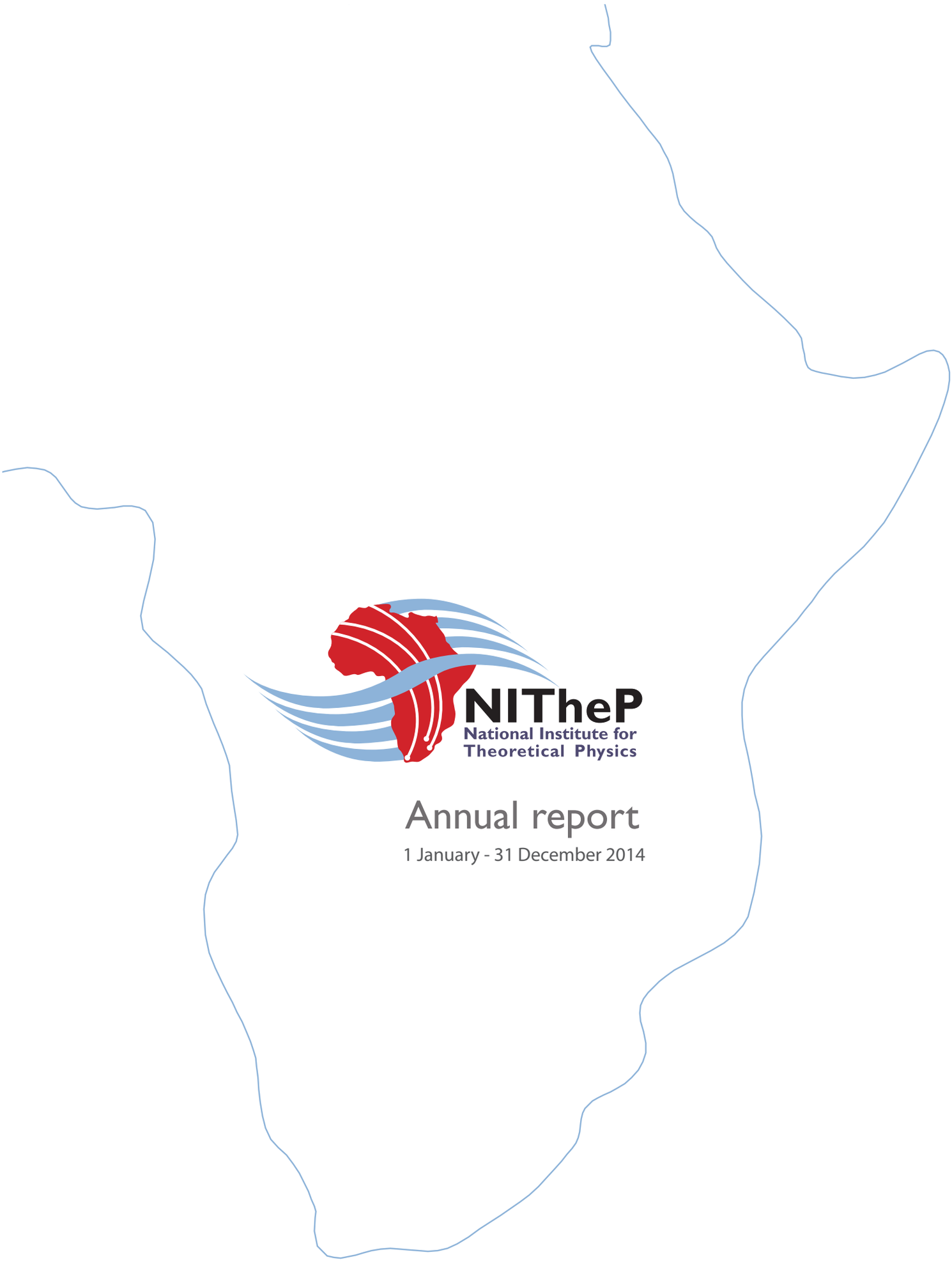


NITheP
National Institute for
Theoretical Physics

Annual report

1 January - 31 December 2014

Members of the 2014 outreach team (from left): Ruan Viljoen, Zina Ndlovu, Kevin Li, Erasmus du Toit, Paul Williams, Janusz Meylahn, Vernon Chisapi, Hein Fourie, Catherine Pfukwa, Bart Smit and Rikus Groenewald.

Contents

Abbreviations

AIMS	African Institute for Mathematical Sciences
CoE	Centre of Excellence
CPUT	Cape Peninsula University of Technology
CSIR	Council for Scientific and Industrial Research
DST	Department of Science and Technology
HartRAO	Hartebeesthoek Radio Astronomy Observatory
ICTP	International Centre for Theoretical Physics
iThemba LABS	iThemba Laboratory for Accelerator Based Sciences
MANCO	Management Committee
NASSP	National Astrophysics and Space Science Programme
NLC	National Laser Centre
NRF	National Research Foundation
NWU	North-West University
RFP	Request for Proposal
RU	Rhodes University
SAAO	South African Astronomical Observatory
SAASTA	South African Agency for Science and Technology Advancement
SAC	Scientific Advisory Council
SAIP	South African Institute of Physics
SARChI	South African Research Chairs Initiative
SKA	Square Kilometre Array
STIAS	Stellenbosch Institute for Advanced Study
SU	Stellenbosch University
UCT	University of Cape Town
UJ	University of Johannesburg
UKZN	University of KwaZulu-Natal
UL	University of Limpopo
UNISA	University of South Africa
UNIVEN	University of Venda
UNIZULU	University of Zululand
UP	University of Pretoria
UWC	University of the Western Cape
WITS	University of the Witwatersrand

Director's Report

NITHEP HAS SEEN A RAPID GROWTH PHASE SINCE ITS INCEPTION IN 2009 THAT LASTED UNTIL 2012. As can be expected, this growth phase had to flatten out at a point commensurate with resources. The first sign of this was in 2013 when there was a decline in several indicators relative to 2012. This trend continued in 2014 where most indicators improved relative to 2013, but still saturated at more or less the same levels as those of 2012. This clearly indicates that NITheP has now entered a stationary phase and that further growth can only be achieved with the allocation of additional resources.

Virtually all the indicators are in line with the targets set for NITheP. Most noteworthy is the research outputs that were up from the 56 publications in 2013 to 71 in 2014. Another very encouraging trend, which seems to indicate that NITheP's efforts at transformation is beginning to bear fruit, is the remarkable change in the demographic profile of bursary holders that is now dominated by black males. The gender profile is, however, still skewed.

