African Institute for Mathematical Sciences Annual Report 2004/5

















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Executive Summary

This report covers the second year of full operation of the African Institute for Mathematical Sciences (AIMS).

In June 2005, 41 students from 15 different African countries were awarded the Postgraduate Diploma in the Mathematical Sciences after having followed an intensive course for 9 months. The modules were taught by 24 lecturers from South Africa and abroad. The knowledge and level of confidence of the students far exceed levels which are normally achieved. Twenty-nine of these students have been accepted for research degrees at South African Universities (University of Stellenbosch 15, University of the Witwatersrand 6, University of Cape Town 3, University of the Western Cape 3, and University of KwaZulu-Natal 2).

AIMS has selected 50 students for the intake in September 2005. In an effort to enroll more South African students, AIMS has embarked on a preparation programme which comprises a fast-track honours-level programme. It started in February 2005 and seven students were enrolled. This programme is to be expanded.

AIMS is becoming increasingly involved in various research projects in which African scientists participate, for example in epidemiological studies. In partnership with the African Mathematics Millenium Science Initiative (AMMSI), and other mathematical sciences institutes across Africa, AIMS has proposed a network of institutes, operating in a similar manner to AIMS, called the African Mathematical Institutes Network (AMI-Net). In July 2005, AIMS held a winter school in Free Software for 40 African lecturers, including several heads of department and system administrators.

Following rapid growth of activities at AIMS, a second building was aquired. A vehicle was purchased to take students to and from the local universities, thereby enhancing ties. Stellenbosch University continues to handle financial, legal, and administrative aspects on behalf of AIMS. This is gratefully acknowledged. Several sponsors have granted significant support to AIMS. These are listed in the report.

AIMS is recognized as a NEPAD Centre of Excellence and it is seen by many who are concerned with development in Africa as a prime example of what can be done. We will endeavour to continue to be worthy of this recognition.

Further details are to be found in this report and the AIMS web site: www.aims.ac.za.

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1. Introduction

The African Institute for Mathematical Sciences (AIMS) has now completed its second year of full operation. Of the 44 students who enrolled in September 2004, 41 have been awarded a diploma in June 2005 while two are still to complete part of the work.

All these students have been exposed to a large variety of experiences in science and they have been participating in this intensely. Most of them say that AIMS has changed their lives. AIMS considers this to be a success beyond its own high expectation.

The success of the AIMS programme is due to many highly committed individuals.

- the students themselves who were selected from a much larger group of applicants, and who realized that they were in many cases given an opportunity of a lifetime,
- the lecturers who come to give all their attention and energy to the students voluntarily and do this for very little in return,
- the staff who work many extra hours without question and they handle the large variety of cultures and some difficult requests with understanding,
- the tutors who fully participate in this community and whose assistance to the students is invaluable.

The AIMS project is of course only possible because of substantial sponsorship. It is evident that many sponsors have embraced the spirit of AIMS and it remains the commitment of AIMS to spend these funds wisely, in the most cost-effective way.

In this document we report on all aspects of the AIMS operation for the academic year 2004/5. We also present the financial report for 2004 in line with the financial reporting period of Stellenbosch University who handle and audit all the income and expenditure accounts of AIMS.

AIMS is receiving suggestions and requests to expand in various directions. These are considered very seriously. However, AIMS also needs to ensure its sustainability and needs to take cognance of the risk factors, one of which is the dependence on the constant availability of each member of its small staff.

2. Academic Programmes

AIMS's activities have expanded in size and in variety. A brief report on the main activities follows.

The map shows where our students come from. AIMS is covering large parts of Africa, but there are still a few gaps, primarily the far west part of West-Africa. AIMS wishes to make the unique learning experience available to all of Afria.



2.1 AIMS 2004

The goal of the AIMS diploma course is to build skills and exposure to cutting edge sciences, and to promote a strong culture of creative problem solving. The first semester is fourteen weeks, the second twelve weeks, and the third semester, devoted to essay writing, is eight weeks. Several of the essays from 2003/4 have now developed into scientific papers submitted for publication.

2.1.1 Students



Students from the following countries have recently completed the programme: Algeria (Kenza Guenda, Yamen Hamdouni), Burundi (Venant Nyandwi), Cameroon (Morgan Kamga Pene, Martial Ndeffoh Mbah, Yves Semegni), Congo (Charles Mberi Kimpolo), DRC (Jules Baruani, Guy Lusilao-Zodi, Gaston Kuzamunu Mazandu, Florimond Mpiana Mulamba, Simon Muya Kasanda, Tony Nsio-Nzundu, Johnny Okito Lokake), Egypt (Ali Nassar), Ghana (James Malm), Kenya (Musa Gabere), Madagascar (Naval Andrianjafinandrasana, Andriamihaja Ramanantoanina), Mozambique (Joaquim Nhanala), Nigeria (Bolade Adetula, Abel Ajibesin, Richard Akinola, Iyabo Bello, Kingsley Muka, Isaac Osunmakinde), Sudan (Reem Abbas, Omnia Abdelgadir, Bayan Amin, Taiseer Fath Elrahman, Mai Hassan, Linah Mohamed, Lubna Mohammed-Salih, Rana Salih), Tanzania (Pendo Kivyiro, Angelina Lutambi, Gasper Mwanga), Zambia (Nyumbu Chishwashwa, Ian Siluyele), Zimbabwe (Vasco Chikwasha, Gibson Nyamuda). Six students were chosen by their peers as representatives to comment on the day-to-day running of AIMS.

