masters	Number of Publications (2013 and 2014)
1	South Africa	2008	5 (2 jointly with AIMS Ghana)	9	36	72
2	Sénégal	2013	1	0	2	9 (Published)
3	Ghana	2014	2 (jointly with AIMS South Africa)	0	-	1
Total			6	9	38	82

Public Engagement

Public Engagement at AIMS is defined as the popularization, teaching and advocacy of mathematical sciences and its applications.

AIMS seeks to facilitate behaviour change in the public, industry and government by improving perceptions regarding the critical importance of mathematical sciences education and the value of mathematical sciences as a socio-economic development option.

Changing Public Behaviour

AIMS is focusing on popularizing mathematics and mathematical sciences for all ages, using public lectures to change hearts and minds, by hosting relevant and engaging expositions and demonstrating the relevance of mathematical sciences to Africa's development.



Community Outreach

AIMS South Africa had an exhibit at the National Research Foundation's National Postdoctoral Forum held in Stellenbosch from December 4 to 6, 2013.

AIMS Sénégal arranged its first open-door event for students from the local high schools on March 15, 2014. A total of 164 high school students, from four high schools in Mbour visited the centre. Activities were facilitated by AIMS students and tutors and were designed to show the use of mathematics for everyday practical use. In addition, the centre launched its science club program. These clubs are organized at local high schools and are designed to increase high school students' interest and knowledge in science. The club has only begun to operate and has mainly focused on providing peer support and discussions on the importance of mathematical sciences.

Throughout the year AIMS Ghana held open days for local primary and high school students. Students interacted with AIMS students and learnt simple ways of solving mathematical problems with the help of a computer.



Public Lectures

There were eight public lectures hosted at AIMS South Africa in this reporting period. The Cosmology Group of the research centre at AIMS South Africa also organised the second TEDxAIMS event held on June 22, 2014 with the theme "Alone in a Crowd." Nine speakers came from all over the world to share their ideas and stories.

AIMS Sénégal hosted several prominent researchers and scientists who delivered 15 public lectures and talks. The AIMS Ghana research centre also hosted several prominent researchers and scientists to provide 10 public lectures and talks.

Events

AIMS CAMEROON LAUNCH

Some of the most influential minds in physics and mathematics joined Prime Minister Philémon Yang, and Michaëlle Jean, the Chancellor of the University of Ottawa and previous Governor General of Canada, in Cameroon's capital city, Yaoundé, to officially launch AIMS Cameroon on February 17, 2014.

To coincide with the official launch a panel discussion was held, titled "Youth, Science and Entrepreneurship for Development." The forum discussed the potential for youth in a science career and the opportunities for innovation and entrepreneurship in the scientific field. Participants and launch attendees included the 2010 Fields Medal winner, Cedric Villani; Neil Turok, AIMS Founder and director of the Perimeter Institute for Theoretical Physics in Canada; David Gross, Nobel Laureate 2004, Klaus von Klitzing, Nobel Laureate 1985; Paul Wiegmann,



Physicist & Blaise Pascal Chair; Howard Alper, Chair of Science Technology & Innovation Council of Canada; Barry Green, Interim Director, AIMS Cameroon and Thierry Zomahoun, President and CEO of AIMS-NEI.

AIMS 10TH ANNIVERSARY EVENT IN PARTNERSHIP WITH IDRC

AIMS marked its 10th anniversary with a reception in Ottawa, Canada on November 6, 2013.

His Excellency the Right Honourable David Johnston, Governor General of Canada, was the honoured guest at the celebration and called AIMS “part of an overall African renaissance in learning.”



His Excellency lauded AIMS as “an important and inspiring initiative” that is helping talented young Africans fulfil their potential in mathematics, the backbone of the modern economy.

The anniversary celebration, co-hosted by IDRC and AIMS, brought together AIMS alumni, parliamentarians, ambassadors, and business leaders, as well as Canadian academics who have volunteered their time to lecture at AIMS centres.

PI DAY IN TANZANIA

AIMS in partnership with the Mathematics Association of Tanzania (MAT) celebrated the 10th anniversary of Pi Day, an annual event commemorating the mathematical constant π (pi).