Despite this positive trend, the number of bursary holders in 2014 dropped to an all-time low. The reason for this is the considerable lower values of NITheP bursaries in 2014 compared to other national scholarship programmes, such as NRF and SKA. This led to a considerable percentage of students declining NITheP bursaries in 2014. This situation has been addressed in 2015 with a considerable increase that brought NITheP bursary values on par with those of other bursary programmes. At the same time this increase was not accompanied by additional resources, which places several other programmes under pressure. Another matter of concern is the declining pool of quality applications from within South Africa for bursaries. This is probably due to the declining pool of high level performers in mathematics and science at grade 12 (see the 2014 NSC Diagnostics Report) and the increased competition from other scholarship programmes and disciplines for this shrinking pool. At this stage the bursary allocation of around 30 bursaries in the budget seems to be commensurate with the available pool of South African applicants.

The situation sketched above can be improved if the considerable pool of applicants from other African countries is considered. However, currently only 13% of the bursary allocation can be used for international students, which severely limits this possibility. It seems vital that NITheP finds funds earmarked for students from Africa to address this shortcoming and to increase its pool of quality bursary holders.

Overall NITheP is performing very well within the limits set by currently available resources. The road forward is to consolidate this situation, but also to seek new resources and opportunities for growth. One possible route that will be explored in 2015 is increased international partnerships. Another priority in 2015 will be to find funds earmarked for capacity development programmes such as bursaries, internships and training workshops. This should free up resources that can then be deployed to create further capacity in research and support of the national network.

Frederik Scholtz

Introduction

NITHEP IS A GEOGRAPHICALLY DISTRIBUTED INSTITUTE with regional centres at the Stellenbosch Institute for Advanced Studies (STIAS), the University of the Witwatersrand (WITS) and the University of KwaZulu-Natal (UKZN). Stellenbosch University (SU) acts as the host institution and the regional centre at STIAS is its headquarters.

The governance system is that of a national Centre of Excellence, which is subject to the notarisation of a binding contract between the granter, the National Research Foundation and the grantee, namely SU, as the host institution of the NITheP headquarters.

NITheP operates in an independent environment (STIAS), with SU providing administrative support. This is critical in the South African (and African) context to ensure non-alliance with a particular institution and to develop an independent identity. A consortium agreement between the hosts of the three regional centres, namely SU, WITS and UKZN, governs the interaction between the three regional centres.

Mandate and Strategy

Vision

NITHEP'S VISION IS to be Africa's leading and an internationally competitive research and training institute in theoretical physics, a discipline that provides the conceptual framework for the natural sciences.

Mission

NITHEP AIMS to sustain a stimulating theoretical physics research and user facility that links South Africa internationally through excellence in research and training, thereby supporting scientific innovation, transformation and socio economic development in South Africa.

Strategic goals

TO IDENTIFY and pursue high-level research projects and expand existing expertise in the fields covered by theoretical physics in South Africa;

TO ACT as a national and African user facility for theoretical physics which optimises communication and collaboration between the existing centres of expertise and stimulates joint initiatives in line with international developments;

TO PROMOTE equitable participation from all communities in South Africa in theoretical physics programmes and to strengthen ties with similar communities on the rest of the African continent;

TO PROVIDE a source of expertise which can feed into broad national scientific policies and goals.

Governance and Structure

Governance

THE GOVERNANCE STRUCTURE, as set out in the governance document for a national Centre of Excellence, makes provision for the establishment of a steering committee, scientific advisory committee and management committee. The composition of these three core governance committees was as follows on 31 December 2014:

Steering committee

- Prof Eugene Cloete (deputy vice-chancellor: research, SU)
- Prof Robert de Mello Koch (School of Physics, WITS)
- Prof Roy Maartens (SKA chair at UWC, Department of Physics; affiliated to Portsmouth University, UK)
- Prof Azwinndini Muronga (director: UJ Science Centre, Soweto Campus; Department of Physics, Faculty of Science, UJ)
- Prof Francesco Petruccione (NITheP deputy director; South African Research Chair in Quantum Information Processing and Communication, UKZN)
- Prof João A. P. Rodrigues (NITheP deputy director; School of Physics, WITS)
- Prof Frederik Scholtz (NITheP director)
- Dr Nthabiseng Taole (Director: Research Chairs and Centres of Excellence (RCCE), NRF.)
- Prof Patricia Whitelock (SAAO; NASSP)

Scientific advisory committee (SAC):

- Prof Sylvester James Gates (University of Maryland, USA)
- Prof Jan Govaerts (Catholic University Louvain, Belgium)
- Prof Sir Peter Knight (Imperial College, London, UK; president of the Institute of Physics; Kavli Royal Society International Centre)
- Prof Neil Turok (Perimeter Institute, Canada)

Management committee (MANCO):

- Dr Kevin Goldstein (School of Physics, WITS), (NITheP associate representative)
- Prof Francesco Petruccione (NITheP deputy director, South African Research Chair in Quantum Information Processing and Communication, UKZN)
- Prof João A. P. Rodrigues (NITheP deputy director, School of Physics, WITS)
- Prof Frederik Scholtz (NITheP director; MANCO chair)

Staff

THE STAFF PROFILE OF NITheP as on 31 December 2014 is shown in Table 1.

Table 1: Staff profile as at 31 December 2014

Position	Node	Number of positions (appointment)
Director	SU	1 (five-year contract)
Deputy director	WITS/UKZN	2 (five-year contracts, 25%)
Chief researcher	WITS/SU	3 (five-year contracts, two associate and one full professor level)
Researcher	SU/UKZN	2 (five-year contracts)
Research associate	SU	1 (three-year appointment)
Senior administrative officer	SU	2 (five-year contracts, one full-time and one 5/8 positions)
Secretary	UKZN	1 (five-year contract)
Total		**12**

Postdoctoral fellows

THE POSTDOCTORAL FELLOWS per node as at 31 December 2014 are shown in Table 2. All positions comprise two-year contracts.

Table 2: Postdoctoral fellows on 31 December 2014

Node	NITheP funded	Externally funded
SU	3	2
UKZN	2	3
WITS	2	5
Total	**7**	**10**

Service rendering

Marketing

AS NITHEP FUNCTION AS A user facility, it is important to maintain a high level of visibility within the community. Marketing has been emphasised since NITheP's inception and 2014 was no exception.