Student progress this year has been very good and has been an improvement on 2003/4.

2.1.2 Course Structure 2004/5

Following a week-long introduction to GNU/Linux by the tutors and system administrator, the first semester consisted of courses designed to develop problem-solving skills with the use of both analytical and computational methods: Problem Solving (*Alan Beardon, Cambridge*), the Art of Approximation (*Sanjoy Mahajan, Cambridge*), Mathematical Methods (*Alan Macfarlane, Cambridge*), Programming with C (*Malcolm Macfarlane, Indiana*), Concepts in Physics (*Fritz Hahne, AIMS*), Electromagnetism and Special Relativity (*Neil Turok, Cambridge, and Robert de Mello Koch, Witwatersrand*), Differential Equations and Mathematical Modelling (*Jacek Banasiak, KwaZulu-Natal*), Inference and Information Theory (*David MacKay, Cambridge*), and Epidemiological Modelling (*Kimber Gross, Cambridge*).

The second semester consisted of review courses where each course gives a detailed introduction to a specific topic in the mathematical sciences: Topology and Geometry (Tadashi Tokieda, Cambridge), Astrophysics and Cosmology (Pedro Ferreira, Oxford, and Kavilan Moodley, KwaZulu-Natal), Stochastic Calculus with Applications to Control and Finance (Ekkehard Kopp, Hull, and Bernt Oksendal, Oslo), Numerical Mathematics and Computational Methods (Hans Munthe-Kaas, Bergen), Mathematical Immunology (Gareth Witten, AIMS), Metabolic Modelling (Jannie Hofmeyr, Stellenbosch), Quantum Mechanics (Maciej Dunajski, Cambridge), Open Quantum Systems (Francesco Petruccione, KwaZulu-Natal), Quantum Information (Christian Toepffer, Erlangen), Variational Methods and Control Theory (Vittorio Cantoni, Milano), and Random Walks and Biopolymers (Tannie Liverpool, Leeds, and Kristian Müller-Nedebock, Stellenbosch).

Another course, Professional Communication *(Cynthia Mac Pherson)*, was introduced to develop comprehension, conversation, and scientific writing skills. Almost a third of the students were Francophone, several Arabic-speaking, and one was Portuguese-speaking.

Progress was assessed continuously through weekly assignments. For ever course each student was assigned a grade: F, P^- , P, or P^+ .

Student feedback is collected after each lecturer left and is used as a basis for advice to new lecturers, and in assisting with selection of lecturers for the following year.



2.1.3 Essays

During April and May the students prepared essays. For these 90 topics were offered by academics involved with AIMS, mostly those from local Universities but some further afield in South Africa and beyond. For many students their choice of essay topic naturally leads on to further postgraduate research. These choices are to some extent influenced by future funding possibilities. AIMS staff give guidance in this respect, but some improvement in the arrangements is still needed. Supervisors should for instance not be given too many students. AIMS is considering initiating a system of Associate Faculty members of AIMS, whereby those faculty most involved with the teaching programme become recognised affiliates of the AIMS institute.

Prof Wesley Kotzé, former Head of Mathematics at Rhodes University, coordinated the supervision of the essays and advised students perparing them. He was assisted by Prof Aderemi Kuku (Ohio State-University), Prof Alan Beardon (University of Cambridge) and Dr Martin Bucher (University of Paris-Sud).

The tutors played an important role in assisting the students in their essays and in monitoring the progress throughout the preparation of the essay.

Prof Kuku's visit was sponsored by the Victor Rothschild Memorial Fund. He had many interactions with the students on their essays and on advising them about careers. He also conducted his own research which is in K-Theory.