Pi Day is held on the fourteenth day of the third month (3/14) since 3, 1 and 4 are the first three significant digits of pi. The goal of the celebrations is to raise awareness about mathematics and its importance in society. This particular year marked the 10th anniversary of the event, for which MAT and AIMS forged a partnership with the common goal of increasing participation and showing the relevance of mathematics in our lives. The partnership also aims to make maths a more popular subject among students, a goal which requires policy-makers to address and improve the way in which mathematics is currently taught in schools.

The guest of honour was the Vice-President of the United Republic of Tanzania, Dr Mohammed G. Bilal. He delivered the keynote address, which emphasised the importance of mathematics specifically in relation to Tanzania’s economic growth. He urged students to take their mathematics studies seriously and teachers to make their teaching relevant to the needs of the country. Dr Bilal was full of gratitude for the



partnership and confirmed his government’s commitment to support the establishment of the AIMS Centre of Excellence in Tanzania.

Dr Bilal presented the awards donated by AIMS to the top-performing students in the National Mathematics Contest organised by MAT.

The event was held in Dar es Salaam and attended by over two thousand school children and their teachers.

As part of the event, a special two-day exhibition called IMAGINARY was co-sponsored by AIMS and the Mathematisches Forschungsinstitut Oberwolfach, from Germany. This exhibition was designed to use display visualizations, interactive installations, virtual reality, 3D objects to explain algebraic geometry in an attractive and understandable manner. This Pi Day was the first time an IMAGINARY exhibition was held in Tanzania.

IDRC HOSTS PANEL DISCUSSION WITH AIMS ALUMNI

As part of AIMS’ 10th anniversary celebrations a panel discussion was held on November 7, 2013. The event was broadcast live on the Web from IDRC’s offices in Canada’s capital city of Ottawa. AIMS alumni Martial Ndeffo, Marvellous Onuma-Kalu, Nosiphiwo Zwane, Richard Junganiko Munthali and Felix Oghenekohwo joined Neil Turok and Thierry Zomahoun in a deep and



compelling conversation moderated by Paul Wells, Senior Columnist for *Maclean’s* magazine. The discourse focused on how AIMS is gaining momentum and recognition as a world-class institute in Africa. Panelists described how AIMS’ unique ability to find top young African talent was what set it apart from other education programs. AIMS’ character-building curriculum provides its participants with a sense of responsibility, networks and inspiration to use mathematical sciences to address key African challenges in public health, the effects of climate change and food security, literacy and poverty.



Improving Education Quality

AIMS is committed to increasing the pipeline of students progressing into secondary and tertiary mathematics education, and to decreasing the failure or drop-out rate of mathematics students at all levels. Through new pedagogical approaches, the use of technology, and updated curricula, AIMS is focusing on strengthening teacher capacity and reaching as many students as possible.

Teacher Training

AIMS South Africa's Schools Enrichment Centre (AIMSSEC) is the driving force behind the centre's outreach activities, and is designed to raise public awareness of the sciences and mathematics, increase interest in AIMS, and build the local capacity of teachers to teach science and mathematics. This comprehensive approach is key in creating sustainable local demand for science and mathematics graduates, and leveraging local and national partnerships. Over the last eleven years 1,240 teachers have completed the AIMSSEC three-month Mathematical Thinking course and in collaboration with the universities of

skills and knowledge, especially in science and mathematics. Discussions with local high schools are ongoing, which is increasing interest among potential teacher participants. The first module is expected to commence in August 2014.

AIMS Ghana, in collaboration with Pepperdine University, organised a workshop for local senior high school maths teachers from six schools in the central region from July 7 to 11, 2014 on its campus at Biriwa. Twenty-one participants comprising thirteen males and eight females were taken through information and communication technology as tools for learning. The training included further in-school workshops at three of the participating senior high schools.

In July 2014, 97 teachers attended the 22nd AIMSSEC Mathematical Thinking course (MT22) and 54 Advanced Certificate in Education (ACE) students attended their fourth residential course.



AIMS' growing alumni network is also serving to improve mathematics education across the continent, with close to 100 alumni, 28 of them women, currently teaching at tertiary institutions in Africa. Having experienced the innovative teaching approaches at AIMS first hand, these alumni are sharing their knowledge and experiences with their teaching colleagues and students, creating change from within their own institutions.