NITheP has continued to deliver a service to the theoretical physics community as the communication channel for parties within the field. The community has been interacting with one another; opportunities from abroad have been communicated to the local theoretical physics community, and local theoretical physics workshops have been advertised abroad. As such, NITheP serves as a channel for information dissemination through which the theoretical physics community can communicate with one another.

NITheP website

When 'Theoretical Physics' is searched from a South African IP address, www.nithep.ac.za comes up second after Wikipedia. Average hits on the website are 7 000 per annum.

Participation at SAIP conference

NITheP attends the annual SAIP conference and hosts an exhibition stand. The purpose of participation is to provide information to the community and facilitate networking among TP community members.

Networking

Associate programme

To achieve NITheP's strategic goals, it is crucial to develop a national network throughout South Africa. In 2014, NITheP's very successful associate programme continued growing. The current status of the network, which now consists of 74 associates (2 junior, 63 individual, 4 institutional and 5 strategic associates), is shown in Table 3. Associates have access to the NITheP visitor, mobility and workshop programmes through a Request for Proposal (RFP) system.

Table 3: Associates as at 31 December 2014

JUNIOR ASSOCIATES (2)	
Dr Eric Maluta	UNIVEN
Dr Thuto Mosuang	UL
INDIVIDUAL ASSOCIATES (63)	
Prof Jacek Banasiak	UKZN
Prof Igor Barashenkov	UCT
Dr Bruce Bartlett	SU
Prof Bruce A. Bassett	AIMS, SAAO and UCT
Prof Nigel Bishop	RU
Prof Moritz Braun	UNISA
Dr Jeandrew Brink	SU
Prof Erwin Brüning	UKZN
Prof Nithaya Chetty	UP, NRF
Dr H. Cynthia Chiang	UKZN
Dr Chris Clarkson	UCT
Prof Jean Cleymans	UCT
Prof Sergio Colafrancesco	WITS
Prof Robert de Mello Koch	WITS
Prof Cesareo A. Dominguez	UCT

INDIVIDUAL ASSOCIATES (49)	
Dr Rocco Duvenhage	UP
Prof Hans Eggers	SU
Prof George Ellis	UCT
Prof Arthur Every	WITS
Dr Kevin Goldstein	WITS
Dr Filippo Giraldi	UKZN
Prof W. Dieter Heiss	SU
Prof Manfred Hellberg	UKZN
Dr William A Horowitz	UCT
Prof Vishnu Jejjala	WITS
Prof Daniel Joubert	WITS
Prof Steven Karataglidis	UJ
Prof Thomas Konrad	UKZN
Dr Julien Larena	RU
Prof Mantile Lekala	UNISA
Prof Richard Lemmer	WITS
Prof Roy Maartens	UWC
Prof Richard Mace	UKZN
Prof Sunil Maharaj	UKZN
Prof Oluwole Daniel Makinde	CPUT
Dr Allan Joseph Michael Medved	RU
Dr Shazrene Mohamed	SAAO
Prof Kavilan Moodley	UKZN
Prof Harm Moraal	NWU
Prof Kristian Müller-Nedebock	SU
Prof Azwinndini Muronga	UJ
Dr Jeff Murugan	UCT
Dr Giuseppe Pellicane	UKZN
Prof André Peshier	UCT
Dr Denis Pollney	RU
Prof Marius Potgieter	NWU
Prof Alex Quandt	WITS
Prof Sergei Rakitianski	UP
Dr Stef Roux	CSIR
Prof Pavlo Selyshchev	UP
Dr Alessandro Sergi	UKZN
Dr Jonathan Shock	UCT
Prof Jonathan Sievers	UKZN

Dr Izak Snyman	WITS
Prof Mark Tame	UKZN
Dr Gary Tupper	UCT
Dr Hermann Uys	NLC, CSIR
Prof Raoul Viollier	UCT
Prof André Weideman	SU
Prof Herbert Weigel	SU
Prof Heribert Weigert	UCT
Dr Amanda Weltman	UCT
Prof Konstantinos Zoubos	UP
Dr Caroline Zunckel	UKZN
INSTITUTIONAL ASSOCIATES (4)	
UCT-CERN (previously known as the Alice Group)	UCT
Centre for Theoretical Physics	UCT
Cosmology Group	UCT
Centre for Space Research	NWU
STRATEGIC ASSOCIATES (5)	
Prof Barry Green	AIMS
Prof Lesley Cornish	DST/NRF CoE in Strong Materials
Prof Ludwig Combrinck	HartRAO
Dr Zeblon Vilakazi	iThemba LABS
Dr Joseph Kirui	University of Venda

Recognition / awards for NITheP associates

NITheP is very proud of our associates for being nominated and recognised for their work.

Prof Oluwole D. Makinde

Prof Makinde from CPUT received a Nigeria National Honour Award in recognition as an Outstanding Scientist in Africa for his enormous contribution to mathematical science research, capacity building and training across the continent.

Nigerian president Dr Goodluck Ebele Jonathan decorated Prof Makinde with the Award entitled 'Member of the Order of the Federal Republic' on 29 September 2014.

Prof Makinde is also the Secretary General of the African Mathematical Union and a Fellow of the African Academy of Sciences. In 2011/2012 he received the African Union Kwame Nkrumah Continental Scientific Award for his outstanding contribution to basic science, technology and innovation in Africa. In 2009/2010 he received the NSTF/NRF TW Kambule National Award for his outstanding contribution to science, engineering, technology and innovation, together with capacity building in mathematical sciences in South Africa. Recently, one of his published papers in the International Journal of Numerical Methods for Heat and Fluid Flow received the 2014 Highly Commendable Paper Award from Emerald Group Publishing Limited in the UK. He has also received several other research excellence awards in field of applied mathematics and computations.

NSTF-BHP Billiton Awards

Two NITheP associates received recognition at the 2014 NSTF-BHP Billiton award ceremony held in Johannesburg on 3 July 2014:

- Prof Jean Cleymans, Emeritus Professor of Physics, University of Cape Town.

  Category: To an individual for an outstanding contribution to Science, Engineering and Technology (SET) over a lifetime.

- Prof Azwinndini Muronga, Associate Professor of Physics and Director of the UJ Soweto Science Centre.

  Category: To an individual or a team for an outstanding contribution in communication for outreach and creating awareness of Science, Engineering, Technology and Innovation over the last five years. This award category was sponsored by SAASTA.