Surname	First name(s)	Торіс	Supervisor
Abbas	Reem Abubaker	The Border Gateway Protocol BGP4	A E Krzesin- ski & B A Bagula
Abdelgadir	Omnia Khalifa	Security Technologies in Wireless Networks	H A Chan
Adetula	Bolade Ade- wale	Thermally Developing Forced Convection in a Channel Filled With Porous Medium	O Makinde
Ajibesin	Adeyemi Abel	Performance of a Turbo Coded Digital Communi- cation System on a Satellite Communication Chan- nel	E O Bejide
Akinola	Richard Ola- tokunbo	Computational aspects of orthogonal polynomials	D P Laurie
Amin	Bayan Hamdi Kamil	Modelling the effect of a dendritic-cell vaccine for chronic HIV-1 infection	G Witten
Andrianjafin- andrasana	Misaina Navaloni- aina	Support Vector Machines and linear inductive learning	J Greene
Baruani	Atumbe Jules	Replacement Theory in Network Reoptimization	A Bagula
Bello	Iyabo Ann	Reduction of Order Technique for Singularly Per- turbed Boundary Value Problems	O Makinde
Chikwasha	Vasco	Application of wavelet analysis to bivariate time- series data	G Witten & J L Melice
Chishwashwa	Nyumbu Benedict	Category Theory	D Holgate
Fath Elrah- man	Taiseer Mirghani	Security Technologies in Wireless Networks	H A Chan
Gabere	Musa Nur	Mathematics for software engineering	I Rewitzky
Guenda	Kenza	On Algebraic Geometric Codes	B Green
Hamdouni	Yamen	Supersymmetry in Quantum Mechanics	H B Geyer
Hassan	Mai Mahdi	Applications of Small World Networks	G Witten
Kagiso	Dintle Nel-	Fuzzy Control with particular reference to the pi-	W Kotze
	son	oneering works of Mamdani and Sugeno	
Kamga Pene	Morgan Ma- gloire	Topology and order	H P A Kunzi
Kivyiro	Pendo Tere- sia	Continuous time limit of the binomial model	D Wilcox
Kuzamunu	Gaston	Traffic Engineering using Network Reoptimization:	A Bagula
Mazandu		Modelling and Controlling dynamic flows	
Lusilao-Zodi	Guy Alain	Security Technologies in Wireless Networks	H A Chan

Surname	First name(s)	Торіс	Supervisor
Lutambi	Angelina Mageni	Demographical Evolution of the HIV Epidemic in Tanzania Compared to South Africa	F Hahne
Malm	James	Long term dynamics of a disease modifying HIV vaccine	G Witten
Mberi Kim- polo	Charles Lebon	Two-phase behaviour in a simulation of an artificial economy	A E Krzesin- ski & B A Bagula
Mohamed	Lina Mah- goub Yahya	Interior-Point Methods for Solving Linear Pro- gramming Problems	F Benyah
Mohammed- Salih	Lubna Abd Elazeem	Reliability Evaluation of MPLS/GMPLS Networks	A Bagula
Mpiana Mu- lamba	Florimond- Eugene	The Topology of the Universe	P Ferreira
Muka	Kingsley Obiajulu	One-Step Methods for Stiff-Dfferential Equations	F Benyah
Muya Kasanda	Simon	Cosmic microwave background anisotropies in cos- mological models	K Moodley
Mwanga	Gasper God- son	Hedging with the Greek letters	J C Ndogmo
Nassar	Ali Mo- hamed Ali	Asymptotic Freedom in Non-Abelian Gauge Field Theories	R De Mello Koch
Ndeffo Mbah	Martial Loth	Travelling wave solutions for PDEs	J Banasiak
Nhanala	Joaquim Francisco	Synthesis of Optimal Technologies and Operations for Renewable Energy	A Chakraborty & J Petrie
Nsio Nzundu	Tony	Relativistic description of two-body scattering re- actions	B Van der Ventel & G Hill House
Nyamuda	Gibson Pe- ter	Generating ultra short laser pulses	E G Ro- hwer & G J Arendse
Nyandwi	Venant	Catastrophes in a complex ecosystem model	G Witten & D Richard- son
Okito Lokake	Jean-Andre	Traffic Engineering using Network Reoptimization: An Optimal Maintenance Policy	A Bagula
Osunmakinde	Isaac Oluse- gun	Telecommunications Fraud Detection using Bayesian Networks	A Potgieter
Ramanan- toanina	Andriamihaja	Nordsieck Methods and General Linear Methods for Ordinary Differential Equations	G Kulikov & D Sherwell
Salih	Rana Mustafa Abd El- magied	Viral Dynamics and CD4 counts in subtype C HIV-1 infected and TB coinfected individuals from southern Africa	G Witten
Semegni	Jean Yves	Some concepts of lattice theory	M Wild
Siluyele	lan John	Application of wavelet analysis to bivariate time- series data	G Witten & J L Melice

2.1.4 Oral Examination

An oral examination in defence of the essay took place during the last week of May and the first week of June. This was followed by the graduation ceremony on 24 June 2005, which was attended by the three local Vice-Chancellors, Professor Ndebele, Professor Brink, and Professor O'Connell, the Deputy Ministers of Education, Mr Enver Surty, and the Director General of the Department of Science and Technology, Dr Rob Adam, as well as a number of prominent African scientists.

2.1.5 Graduation

On the day of the graduation two interesting talks were presented namely by Professor Romain Murenzi, Minister of Education, Science, Technology and Scientific Research in Rwanda, on "Application of continuous Wavelet Transforms to Image Processing", and by Professor Neil Gershenfeld of the MIT Center for Bits and Atoms, on "Bits and Atoms".



2.1.6 Bursaries currently available for alumni

AIMS has funds available through sponsorship of the Mellon Foundation and the Department of Science and Technology for partial support for 25 students to continue with MSc study after the AIMS year. As in the previous year when only 10 such bursaries were available, all the available bursaries were taken.