Stellenbosch and Fort Hare 144 students have graduated with an Advanced Certificate in Education.

AIMS Sénégal has also completed the development of its Teacher Training module, which will be implemented in partnership with the Faculté des Sciences et Technologies de l'Éducation et de la Formation, Sénégal's national teacher training school. This module will be made available to local high school teachers in order to increase their teaching



Guiding STEM Policy, Coordination and Investment

AIMS continues to grow its footprint and authority in the STEM arena. With the replication of its centres of excellence, the success of its academic model and a strong multi-dimensional public engagement effort led by President and CEO Thierry Zomahoun, AIMS is increasingly being invited to participate in national, regional and global discussions on STEM.

UNIVERSITY OF MICHIGAN

On invitation from Professor Nkem of the University of Michigan Mathematics Department, Mr Zomahoun travelled to the Great Lakes State, Michigan in April 2014 where he participated in the University of Michigan's Third Biennial STEM-Africa Initiative conference titled Effective US Strategies for African STEM Collaborations, Capacity Building and Diaspora Engagement where he highlighted the transformation of Africa's youth, science and entrepreneurship through the emergence of STEM centres of excellence.

Right: Thierry Zomahoun speaking at the International Economic Forum of the Americas. Below: Thierry Zomahoun with Professor Nthuli Ncube the Vice-President of the AfDB.

CONFERENCE OF MINISTERS OF EDUCATION OF THE AFRICAN UNION (COMEDAFVI)

AIMS, on the invitation of ADEA, attended the sixth ministerial meeting in Yaoundé officially opened on April 25, 2014 by Mr Philemon Yang, Prime Minister of the Republic of Cameroon, in the presence of African Ministers of Education, Cameroon members of government, the diplomatic corps; students of the Pan-African University; partners and invited guests. Mr Zomahoun presented AIMS as a working model to support the African Union's strategy for STEM. During this meeting, several partnerships were identified and initiated, notably with the Commission of the African Union for Science and Technology and the Forum for African Women Educationalists.



AFRICAN DEVELOPMENT BANK

By invitation from the Vice President of the African Development Bank (AfDB), Professor Nthuli Ncube, Mr Zomahoun led an AIMS delegation, in the first week of May 2014, to Tunis for meetings with various departments of the AfDB.

Mr Zomahoun also participated at the Bank's annual meeting in Kigali, Rwanda, from May 19 to 23, 2014, where he was invited to serve on panels related to STEM and youth employment. Overall the AIMS global network is working closely with the AfDB to build a strong partnership and leverage the funding opportunities at regional, sub regional and country level.

WORLD ECONOMIC FORUM, REGIONAL MEETING

From May 7 to 9, AIMS was invited to attend the World Economic Forum's Regional meeting in Africa themed: "Forging Inclusive Growth, Creating Jobs", held in Abuja, Nigeria. The meeting served as an important opportunity to engage with this international institution committed to improving the state of the world through public-private cooperation. Mr Zomahoun was invited to private sessions on shaping inclusive growth and also participated in the Global Agenda Council's dinner where members made presentations on the successful projects this forum has recently undertaken.



INTERNATIONAL ECONOMIC FORUM OF THE AMERICAS

On invitation by IDRC, Mr Zomahoun led an AIMS delegation to this forum, on June 11, 2014, in Montreal where they had the opportunity for bilateral meetings and to participate in a panel discussion. He participated in a panel discussion entitled "Opportunity Calls: Booming Innovation in Africa." Chaired by Naser Faruqi, the Director, Science and Innovation for IDRC, the panel discussed the opportunities of universities, granting councils and the private sector from industrialized countries to collaborate with African countries to facilitate innovation and trade within Africa. Panelists were invited to describe current investment opportunities in innovation in Africa, the need for advanced skills training, and opportunities of collaboration. Bilateral meetings were held with representatives of Bombardier, Desjardins, DHL Freight, and the US State Department during the forum. As a result of these meetings, Mr Zomahoun was approached by the former Prime Minister of Canada, the Right Honourable Joe Clark who extended an invitation to present AIMS in Germany to a selection of executives and CEOs associated with Mr Clark. In addition, a meeting was held with the Canadian Minister of International Trade, Ed Fast to discuss the ongoing relationship of AIMS with the government of Canada.