Associate Workshop

A total of 30 associates attended the annual NITheP Associate Workshop held at the NITheP offices in Stellenbosch on 18 and 19 September.

The workshop started with a meeting on general associate matters, followed by the annual associate meeting. The second day consisted of a scientific programme, with six 30-minute talks.

International linkage

The NITheP director attended, on invitation of the ICTP, its 50th birthday celebrations in Trieste, Italy.

At this occasion the NITheP director and ICTP officials held useful discussions. It was decided to follow up on these discussions with a formal visit in 2015 to establish closer collaboration between the two institutes. A visit to the International School for Advanced Studies in Trieste (SISSA) is also envisaged.

African development programme

The third African School on Electronic Structure Methods and Applications (ASESMA) was to take place in Nigeria during 2014. Due to the very unfortunate incident regarding the abduction of the school girls, the event was postponed until 19 January 2015 and will be hosted at WITS.

ASESMA schools, which take place on a biennial basis until 2020, emphasise the theory and computational methods for predicting and understanding properties of materials through calculations at the fundamental level of electronic structure. Previous schools were held in Cape Town (2010) and Eldoret, Kenya (2012).

Request for proposal (RFP) system

NITheP gives associates and staff access to NITheP resources and, in particular, the mobility, long-term visitor, workshop and research programmes through a competitive, proposal-driven system.

Table 4 summarises the support given to staff and associates under this system during the year. The individual activities listed below are reported on in detail under the appropriate headings (note: not all the proposals approved for support actually materialised and this is due to a variety of reasons).

Table 4: Proposals supported under the RFP system in 2014

Type of activity	Number of proposals
Long-term visitors	9 (16.5 visitor months)
Mobility	2
Schools	1
Capacity development workshops	1
Research workshops	6

Mobility

Under the mobility programme, support is provided for associates to travel between South African higher educational institutions and, in particular, to the three nodal centres situated at SU, WITS and UKZN. Support is given for a period of up to two months per year and includes accommodation, subsistence and, in cases that were strongly motivated and justified, transport costs. Two proposals were supported under this programme in 2014.

Associates who used the programme are Prof Thomas Konrad (UKZN) and Prof Julien Larena (Rhodes), who made various research visits to UCT during May, July and November 2014.

The research undertaken during these visits included:

- Study of perturbations in LTB spacetimes. This led to one publication and a new project aiming at studying the formation of cosmological structures in the vicinity of non-linear, already formed structures such as voids or clusters (in preparation).
- Preliminary studies of relativistic corrections to cosmology, in particular, GR corrections to the observed bispectrum and imprints of relativistic effects on non-Gaussianities.
- Preliminary investigation on the feasibility of general relativistic cosmological simulations. A Newtonian version of the code has been developed and tested, and currently the GR equations are implemented.

A publication resulted from this mobility grant:

February, Larena, Clarkson and Pollney, ***Evolution of linear perturbations in spherically symmetric dust spacetimes, Class.*** Quantum Grav. 31 (2014) 175008.

Visitors

A vibrant visitor programme is vital for NITheP's success. Visitors are attracted to NITheP by means of two mechanisms. The first is the long-term visitor programme, accessed through the RFP system. Under this programme, staff and associates can apply for support for longer-term visiting collaborators, typically for a period of one to six months. This support covers accommodation and subsistence and, only in exceptional cases, travel costs.

NITheP also budgets annually for short-term visitors who typically spend a few weeks (less than a month) at a NITheP centre or tertiary institution of an associate. Foreign researchers may apply for support under both of these programmes.

The NITheP short-term visitor programme supported 56 visitors during the year, and details are indicated in Table 5.

Table 5: Short-term visitors who visited NITheP in 2014

NITheP node	Short-term visitors
SU	13
UKZN	17
WITS	26
Total	**56**

Table 6 summarises the long-term visitors who were supported under the RFP system, which totalled 16.5 visitor months.

Table 6: Long-term visitors supported under the RFP system in 2014

Visitor	Home institute/affiliation	Host (affiliation)	Term (month)	Publication
Prof Karl Schilcher	University of Mainz	Prof Cesareo Dominguez	1	0
Dr Ken Ganga	Université Paris Diderot	Dr Cynthia Chiang	2	0
Prof Tom Trainor	University of Washington	Prof Hans Eggers	3	1 and 1 in progress
Prof Günter Wunner	University of Stuttgart	Prof Dieter Heiss	1.5	1 and 1 in progress
Prof A. V. Gorokhov	Samara State University	Prof Francesco Petruccione, Dr Ilya Sinayskiy	1	1 in progress
Dr Shamik Gupta	Université Paris-Sud	Prof Hugo Touchette	1	1 in progress
Prof Antal Jevicki	Brown University	Prof João Rodrigues	2	2
Dr Rosemary Harris	Queen Mary University of London	Prof Hugo Touchette	3	3 and 4 in progress
Prof Jean-Phillipe Uzan	Institut d'Astrophysique de Paris	Dr Amanda Weltman	2	0

Capacity development workshops

Capacity development in theoretical physics in South Africa is very much part of the NITheP mandate and agenda. This involvement continued in 2014 with the 2nd International Workshop on Hot and Dense Nuclear and Astrophysical Matter (HDM) organised by Prof Azwinndini Muronga. This workshop breaks new ground, being hosted at a location such as the University of Venda.

This workshop was aimed at providing experimental and theoretical tools to allow deep understanding of the open problems in the physical processes occurring in relativistic nucleus-nucleus collisions and in the astrophysical and cosmological matter.

With South African scientists participating at CERN and the country hosting SKA, there is a strong need for a school to prepare physics and astrophysics students and emerging researchers in these fields. The school and workshop was attended by 70 students and emerging researchers from the previously disadvantaged universities.

Bursaries

A total of 23 bursaries were awarded in 2014. The total actual amount paid out was R1,38 million. The bursaries awarded are summarised in Table 7.

Table 7: Bursaries awarded in 2014

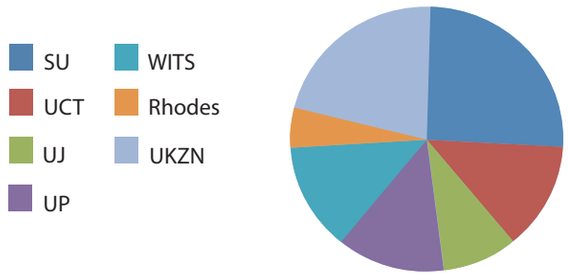
Level	Number	Amount allocated per bursary (R)	Actual cost (R)*	Budgeted cost (R)*
Honours	0	R 40 000	0	0
MSc	13	R 55 000	R 630 000	R 715 000
PhD	10	R 75 000	R 750 000	R 750 000
Total	**23**		**R 1 380 000**	**R 1 465 000**

The bursary holders per institution and degree are shown in Table 8.