2.1.7 Destination of students

Some of the 41 students who graduated in 2005 have already started with MSc or PhD study at South African universities and some have indicated that they will enter by January 2006. Although some may still change their mind, it currently appears that 29 students will continue their study in

South Africa, with 15 at Stellenbosch University, 3 at the University of Cape Town, 3 at the University of the Western Cape, 6 at the Witwatersrand University and 2 at the University of KwaZulu-Natal. Three students have positions to study abroad and 9 returned home.

2.2 AIMS2003-4

Students from the following countries attended AIMS during its first academic year: Algeria (Djalil Ayed, Ilhem Benzaoui, Latifa Bouguerra), Cameroon (Earnest Akofor, Blaise Dongmo, Martin Bidima), Democratic Republic of the Congo (Justin Bazimaziki, Pierre Mulamba, Pierrot Dibwe), Ghana (Henry Amuasi), Kenya (Timothy Kamanu, Davis Ntwiga), Malawi (Peter Mhone), Morocco (Khadija El Bouchefry), Nigeria (Shehu Abdussalam, Eucharia Nwachukwu, Nneoma Ogbonna, Akwum Onwunta, Emmanuel Osalusi, Itoro Udoakpan), South Africa (Jerry Masekela, Alfred Motau, Kenny Mphahlele), Sudan (Altaj Mohammed, Ikleel El Mahadi, Eihab Mohammed, Zakariya Mohammed), Zimbabwe (Archie Karumbidza, Gift Muchatibaya, Tendai Mugwagwa).

Another four students completed a few select AIMS courses towards their Masters degrees at that the University of Stellenbosch (Louis Brewis, Jan Groenewald, Gawie Le Roux, Ashley Marcus).

Name	Country	University	Supervisor(s)
Henry Amuasi	Ghana	University of Stellenbosch	Dr Kristian Müller-Nedebock
Altaj Mohammed	Sudan	University of Cape Town	Dr Gareth Witten
Justin Bazimaziki	DRC	University of the Western Cape	Dr Nizar Marcus & Prof R Frey
Ilhem Benzaoui	Algeria	University of Stellenbosch	Prof Barry Green
Archie Karumbidza	Zimbabwe	University of Stellenbosch	Prof Arnold Keet
Timothy Kamanu	Kenya	University of the Western Cape	Chris Koen & Prof Danelle Kotze
Tendai Mugwagwa	Zimbabwe	University of Cape Town	Dr Gareth Witten
Pierrot Musumbu	DRC	University of Stellenbosch	Prof Hendrik Geyer
Davis Ntwiga	Kenya	University of the Western Cape	Dr Jean-Claude Ndogmo
Nneoma Ogbonna	Nigeria	University of Cape Town	Dr Jochen Petersen
Emmanuel Osalusi	Nigeria	University of Limpopo	Prof Daniel Makinde
Akwum Onwunta	Nigeria	University of Stellenbosch	Prof Johan de Villiers

The following twelve students are receiving partial funding for their post-AIMS study:

As can be seen, these students are working on a variety of topics, including pure mathematics (2), statistics, epidemiology (2), traffic modelling, financial mathematics, approximation theory, fluid dynamics, chemical engineering, and theoretical physics (2).

2.3 AIMS2004–5

2.3.1 Applications

AIMS received 182 applications for the September 2005 intake, coming from 21 different countries in Africa. Of these 30 are female and 152 are male. For the first time, applications were received from Comoros and Ethiopia.

2.4 AMSP2005

The Advanced Mathematical Sciences Programme, supported by DST and NRF is a new programme intended to draw and prepare South Africans for the core programme at AIMS.

2.4.1 Programme

Six SA students attended this course since February which consisted of about 20 contact hours per week. The lecturers involved were

- Professor Wesley Kotzé (coordinator), who also handled most of the mathematics teaching
- Professor Alan Beardon taught complex analysis
- Professor June Juritz taught introduction to probability and statistics
- Professor Werner Richter, Dr Mike Pickles and Ms Kate Marvel taught physics
- Carl Scheffler taught the formal computational skills and Python programming.

The students show increasing skills in problem solving and programming.

2.4.2 Students

Seven students, including one woman, were accepted (*Rivalani Hlongwane, Lucky Makhwedzha, Zolisile Manga, Motsamai Modise, Coffart Mogale, Thabo Moretlo, Daphney Singo*).



2.5 Researchers

In addition to the teaching programmes, African researchers are invited for a period of two months and encouraged to become involved in the students' programme through assisting in tutorials or giving seminars about their research.

In the past year, the following six researchers were selected from a number of applications to visit AIMS for a period between one and two months each. All these visits have been sponsored by the Ford Foundation.

Mr Tope Omitola is a Nigerian and UK citizen, currently studying in the UK at the University of Cambridge. His interests are in Computer Science, concentratingon verifying computer algorithms.

Dr Simon Osindero came from the University of Toronto in Canada (Ghana citizen). He helped with the tutoring of the course: Electromagnetic Theory and Special Relativity.