Next Einstein Forum

FEATURE

The Next Einstein Forum (NEF), officially launched in June 2013 during the AIMS Global Alumni Reunion, is a new global forum for science in Africa that will propel Africa onto the global scientific stage.

The NEF will unite more than 500 outstanding thinkers and distinguished stakeholders from around the world together in Africa. NEF Global Gatherings, held every second year, will showcase 15 of Africa's top young scientists and connect them with leaders from Africa and the rest of the world in high-profile, invitation-only forums. These leading scientists, policy-makers, business people, journalists, civil-society representatives and entrepreneurs will highlight breakthrough discoveries and catalyze scientific collaboration for human development.

The NEF has been launched in partnership with the Robert Bosch Stiftung. "We are convinced of the central role of international-class science and innovation in Africa for long-term sustainable development of Africa and see exceptional potential in the NEF becoming a major catalyst in this field," said Dr Ingrid Wuenning Tschol, Senior Vice-President of the Robert Bosch Stiftung.

Why a Next Einstein Forum in Africa? A new global economic and scientific landscape is emerging, with Africa's rapid transformation driven by the power of demographics, economic growth and political will. Science, technology and innovation are driving this process. Given the continental scale of change, there is a pressing need for a global forum in Africa where science can meet society, the media and policy-makers. To accelerate this transformation from promise to progress, African scientists must pursue international-class scientific work in Africa and science in Africa must develop an internationally-visible cohesive identity.

The NEF will foster a strong African scientific community as an influential member of the global scientific community, which will ensure sustainable human development in Africa and other parts of the world.

The first historic gathering will be hosted by the government of Sénégal in March 2016.

"The NEF will showcase 15 of Africa's top young scientists and connect them with leaders from Africa and the rest of the world."

AIMS in the Media

AIMS continues to garner media attention around the globe.

As part of the official launch of AIMS Cameroon, Thierry Zomahoun was interviewed on March 30, 2014 on the Cameroon Radio Television Channel's show *Globewatch* by Charles Ebune. 1985 Nobel Laureate Professor Klaus von Klitzing was interviewed on the same program on April 6, 2014. The AIMS model was discussed as was the future of science and math as a tool for socio-economic development.



An article also appeared in the February issue of *Notre Afrik* magazine, and there were a number of other media references around the launch. A live interview also took place on Radio France Internationale's (RFI) *7 milliards de voisins*, a radio program that looks at daily global issues. During the RFI panel discussion, Mr Zomahoun was joined by Prof. Mama Foupouagnigni, the AIMS Cameroon Academic Director, to discuss the state of mathematical sciences education in Africa and how AIMS is contributing to the field. The podcast of the interview can be found here www.rfi.fr/emission/20140418-1-enseignement-mathematique-afrique.



A short selection of other media articles are listed below:

- <http://www.space.com/25527-ligo-filmmaker-perspectives.html>
- http://www.oregonlive.com/forest-grove/index.ssf/2014/04/teaching_math_in_cape_town_lea.html
- http://www.thestar.com/news/world/2014/02/10/the_search_for_africas_einstein.html
- <https://ca.finance.yahoo.com/news/two-nobel-laureates-fields-medallist-181100523.html>



MANDELA: POLITICS HIS PROFESSION, EDUCATION AND HIS PASSION

<http://www.theglobeandmail.com/globe-debate/mandela-politics-his-profession-education-his-passion/article15800318/>

EBOLA AND BEYOND: HOW CANADA BACKS AFRICAN PROBLEM SOLVERS

<http://www.idrc.ca/EN/Resources/Publications/Pages/ArticleDetails.aspx?PublicationID=1340>

AFRICAN MATHS INSITUTE TO OPEN IN TANZANIA

<http://www.universityworldnews.com/article.php?story=2013100414341460&query=African+maths+institute>

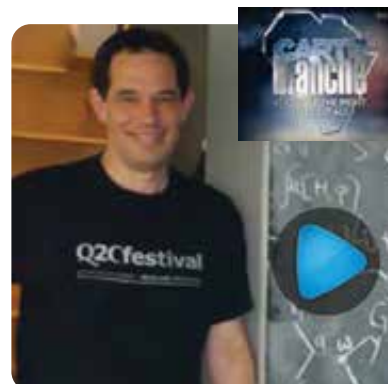


NEIL TUROK AT TED 2014 CONFERENCE

In March 2014, founder and Chair of AIMS, Professor Neil Turok, was an invited favourite speaker in the All-Stars Sessions of the TED 2014 conference in Vancouver, Canada.