Table 8: Bursary holders per institution in 2014

Institution	MSc	PhD	Total
RHODES	1	0	1
SU	2	4	6
UCT	2	1	3
UJ	2	0	2
UKZN	3	2	5
UP	2	1	3
WITS	1	2	3
Total	**13**	**10**	**23**

Universities represented



* Actual amount and budgeted amount are separated as in some years the two are not identical due to top-ups etc.

Table 9 shows the details by race and gender. The bursary demographic profile shows an encouraging trend in that it is now dominated by bursary holders from previously disadvantaged communities. This seems to indicate that NITheP's efforts at transformation and engagement with these communities to increase participation in the mathematical sciences is beginning to bear fruit. Unfortunately the gender profile is still skewed. Participation by the coloured community also remains a continuing concern.

The number of bursary holders in 2014 dropped to an all-time low of 23. The reason for this is the considerably lower values of NITheP bursaries in 2014 compared to other national scholarship programmes, such as NRF and SKA. This led to a considerable percentage of students declining NITheP bursaries in 2014. This situation has been addressed in 2015 with a considerable increase that brought NITheP bursary values on par with those of other bursary programmes.

Another matter of concern is the declining pool of quality applications from within South Africa for bursaries. This is probably due to the declining pool of high level performers in mathematics and science at grade 12 (see the 2014 NSC Diagnostics Report) and the increased competition from other scholarship programmes and disciplines for this shrinking pool. At this stage the bursary allocation of around 30 bursaries in the budget seems to be commensurate with the available pool of South African applicants. The change in the composition of the pool of bursary holders in the period 2008 – 2014 is reflected in figure 1.

Figure 1: Change in composition of bursary pool in the period 2008 – 2014

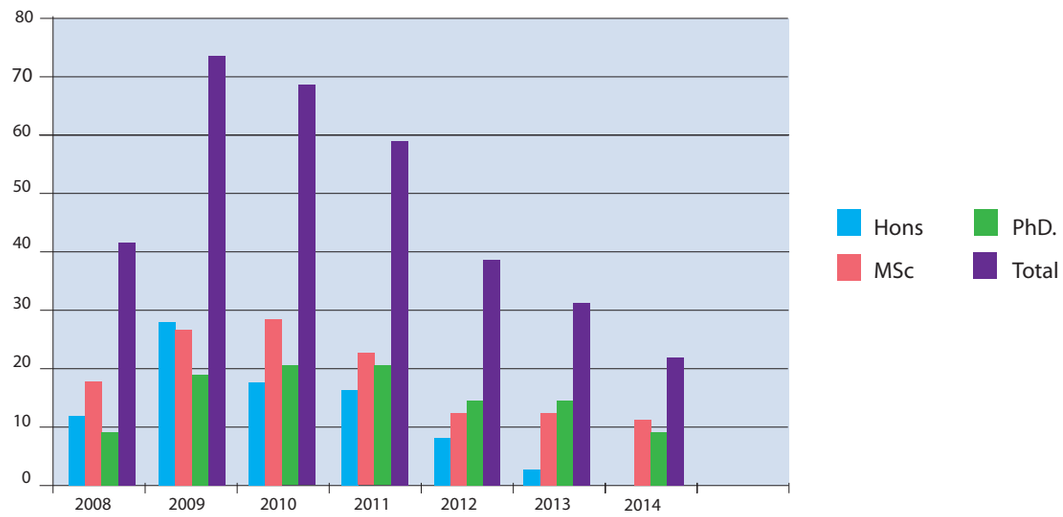
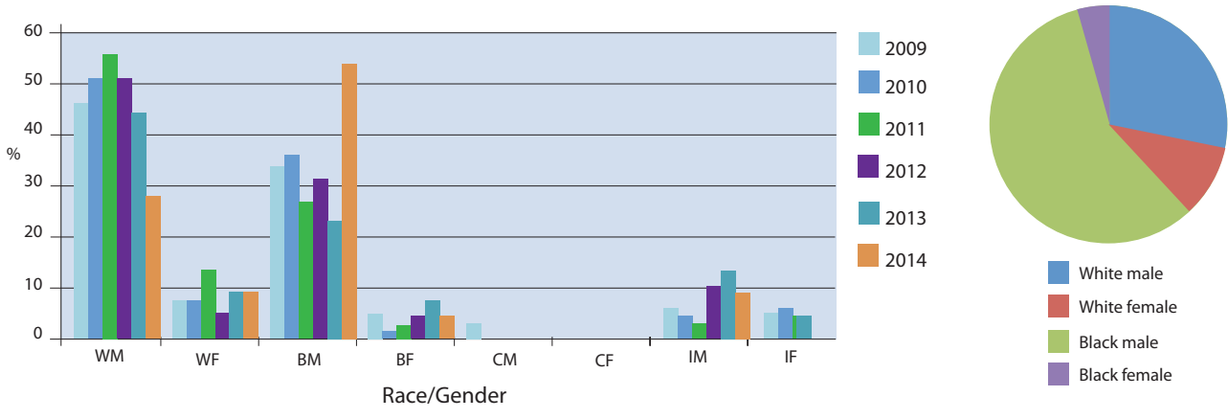


Table 9: Bursary holders per race and gender 2014

Degree	White		Black		Coloured		Indian		Total
	Male	Female	Male	Female	Male	Female	Male	Female	
Honours	0	0	0	0	0	0	0	0	0
MSc	3	2	6	1	0	0	1	0	13
PhD	3	0	6	0	0	0	1	0	10
Total	**6**	**2**	**12**	**1**	**0**	**0**	**2**	**0**	**23**

The change in demographic profile from 2009 to 2014 is reflected in Figure 2.

Figure 2: Demographic profile of bursary holders (represented as a %)



Annual bursary holder workshop

The second NITheP bursary holder workshop, an open event, was held at the NITheP offices in Stellenbosch on 20 and 21 November 2014. A total of 18 MSc and PhD students presented 20-minute talks. The students enjoyed the challenge of presenting their work to their peers, as well as the opportunity to network with each other and to discuss the various topics covered in their work.