Mr Karyl Raniriharinosy came to AIMS from Madagascar, for 2 months. His field of research is the modelling of scattering of electromagnetic waves.

Mr Ali Didi Seddik is a Moroccan citizen. He came to AIMS for 2 months, after which he also visited Ithemba Labs for 3 weeks. He is currently completing his PhD thesis in solid state physics.

Mr Komi Sodogo is a Togolese citizen, currently doing is PhD studies in Benin (IMSP). He is doing research in the field of non-relativistic supersymmetric quantum mechanics.

Dr Melusi Khumalo came from the University of Swaziland to AIMS for a period of one month. He worked on a paper for publication that deals with third order convergent modified Newton methods for solving univariate root-finding problems.

Prof Aderemi Kuku visited AIMS during April 2005. He is an expert on K-Theory and he continued with his research at AIMS.

2.6 New Initiatives

2.6.1 Winter School in Free Software

AIMS has proposed an African Mathematical Institutes Network (AMI-Net) to be developed in collaboration with AMMSI and other mathematical institutes such as the IMSP in Benin. AMI-Net proposals for a feasibility study have been approved by the NEPAD Science and Technology Steering Committee, and the NEPAD Secretariat is now seeking funding from various international donors. It is intended that AIMS serves as the hub for AMI-Net.

The Go Open Source Campaign (see www.go-opensource.org) co-funded a course, *GNU/Linux as a Tool for Science*, which AIMS ran in July and August 2005 for 43 participants including faculty and IT officers from South African and African Universities. Additional funding was provided by Cheryl Grunbock and Martin King, inventor of the T9 text messaging system. This could form part of a shift in focus at AIMS to programming skills based around the language *Python*. This course is a pilot for a future AMI-Net training course.

2.6.2 TSF

A combined programme with the Shuttleworth Foundation (TSF) has commenced. TSF sends GNU/Linux trainers to AIMS once a month. In return AIMS students assist in basic training for primary school teachers and pupils at the tuXlabs (TSF GNU/Linux labs in disadvantaged Western Cape schools). This is modelled on the interaction between the Schools Linux User Group (SLUG) and TSF. SLUG provides the volunteers who help install the tuXlabs.



2.6.3 AIMSSEC

Several activities which were reported on at www.aims.ac.za/aimssec have taken place. A course for mathematics teachers was held in Stellenbosch during for July 2005.

2.6.4 FabLab

AIMS is considering installation of a Fabrication Laboratory (FabLab) where devices which were designed by computer can be fabricated. The lab would expose AIMS students to high technology, low cost construction of devices and add greatly to their education, showing how their knowledge in the mathematical sciences and in Python becomes of immediate practical importance. The lab would be a prototype for similar labs which could in time be installed in similar institutes across Africa.

3. Infrastructure

3.1 Governance

3.1.1 Council

The AIMS Council includes representatives from each of the participating Universities:

- Jan van Bever Donker, University of the Western Cape,
- Hendrik Geyer, University of Stellenbosch,
- Fritz Hahne, AIMS Institute Director,
- Keith Moffatt, University of Cambridge,
- Daya Reddy, University of Cape Town,
- Graham Richards, University of Oxford,
- Neil Turok, University of Cambridge (Chair),
- Vincent Rivasseau, University of Paris-Sud-XI.

A subset of the AIMS Directors are also the Trustees of the AIMS Trust, a registered tax-exempt charitable trust in South Africa.

3.1.2 Advisory Board

The Advisory Board advises on all aspects of the AIMS programme, especially its integration with existing courses and research projects in South African and other African universities.

The members of the Advisory board are:

- Chris Brink, University of Stellenbosch (Chair),
- Nigel Bishop, University of South Africa,
- Jat Du Toit, North-West University,
- George Ellis, University of Cape Town,
- Barry Green, University of Stellenbosch,
- Oluwole Makinde, University of the North,
- Jan Persens, University of the Western Cape,
- Sibusiso Sibisi, Council for Scientific and Industrial Research, SA,
- Patricia Whitelock, South African Astronomical Observatory,
- Edmund Zingu, Mangosuthu Technikon.

3.1.3 Executive Team

The Executive Team, chaired by the Institute Director, Fritz Hahne, oversees the detailed management and day to day running of the AIMS project. Members of the team include:

- Jean-Claude Ndogmo, University of the Western Cape
- Kristian Müller-Nedebock, University of Stellenbosch
- Vasco Brattka, University of Cape Town

3.2 Staff

The director, Professor Fritz Hahne, is assisted by the following staff.

- The Facility Manager, Mr Igsaan Kamalie, who is assisted by Mr Emmanuel Kongolo
- The Computer Officer, Mr Jan Groenewald
- The Administrative Officer, Mrs Mirjam Miske

For a limited time of a few months Dr Gareth Witten was responsible for coordinating the academic teaching programme.

3.2.1 Tutors

Four tutors (*Kate Marvel, Mike Pickles, Carl Scheffler, Lisa Willis*) assist throughout the year. In 2005/6 there will be six tutors, including two AIMS graduates.