AIMS FOUNDER RECEIVES HONOURARY DEGREES

Professor Neil Turok received an honorary doctorate from Nelson Mandela Metropolitan University on April 10 and another from Rhodes University on April 11. He was honoured for his significant and ground-breaking contributions to theoretical physics and his support for mathematical sciences in South Africa. Prof Turok also appeared in a special feature on *Carte Blanche* (a South African investigative journalism program) on April 27, 2014. This can be viewed at <http://carteblanche.dstv.com/player/519884>



Finance Overview

Financial Report 2013-14

The African Institute for Mathematical Sciences (AIMS) was established in Cape Town, South Africa, in 2003 as a centre for postgraduate training and research in mathematical sciences for talented students from across Africa. Following the success of AIMS in South Africa, the AIMS Next Einstein Initiative (AIMS-NEI) was launched as a Pan-African network of centres of excellence. The goal of AIMS-NEI is to establish 15 centres of excellence by 2023.

These consolidated financial statements include 100% of the assets, liabilities, revenues and expenses of the following entities:

- AIMS Next Einstein Initiative Foundation (Canada);
- AIMS South Africa;
- AIMS Sénégal;
- AIMS Ghana;
- AIMS Cameroon;
- AIMS Next Einstein Initiative Foundation (UK);
- AIMS Next Einstein Initiative Foundation (Germany);
- AIMS Next Einstein Initiative Foundation (UK) (Secretariat in South Africa).

During the fiscal year ended 30th June 2014, our total revenues increased by 56% to \$ 12.6 million from \$ 8.1 million during the previous year. Restricted revenues increased to \$ 11.6 million from \$ 8.0 million in the previous year. Unrestricted revenues and investment income were significantly higher at \$ 1.0 million in the current year from \$ 0.1 million in the previous year. This increase of \$ 0.9 million mainly consisted of donations from AIMS-Support Trust, a charity registered in the UK, which was wound up and its assets and liabilities were merged with AIMS-NEI Foundation UK. The Victoria Rothschild family originally created this Trust for the benefit of the AIMS-NEI Foundation, UK.

Our total expenses increased to \$ 11.8 million from \$ 8.5 million for the previous year. These expenses are broken down into program and non-program expenses as outlined below:

Total program expenses increased by 46% to \$ 10.2 million from \$ 6.9 million for the previous year due to the opening of a new centre in Cameroon and the building of institutional capacity to deliver high quality programs. **Total non-program expenses** increased marginally by 2% to \$ 1.60 million from \$ 1.58 million.

Overall, we had a surplus of \$0.9 million against a deficit of \$0.4 million for the previous year for a net change of \$1.3 million. The increase in unrestricted revenue mainly accounted for this surplus. Our **ratio of program expenses to non-program expenses** stood at 86/14 in the current year against 82/18 in the previous year.

The opening of a new centre in Cameroon and building of capacity on program delivery were the main reasons for the improved ratio.

Our full consolidated financial statements, audited by Deloitte LLP, are also available on our website www.nexteinstein.org



Lalit Kumar Varma
Chief Financial Officer



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Report of the Independent Auditor on the Summary Consolidated Financial Statements

TO THE DIRECTORS OF AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES – NEXT EINSTEIN INITIATIVE FOUNDATION (CANADA)

The accompanying summary consolidated financial statements, which comprise the summary consolidated statement of financial position as at June 30, 2014, the summary consolidated statement of operations for the year then ended, and the related note are derived from the audited consolidated financial statements of African Institute for Mathematical Sciences – Next Einstein Initiative Foundation (Canada) (the "Organization") for the year ended June 30, 2014. We expressed an unmodified opinion on those consolidated financial statements in our report dated February 19, 2015.