Internships

The internship programme continued in 2014. Applications were invited during the first half of 2014.

This programme has two components. The first enables students at Honours or MSc level to join NITheP workshops and complete a small research project, typically on the scale of an honours project, under the supervision of an invited workshop participant. The second component makes provision for students, mainly at honours level or who have recently started at master's level, to join NITheP staff or associates during recess periods to complete a research project.

In both instances, the supervisor and an independent local examiner, usually from the student's home institution evaluate the project. Students may use the marks generated in this way for credits at their home institution, if the home institution approves of this.

In this way, NITheP provides a training opportunity, often under the guidance of a leading researcher, which alleviates the pressure of project supervision on departments. Typically NITheP supports the students who pass the screening process for this programme in terms of travel, accommodation and subsistence costs. The internship topics can be viewed on the NITheP website.

Table 10 summarises the details regarding this programme during 2014. Particularly encouraging is the considerable number of interns who continue with a higher degree. Table 11 reflects the demographics of the NITheP internship students.

Table 10: Internship statistics for 2014

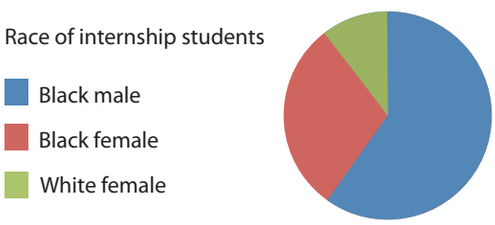
Student's home institute (host institute)	Number of students	Number of students earning credits	Students who continued with higher degree
SU (WITS)	1	1	1
UCT (UWC)	1	1	1
UP (UCT)	1	1	1
UP (UKZN)	1	0	0
UWC (UJ)	4	3	3
UZULU (UJ)	1	1	1
UZULU (UKZN)	1	0	0
Total	**10**	**7**	**7**

Demographics of internship students are summarised in Table 11:

Table 11: Internship students per race and gender 2014

Student	White		Black		Coloured		Indian		Total	Citizenship
	M	F	M	F	M	F	M	F		
Isobel Kolbe	0	1	0	0	0	0	0	0	1	SA
Sibusisiwe Mabaso	0	0	1	0	0	0	1	0	1	SA
Purity Phehlukwayo	0	0	0	1	0	0	0	0	1	SA
Thobeka Lamula	0	0	0	1	0	0	0	0	1	SA
Gcina Maziya	0	0	1	0	0	0	0	0	1	Swaziland
Sukhuma Mkhize	0	0	1	0	0	0	0	0	1	SA
Jerry Mokgolobotho	0	0	1	0	0	0	0	0	1	SA
Phumzile Maboika	0	0	0	1	0	0	0	0	1	SA
Thulani Shiluvani	0	0	1	0	0	0	0	0	1	SA
Bongikosi Zikhali	0	0	1	0	0	0	0	0	1	SA
Total	**0**	**1**	**6**	**3**	**0**	**0**	**0**	**0**	**10**	**90% SA**

Demographics summary:
90% of NITheP internship students were South African.



Travel grants

In addition to the bursary and internship programmes, NITheP also offers support to students, enabling them to travel to national and international conferences and schools. Support is only provided if the student gives a presentation or poster or, in the case of schools, if the supervisor strongly motivates attendance. Support is limited to R5 000 for national conferences and R15 000 for international conferences. Table 12 indicates the statistics for travel grants allocated in 2014.

Table 12: Travel grants allocated in 2014

Institution	National (R5K)	International (R15K)
UJ	0	
SU	0	1 (R15K)
WITS	0	
UKZN	0	
Total	**0 (R0K)**	**1 (R15K)**

Outreach, community service and the popularisation of science

Public talks

NITheP's outreach activities include the popularisation of science. In this regard, NITheP hosts and supports a programme of public talks in the theoretical physics community. These are normally aimed at the general public, students and high school learners. NITheP collaborated with iThemba LABS to host monthly public talks throughout 2014. NITheP generally assisted with the provision of the speaker, and iThemba LABS provided the transport and refreshment to approximately 70 Grade 11 and 12 learners who attend schools mainly in Khayelitsha and surrounding informal settlement areas

ESKOM Expo for Young Scientists

NITheP sponsored two prizes for the Best Physics and Best Mathematics projects at the national ESKOM Expo for Young Scientists for the fourth consecutive year. NITheP researchers acted as judges at the event, which was held in Johannesburg on 8 October 2014.

NITheP awarded two prizes of R2 000 each as follows:

- NITheP Prize for Best Mathematics project: "Is Zero a Number" by Ms Nomthandazo Sithole (Ehlanzeni region).
- NITheP Prize for Best Physics project: "Dog Day Dynamics" by Ms Nomthandazo Sithole (Ehlanzeni region).

The researchers who judged at the event were:

- Prof Alan Cornells
- Prof Alex Quandt
- Prof Kevin Goldstein

Soweto Science Centre learners visit Digital Planetarium and attend launch of National Science Week

NITheP was one of many exhibitors at this event, held at UFS Vista Campus on 2 August 2014.

The event was opened by Minister Naledi Pandor. In attendance were many other dignitaries from the NRF, DST and local Free State governing bodies, as well as some 4 300 learners who visited the stalls to learn about the opportunities available to them.

Prof Azwinndini Muronga, Director of the UJ Soweto Science Centre brought a group of 11 learners from Soweto to attend the opening and view the exhibitions. The group was also invited afterwards to view a private show of the Digital Planetarium at Naval Hill. Thereafter, Prof Matie Hoffman (UFS) led the leaners through a few calculations, such as how to estimate the height of a particular solar flare, and how to determine the distance of a planet from Earth.

On the Saturday evening, the group went to Boyden Observatory to learn about its history and telescopes. A discussion on the various constellations in the night sky ensued. Prof Muronga then gave a talk on theoretical physics and why it should be studied. This talk was attended by other members of the general public, managers of various science centres and dignitaries of the NRF and DST.

NITHEP would like to thank:

- Prof Hoffman and Patricia Lamusse from UFS for their arrangements and financial contributions.
- SAASTA for sponsoring the accommodation and its other support.
- Prof Muronga for safely transporting the learners from the Soweto Science Centre. .

SAASTA booklet

NITheP assisted SAASTA during 2013 with the production of a booklet for physics outreach activities. The booklet was very well received during 2014, and was handed out at all outreach activities, such as the National Science Week exhibition and iThemba LABS public talks. The booklet is aimed at learners to inform them about role models in the science field, as well as career options and the various fields.