It is very clear to everyone, and many visitors have commented that the staff is very stretched. The AIMS operation is growing at a rapid pace and the staff members take on more and more responsibilities and tasks. They do so willingly, but the risk of being so dependent on the good health and availability of each member of staff becomes a matter of concern.

3.3 Physical Facilities

3.3.1 Melrose Road

Various improvements and expansions were undertaken during 2004/5. Alterations were made to create a lecture room for AMSP as well as a researchers' room with twelve seats. Further additions were: aqua-coolers, cabinets, blackboards, air conditioning units for the main lecture hall, and a hydroboil.

3.3.2 Watson Road

The newly acquired building in Watson Rd is being renovated. One of the appartments has had significant fire damage which the previous owner has not repaired yet. The assistant to the facility manager is accommodated in the building and he acts as a care-taker of the building.

3.3.3 Future Renovations

When the AMI-Net project is launched, additional office space will be required. Even in the interim AMI-Net might also require office space soon. It is apparent that major extensions to the building are necessary but these will be costly and require a significant additional sponsorship.

Renovations of the beachfront block in Muizenberg (next to which the main AIMS facility is situated) have started. This promises to uplift the area drastically and has already brought improved security to Melrose Road.

3.3.4 Meals

AIMS is continuing to deal with Kagiso Khulani Supervision (Compass Group Southern Africa Pty Ltd)for normal meals and catering services. The menu was improved and the kitchen manager was replaced. AIMS obtains constructive feedback from the students and guests. The relation with Kagiso Khulani Supervision in handling these are very good.

3.3.5 Transport

Four AIMS staff members have acquired professional driving permits (PDPs), which allow them to drive the 16 seater minibus (*Emmanuel Kongolo, Igsaan Kamalie, Jan Groenewald, Carl Scheffler*).



The newly acquired minibus is used for airport transport and academic or social activities for the students. When there is a function for all students a 30 seater bus is hired as well.

3.4 Library

The library is constantly being extended. Some lecturers and visitors donate books. AIMS asks lecturers, tutors, and students to make suggestions for acquisitions. Such acquisitions should be formally budgeted for. The library is spacious enough to cater for the current rate of acquisitions for some time.



The library has run smoothly over the past 12 months, while improvements have been made to the catalogue, which is based on the U.S. Library of Congress system, grouping books by subjects that are more useful and relevant to AIMS students.

Last year the AIMS library contained almost 2500 books, the majority on mathematics and science, but with some other areas included. Since then 196 new books have been added, mostly related to lecture courses at AIMS or others recommended by AIMS lecturers. In particular the selection of books in areas of mathematics which previously were not well covered, such as biomathematics or numerical analysis, has been broadened. This process will continue over the next few years as other omissions become apparent.

A small but significant number of English language books and dictionaries have also been purchased to assist students in learning English. The stock of novels and other books for leisure reading has expanded, with continual donations of popular science books from the science editor of The Sunday Times (UK) newspaper forming a large part of this.

University of Stellenbosch student numbers are used to access electronic journals. A few visitors do not have such student numbers so they have to ask tutors for access. Not all databases are available off-campus yet; this is a work-in-progress at the University of Stellenbosch.

3.5 ICT

3.5.1 Software

AIMS stays committed to Free and Open Source software in order to allow alumni to have skills in software easily and freely obtainable. The students are shown how to install Ubuntu Linux and add the necessary scientific software tools.

It is our intention to teach the popular programming language Python as a base skill in modelling to our students in future years.

3.5.2 Hardware

During 2004/5 a data projector was acquired for the computer lab. The AMSP students receive their computing training there. A wireless extension of the network was installed (staff who live nearby utilise this). New hard drives and memory have been ordered to expand the redundancy and capability of the current servers, and to cope with the constant influx of new users. A colour laser printer was also acquired.

AIMS will probably acquire another twenty desktops to cope with the expansion.

3.5.3 Web

We are currently investigating several content management systems (CMS). Installing a CMS will ease maintenance of the main website and provide a platform for lecturers to manage the content on their sites.

3.5.4 Future projects

Videoconferencing and VOIP technologies have been investigated and will probably be implemented during the next academic year. (This has been legal in South Africa from 1 February 2005.)

Several software projects are ongoing: spam, antivirus, redundancy of servers, bandwidth management, mailing lists, web content delivery, etc.

3.6 Admin

All administration is handled by one administrative officer on site, Mrs Mirjam Miske, but she has the administrative infrastructure of the University of Stellenbosch at her disposal. Many of the sections of the University of Stellenbosch administration render AIMS excellent support which is gratefully acknowledged.