The summary consolidated financial statements do not contain all the disclosures required by Canadian accounting standards for not-for-profit organizations. Reading the summary consolidated financial statements, therefore, is not a substitute for reading the audited consolidated financial statements of the Organization.

MANAGEMENT'S RESPONSIBILITY FOR THE SUMMARY CONSOLIDATED FINANCIAL STATEMENTS

Management is responsible for the preparation of a summary of the consolidated financial statements on the basis described in the Note to the summary consolidated financial statements.

AUDITOR'S RESPONSIBILITY

Our responsibility is to express an opinion on the summary consolidated financial statements based on our procedures, which were conducted in accordance with Canadian Auditing Standards ("CAS") 810, "Engagements to Report on Summary Financial Statements".

OPINION

In our opinion, the summary consolidated financial statements derived from the audited consolidated financial statements of the Organization for the year ended June 30, 2014 are a fair summary of those consolidated financial statements, on the basis described in the Note to the summary consolidated financial statements.

OTHER MATTER

The summary consolidated financial statements for the year ended June 30, 2013 are unaudited.

A stylized, handwritten-style signature of "Deloitte LLP" in black ink.

Chartered Professional Accountants,
Chartered Accountants
Licensed Public Accountants
February 19, 2015

**African Institute of Mathematical Sciences – Next Einstein Initiative
Foundation (Canada)**

**SUMMARY CONSOLIDATED STATEMENT OF FINANCIAL POSITION
AS AT JUNE 30, 2014** (Stated in thousands of US dollars)

	2014	2013 (Unaudited)
	\$	\$
Assets		
Current assets		
Cash and cash equivalents	1,575	3,389
Investments	932	–
Accounts and contributions receivable	1,287	573
Harmonized Sales Tax receivable	5	8
Prepaid and other expenses	266	52
	4,065	4,022
Investments	348	273
Capital assets	4,453	4,583
	8,866	8,878
Liabilities		
Current liabilities		
Accounts payable and accrued liabilities	859	413
Deferred contributions	1,761	3,165
	2,620	3,578
Net assets		
Invested in capital assets	4,453	4,583
Endowment	348	273
Unrestricted	1,445	444
	6,246	5,300
	8,866	8,878

The accompanying notes to the summary financial statements are an integral part of this summary consolidated financial statement.

SUMMARY CONSOLIDATED STATEMENT OF OPERATIONS FOR THE YEAR ENDED JUNE 30, 2014 (Stated in thousands of US dollars)