Outreach road trip to Garden Route schools

The outreach road trip was done in collaboration with the following sponsors:

- Optical Society of America (OSA)
- SPIE (the international society for optics and photonics)
- NITheP
- The Dean's Office for the Faculty of Natural Sciences, SU
- Department of Physics, SU
- iThemba LABS

NITheP supported 11 post-graduate students from the Laser Research Institute, the Institute for Theoretical Physics and the greater part of the department's student body on an outreach road trip. This is the fourth consecutive year this outreach trip has taken place.

The aim of the trip, which took place from 7 to 13 September 2014, was to visit nine schools in underprivileged communities in the Garden Route area. Popular physics demonstrations were given and learners were informed about physics as a career path. The students explained the basic philosophies of mathematical modelling of physical systems and experimental physics. The feedback received was overwhelmingly positive, as was also the case with the previous trips.

Date	Schools visited	Number of learners
8 September	Oudtshoorn HS Bridgton Secondary	130
9 September	Percy Mdala HS Knysna HS	65
10 September	Thembalethu HS York HS	121
11 September	Punt HS Sao Bras Secondary	111
12 September	Hillcrest Secondary	40

The feedback from the 400+ learners reached, as well as the teachers, was very positive. The learners showed great interest in the presentations and demonstrations and many indicated that, because of the interesting and stimulating material presented, they may consider science as a career if they had not already done so.

Additionally, this year's outreach initiative also attracted the attention of several television programmes. The regular morning show Expresso, as well as In the Shoes, joined the outreach team on 12 September to record footage to use on their respective programmes. Two members of the outreach group, Zina Ndlovu and Rikus Groenewald, were invited to participate in a future interview on Expresso on the outreach initiative. An edited copy of the video footage of 12 September is available to all interested sponsors.

Janusz Meylahn has fun with corn starch as a non-Newtonian fluid.

Collaboration with PROTEC and UKZN Science Centre

NITheP collaborated with the UKZN Science Centre and PROTEC (the programme for technological careers) providing speakers and lunch for an event. PROTEC is a national independent non-profit educationa provider that helps to prepare learners from disadvantaged communities for successful careers in science, engineering and technology.

UKZN College Awards programme

NITheP UKZN sponsored the College Awards programme, which recognises students who excel at UKZN. NITheP donated gift vouchers from Adams Bookshops for the Best Third Year Student in Physics and Best Honours Student in Physics.

Service to the theoretical physics community

During 2014, NITheP continued to inform the community about workshops (local and international events that are not necessarily funded by NITheP), schools, summer programmes, employment and study opportunities abroad.

Job shadowing

Four job shadowing opportunities for learners were also organised during the year. In these interventions, NITheP collaborated with iThemba LABS and the SU Physics Department to give the learners an opportunity to experience all three environments.

The learners who participated were:

- Calib Buckton, grade 11 learner from Stellenberg High School, visited NITheP on 25 and 26 June 2014.
- Yasmeen Brown, grade 11 learner from Norman Henshilwood High School, visited NITheP on 14 and 16 July 2014.
- Daniel Frier, grade 11 learner from Settlers High School, visited NITheP on 16 and 18 July 2014.
- Michaela Wannamaker, grade 11 learner from St Cyprian's School, visited on 18, 21 and 23 July 2014.

Vernon Chisapi demonstrates how shower gel acts as a non-Newtonian fluid.

Research and training

Research focus

NITheP has a clear research focus, derived from existing research capacity at the nodal centres and strategic priorities. With the appointment of associates, the research focus includes research capacity outside these centres. The current core research activities are centred along the following themes:

- Statistical and Condensed Matter Physics (SU, WITS)
- Quantum Information and Computation (UKZN)
- High Energy Physics
  - String Theory and Matrix Models (WITS, UCT)
  - Phenomenology (WITS, UCT)

Schools, workshops and short research programmes under RFP system

NITheP supports workshops and research programmes organised at its nodal centres or an associate's home institution. Programmes are accessed through the RFP system. Workshops typically span three to five days and research programmes a period of one to three months. These activities are often combined.

NITheP's flagship training programme, the Chris Engelbrecht Summer School, runs annually. This proposal-driven programme enables any member of the theoretical physics or broader physics community to propose a topic, speakers and organising committee for the school.

In 2014 the following schools, workshops and short research programmes were supported under the RFP system. In addition to the grants made by NITheP, an additional amount of R352,200 was leveraged through these workshops/conferences.

Schools

The 25th Chris Engelbrecht Summer School, titled ***Non-linear Phenomena in Field Theory***, took place from 21 to 31 January 2014 at the Protea Hotel, Stellenbosch. The organising committee comprised Herbert Weigel (SU) (Chair), F. G. Scholtz (NITheP) and Robert de Mello Koch (WITS).