4. Budget

4.1 Official statement

AIMS		
inancial Statement for the year ended	31/12/2004	31/12/2003
ICOME	11.714.094.63	8,411,066.5
bdussalam	7,632.15	
ndrew W Mellon Foundation	4,099,890.00	-
ambridge University	121,099.00	113,705.0
amproge University Press	161,750.00	116,000.0
hicano State University	88,000.00	-
hrist's College	1 007 23	
epartment Science & Technology	-	1 050 000 0
G Woods Will Trust		10.000.0
ord Foundation	818,684.06	1,183,605.5
pundation de France	(40,784.22)	211,354.5
alsoy Chantaole Foundation	692,071.86	1,160,269.3
terest Received	207 001 54	39,145.0
ITAM	397,204.51 718,577.30	323,729.5
ing	220,890.00	-
ondon Mathemetical Society	56,414.01	-
lathematical Association	4,174.70	-
iscellarieous Income	2,192.11	-
ewnnam College	1,010.04	-
nr piroea	120,000.00	-
amsay. Son & Parker	3 000 00	1,200,000.0
eardel Group	200.000.00	200 000 0
preckley Partners	31.773.30	200,000.0
tellenbosch University	450,000.00	
rees of Victor Rothschild	69,049.80	46,237.6
nnity College	570,465.05	•
	450,000.00	
edafone Group	1,488,197,50	1,200,000.0
rpenditures	7 874 733 59	\$ 186 A12 C
dvertising	18,248,89	24.514.5
filiation and Registration	5,200.00	513.8
ooks	24,179.78	2,153.0
uilding, Building refurbushment costs, Equipment and Furniture	3,214,417.28	4,565,553.8
ursanes	315,480.00	56,500.0
onsumables	56 006 62	6,157.2 43.406.4
opying and Printing	30,941,12	14 521 6
Curses	55,573,69	12.056.1
ntertainment	754,746.94	235,879.8
owers and Gifts		5,439.0
eneral Office Expenses	83,703.69	28,659.7
Surance	34,039.89	40,716.1
aintenance of Environment	1/3,316.15	105.5
dical Expenses	5,755.70 150.071.47	900.0 95.745 9
unicipal Expenses	135.097.64	829.9
ostage	6,706.95	2,317.9
egional Services Council Levy	2,694.96	877.1
emuneration	987,282.23	327,475.88
m or Equipment (ava		4,548.0
ationary	9,326.83	3,076.5
ipendia	274 500 00	(3,016.98 11.000.07
lephone	34,869.63	69,946.1
avel Expenses	1,284,485.28	517,555,70
러 SURPLUS FOR THE YEAR CCUMULATED FUNDS ON 01/01/2004	3,842,361.11 3,704,551.74	2,225,453.88 1,479 <u>,107.8</u> 0
CCUMULATED FUNDS ON 31/12/2004	7,546,922.85	3,704,561.74
SS BALANCE SHEET ITEMS	(1,872.00)	[61,562.42
editors ovision for Leave	- (1 872 00)	(59,312.43
	<u>[[[]]</u>	(£,440.9)
INDS AVAILABLE ON 31/12/2004	7,548,794.85	3,766,124.1
UNDS AVAILABLE ON 31/12/2004	7,548,794.85	3,766,124

4.2 Budget

4.2.1 Income

Notes	+ZAR	-ZAR	Total ZAR

Current funds					
Current balance (as on 8 August 2005)	5 998 753				
Less balance of earmarked funds:					
Ford Foundation		840 170			
Victor Rothschild Memorial Fund		35 930			
Funds earmarked for post AIMS bursaries		803 000			
Epidemiological Research Fund		477 901			
Funds available for main AIMS programme			3 841 752		

Estimated income					
Funds available for main AIMS programme (from above)	3 841 752				
Income expected:					
University of Cape Town		450 000			
University of Stellenbosch		450 000			
University of the Western Cape		450 000			
Gatsby Charitable Foundation		1 700 000			
Estimated total funds for 2005/6			6 891 752		

4.2.2 Notes on Income

- 1. Funds from the Andrew W Mellon Foundation are intended for the academic teaching program for the three year periods 2003/4, 2004/5 and 2005/6 and is based on student numbers of 30, 40 and 50 respectively. It also contains a component for supporting ten partial student bursaries per year for an MSc in South Africa following the AIMS course.
- 2. The funds shown as Cambridge University are from UCLES and the contribution for 2004 is intended for AIMSSEC. The AIMSSEC funds have subsequently been transferred to a separate cost centre. Several College donations have been earmarked for AIMSSEC.
- 3. The Canon Collins Educational Trust supports partial bursaries for students from SADC countries.
- 4. The funds from Chicago State University consitute a once-off contribution to the acquisition of furniture and equipment.
- 5. The funds from the Ford Foundation for 2004 were earmarked to supporting networking and research across Africa.
- 6. The funds from the Gatsby Foundation cover accommodation, meals, travel and personal expenses for the AIMS students on the basis of 30, 40 and 50 students for the first 3 years of operation.
- 7. IUTAM contribution was used for the workshop on capacity building.
- 8. The funds received from Martin King were partly employed for the winter school on computing.

- 9. The funds shown as being from the National Research Foundation (NRF), originated from the French goverment and are employed to fund a post-AIMS PhD student.
- 10. The funds received from Stellenbosch University and the University of Cape Town were used for general expenses.
- 11. Funds from Trinity College were granted to partly cover the acquisition of the new building.
- 12. The Vodafone Group grant takes care of the core funding of AIMS.