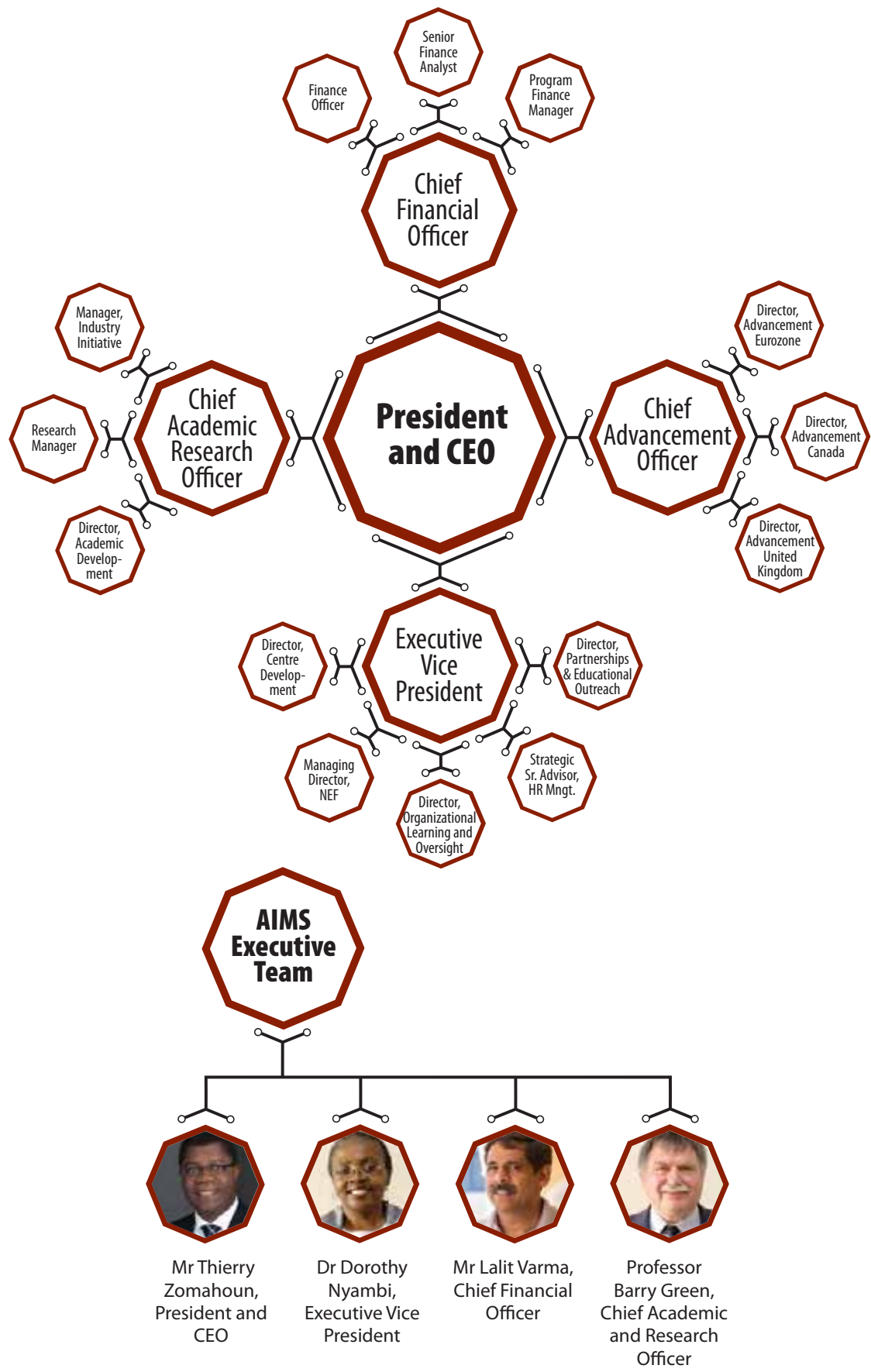
	2014	2013 (Unaudited)
	\$	\$
Revenue		
Restricted	11,617	7,979
Unrestricted	898	21
Investment and other income	133	101
Total revenue	12,648	8,101
Expenses		
Program expenses		
Taught Masters and research program	6,219	4,729
Academic and educational support	791	467
Monitoring and evaluation	71	301
Industry initiative	118	61
Public engagement and partnership development	2,019	824
Alumni engagement	24	112
Centre development	929	452
	10,171	6,946
Non-program expenses		
Administrative and fund raising expenses	1,605	1,577
Total expenses	11,776	8,523
Excess of revenue over expenses (expenses over revenue)	872	(422)