It needs to be emphasized that the funds received during 2004 are constrained in different ways as they need to cover expenses for 2005 and that in some cases they are earmarked for specific purposes.

4.2.3 Expenditure

Notes	Amount ZAR	Subtotal ZAR	Total ZAR
		•	

Expenditur	e		
Staff and lecturing:			
Director, second senior academic (vacant at present), fa-	1 200 000		
cility manager with an assistant, computer officer, and			
administrative officer			
Future assistants to computer officer and administrative	300 000		
officer			
Junior lecturers and teaching assistants (6)	500 000		
Travel and honorarium of lecturers (first term)	250 000		
Travel and honorarium of lecturers (second term)	350 000		
Supervision of essays (third term)	120 000		
Total staff costs		2 720 000	
Direct student costs for 50 students:			
Travel (return ticket to AIMS)	500 000		
Stipend	375 000		
Meals	750 000		
Medical Insurance	150 000		
Accommodation costs	500 000		
Local transport to universities, etc.	50 000		
Stationery and learning materials	75 000		
Total student costs		2 400 000	
Additional general costs:			
Telephone	60 000		
Internet	180 000		
Electricity and Water	200 000		
Total general costs		440 000	
Acquisitions:			
Library books	30 000		
Computer fund	150 000		
Furniture	50 000		
Vehicle fund	50 000		
Total Acquisitions		280 000	
Grand total for expenditures			5 840 000

Notes	Amount ZAR	Total ZAR	

AMSP Expenditures (earmarked by NRF & DST grant)		
Student expenses for 15 students	300 000	
Additional teaching (DST)	200 000	
Total for AMSP		500 000
Notes	Total ZAR	

Various earmarked grants

Research in Epidemiology (Vodacom)	500 000
Research Networking in Africa (Ford Foundation)	840 170
Victor Rothschild Memorial Fund for research visitors	35 930
National Research Foundation (NRF) for research visitors	80 000
AIMSSEC (schools enrichment programme; now trans-	78 526
ferred to a separate cost center). Balance as on 8 August	

4.2.4 Notes on expenditures

- 1. The largest item of expenditure is acquisition of capital items, including a second building. Due to rapid growth of operations at AIMS, furniture and equipment needed to be purchased.
- 2. The item "Bursaries" refers to AIMS graduates receiving bursaries from AIMS to support further study.
- 3. The item shown as "Entertainment" refers to daily meals for the AIMS students and lecturers as well as meals at special occassions such as workshops.
- 4. In the items "General Office Expenses" and "Stationery", costs of stationery for students and learning material is included.
- 5. The cost of the internet is high but this needs to be kept at this level and may even be extended somewhat.
- 6. "Medical Expenses" refers to medical insurance for all students and for some visitors, as required.
- 7. "Stipendia" refers to a small monthly allowance for out-of-pocket expenses for all students.
- 8. "Travel expenses" refers to arriving and departing students, lecturers and researchers. These costs, particular within Africa, remain unreasonably high despite all efforts to obtain competitive rates from several travel agents. During 2004 the item is especially high as it includes the travel costs for the delegates to the workshop on capacity building, which took place earlier in 2004.

4.3 Sponsors

AIMS has been made possible through the generous support of the following organisations and individuals

- The Gatsby Charitable Foundation, UK;
- The Vodafone Group Foundation, UK;

- The Andrew W. Mellon Foundation;
- The Ford Foundation;
- The Vodacom Foundation, South Africa;
- PetroSA, South Africa;
- Department of Science and Technology, South Africa;
- Chicago State University;
- Trinity College, Cambridge University;
- Cambridge University Press;
- The David and Elaine Potter Charitable Foundation;
- The University of Stellenbosch;
- The International Council of Scientific Unions (ICSU), with UNESCO and the US State Department;
- The International Union of Theoretical and Applied Mechanics (IUTAM);
- Seardel Investment Corporation Limited, South Africa;
- Cheryl Grunbock and Martin King;
- Canon Collins Educational Trust for Southern Africa;
- The London Mathematical Society;
- The University of Cambridge Local Examinations Syndicate;
- The Daniel lagolnitzer Foundation (Fondation De France);
- The Muizenberg Millenium Education Trust;
- The National Research Foundation
- The Go Open Source Campaign;
- SUN Microsystems see this press release: PDF, OpenOffice;
- Hyper-Interactive Teaching Technology;
- The Victor Rothschild Memorial Fund;
- The Ellison Medical Foundation;
- Fred Turok;
- Stella Innes, for the donation of the remarkable mathematical research library of her late husband Evan Innes. A brief biography of Evan is provided here: PDF, OpenOffice;
- British Airways, South Africa Office;
- European Mathematical Society Committee for Developing Countries;
- Jonathan Leake, Sunday Times.

Appendix A. Contact Details

AIMS can be contacted through its website at www.aims.ac.za/english/contact.php, by sending an email to info@aims.ac.za, or by using the physical address below:

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