NOTE TO THE SUMMARY CONSOLIDATED FINANCIAL STATEMENTS

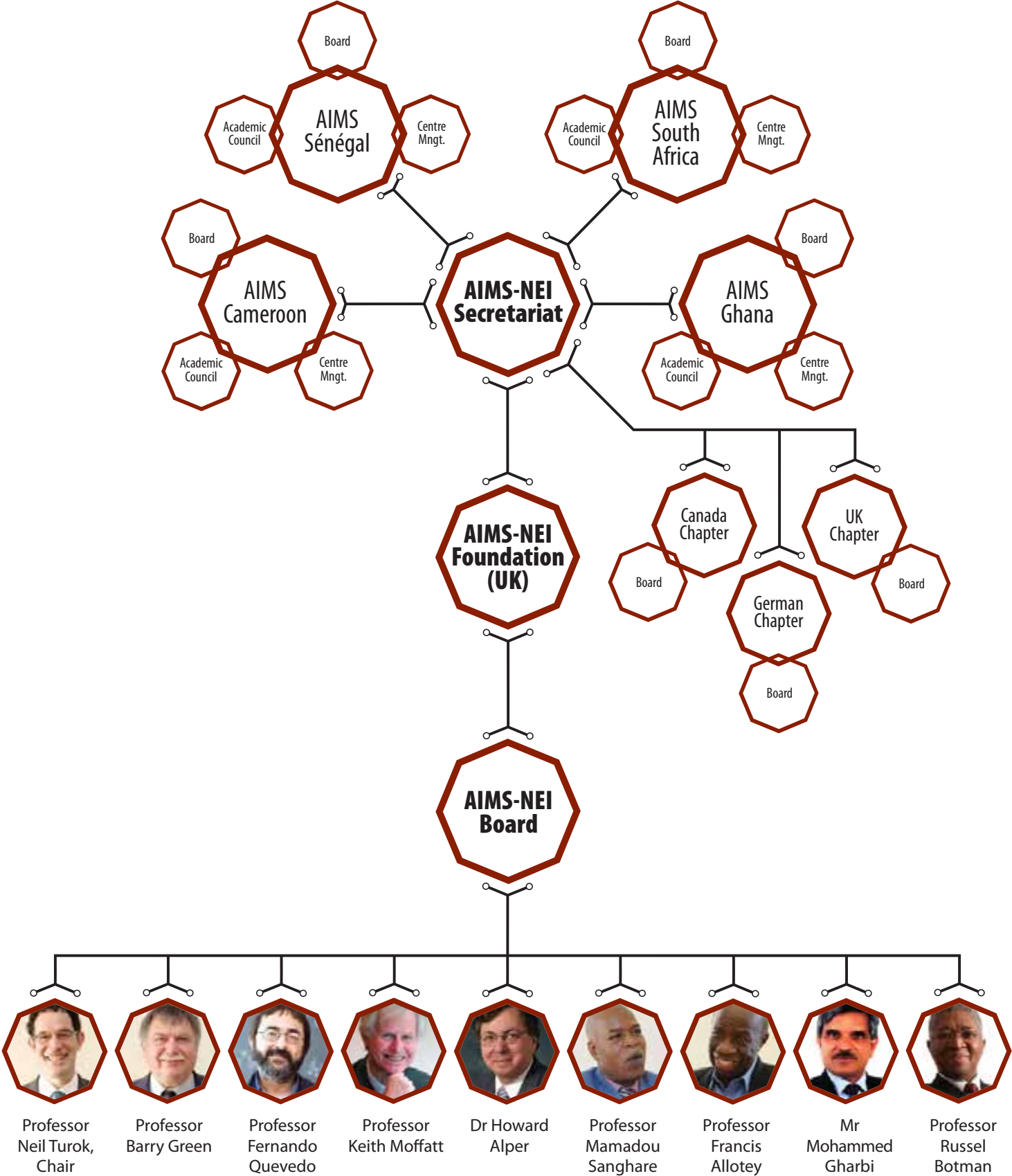
Basis of presentation

African Institute for Mathematical Sciences – Next Einstein Initiative Foundation (Canada) has prepared these summary consolidated financial statements to be included in its annual report. These summary consolidated financial statements present an aggregated view of the same information as contained in the audited consolidated financial statements, except that it does not include the consolidated statement of changes in net assets, the consolidated statement of cash flows and the notes to the consolidated financial statements. Complete audited consolidated financial statements for the year ended June 30, 2014 are available upon request.

AIMS-NEI Organizational Chart 2013-2014



Governance Structure



Network Supporters

Major Donors



Robert Bosch **Stiftung**



Other Supporters

Including the universities which provide scholarships for AIMS students through the One-for-Many Scholarship program.



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UNIVERSITY PRESS



The Abdus Salam
International Centre
for Theoretical Physics

PERIMETER **PI** INSTITUTE FOR THEORETICAL PHYSICS



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AIMS

African Institute for
Mathematical Sciences
NEXT EINSTEIN INITIATIVE

4 Centres

AIMS Cameroon,
AIMS Ghana,
AIMS Sénégal,
AIMS South Africa.

741 Alumni

Since 2003.
Over 30%
women.

42 Countries

Represented by
African students.



AIMS

African Institute for
Mathematical Sciences
CAMEROON



AIMS

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Mathematical Sciences
GHANA



AIMS

African Institute for
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SENEGAL



AIMS

African Institute for
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SOUTH AFRICA

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