Workshops

1. ***Cosmology on Safari*** was held from 26 to 30 January 2014 at Bonamanzi, Northern KwaZulu-Natal. The organising committee comprised H. Cynthia Chiang (UKZN), Matt Hilton (UKZN), Kavilan Moodley (UKZN), Jonathan Sievers (UKZN), Amanda Weltman (UCT) and Sahal Yacoob (UKZN).
2. Prof Kristian Müller-Nedebock (SU) was approached by the organisers of the annual ***I-CAMP '14*** (Inter-continental school of geometry and topology in soft matter, optics and biological systems) to host the workshop at SU. NITheP made R25 000 in funding available to enable local students to make use of this opportunity on their doorstep. ***I-CAMP '14*** was held from 15 to 29 June 2014 at SU. The organising committee comprised Kristian Müller-Nedebock (SU), Ivan Smalyukh (University of Colorado Boulder, USA), Mark Bowick (Syracuse University, USA), Jan Engelbrecht (WITS), Izak Snyman (WITS). A publication resulted from the workshop.
3. ***Quantum Information Processing and Communication (QIPC2)*** was held from 3 to 7 November 2014 at the Alpine Heath Resort, Drakensberg. The organising committee comprised Y. Hardy (UNISA), J. Koch (Northwestern University, USA), L. Marucci (University of Naples, Italy) and Mark Tame (UKZN).
4. ***Workshop on Large Deviations in Statistical Physics*** was held from 3 to 14 November 2014 at the STIAS/Wallenberg Research Centre, Stellenbosch. The organising committee comprised Hugo Touchette (NITheP), Rosemary J. Harris (Queen Mary University of London, UK), Raphael Chetrite (Université de Nice, France).
5. ***HDM 2014 International Workshop*** was held from 23 to 30 November 2014 at North West University, Mafikeng Campus. The organising committee comprised Azwinndini Muronga (UJ) (Chair), Jean Cleymans (UCT), Simon Connell (UJ), Helen Drummond (NWU), Kaitano Dzinavatonga (NWU) (Co-chair), Eno Ebenso (NWU), Dzivhuluwani Ndiitwani (NWU), Ashmore Mawire (NWU), Thebe Medupe (NWU) and Sweetness Maseko (UJ).
6. ***Quantum Simulations and Quantum Walks*** was held from 24 to 28 November 2014. The organising committee comprised Francesco Petruccione (UKZN), Y. Shikano (Institute for Molecular Science and Chapman University) and Ilya Sinayskiy (NITheP/UKZN).
7. ***Frontiers of the AdS/CMT Correspondence*** was held from 1 to 5 December 2014 at UCT Upper Campus. The organising committee comprised Jeff Murugan (UCT) (Chair), Jonathan Shock (UCT), Amanda Weltman (UCT), Emanuel Malek (UCT), Cristhiam Lopez-Arcos (UCT) and Michael Abbott (UCT).
8. ***Joburg Workshop on Matrices, Holography and QCD*** was held from 15 to 19 December 2014 at the School of Physics, WITS. The organising committee comprised João Rodrigues (WITS) (Chair), Antal Jevicki (Brown University, USA), Robert de Mello Koch (WITS), Kevin Goldstein (WITS), Chung-I Tan (Brown University, USA), Vishnu Jejjala (WITS), Alan Cornell (WITS) and Shinji Hirano (WITS).

Table 13: Participation in NITheP-organised events in 2013

Event	Student participants (including postdocs)				Ordinary participants				Invited speakers (includes local & international)	Total participants	Funds received from NITheP (K)	Funds leveraged from other sources by the workshop organisers (K)
	South African	Other African countries	International	**Total**	South African	African	International	**Total**				
SCHOOLS												
25th Chris Engelbrecht Summer School: *Non-linear Phenomena in Field Theory*	17	0	0	**17**	4	0	0	**4**	7	28	300K	0
CAPACITY DEVELOPMENT WORKSHOPS												
HDM 2014 International Workshop	56	0	0	**56**	10	2	2	**14**	11	81	50K	50K
RESEARCH WORKSHOPS												
Large Deviations in Statistical Physics (Hugo Touchette)	2	3	14	**19**	2	0	17	**19**	12	50	150K	61,5K
Frontiers of the AdS/CMT Correspondence (Jeff Murugan)	11	4	3	**18**	21	4	3	**28**	4	50	150K	0
Quantum Simulations/Open Quantum Walks (Ilya Sinayskiy)	4	3	3	**10**	1	1	18	**20**	8	38	100K	15,7K
Quantum Information Processing and Communication (QIPC) (Francesco Petruccione)	16	5	9	**30**	16	3	15	**34**	4	68	100K	100K
Joburg Workshop on Matrices, Holography and QCD (Joao Rodrigues)	19	0	2	**21**	19	0	7	**26**	5	52	150K	125K
Cosmology on Safari (Kavilan Moodley)	11	4	3	**18**	21	4	3	**28**	8	54	100K	0
Total	**136**	**19**	**34**	**186**	**94**	**14**	**65**	**173**	**59**	**421**	**1,1m**	**352,2K**

Faculty development

NITheP has embarked on an initiative to engage with faculties and students at more remote centres to enhance research and training in theoretical physics at these centres. In November 2014 a workshop was held as part of this initiative: NITheP Board member Prof Azwinndini Muronga chaired the ***HDM 2014: International Workshop on Hot and Dense Nuclear and Astrophysical Matter.*** This workshop took place at UNIVEN and is of utmost importance, as it took place at one of South Africa's remote centres and benefitted the local community of students and faculty. The event was supported by UNIVEN, NITheP, NRF, the Frankfurt Institute for Advanced Studies, the Helmholtz International Centre for FAIR (Facility for Antiproton and Ion Research), UJ and SA-CERN.

Teaching and postgraduate supervision

NITheP's mandate clearly states an involvement of NITheP staff members in teaching and postgraduate supervision. Table 14 shows the 2014 involvement of NITheP staff in teaching, while Table 15 displays the number of Honours (projects), MSc and PhD students under NITheP staff supervision.

Table 14: Hours of teaching by NITheP staff in 2014

Node	Undergraduate (hours)	Honours (hours)	Advanced (MSc/PhD) (hours)	Total
SU	0	0	98	98
UKZN	24	96	0	120
WITS	85	0	0	85
Total	**109**	**98**	**98**	**303**

Table 15: Postgraduate supervision in 2014 (figures in brackets denote the number of NITheP bursary holders contained in the preceding figure)

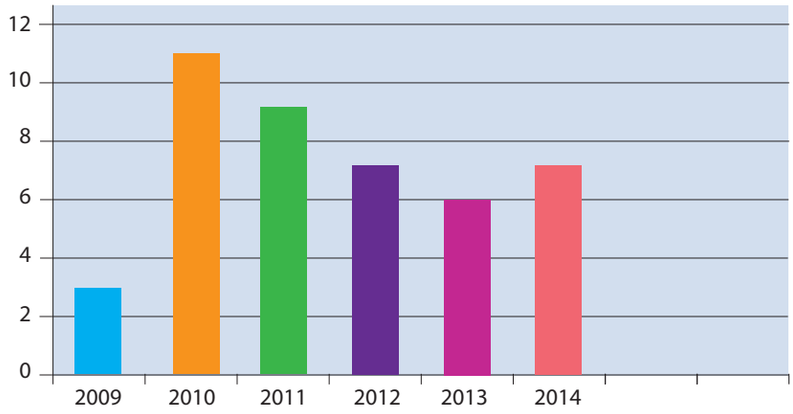
Node	Honours (projects)	MSc	PhD	Total
SU	3	3 (1)	6 (1)	12 (2)
UKZN	2	6 (1)	15	23 (1)
WITS	3	1	4	8
Total	**8**	**10 (2)**	**25 (1)**	**43 (3)**

The number of MSc and PhD students under NITheP staff supervision who graduated in 2014 is displayed in Table 16.

Table 16: MSc and PhD students under NITheP supervision who graduated in 2013 (figures in brackets are NITheP bursary holders)

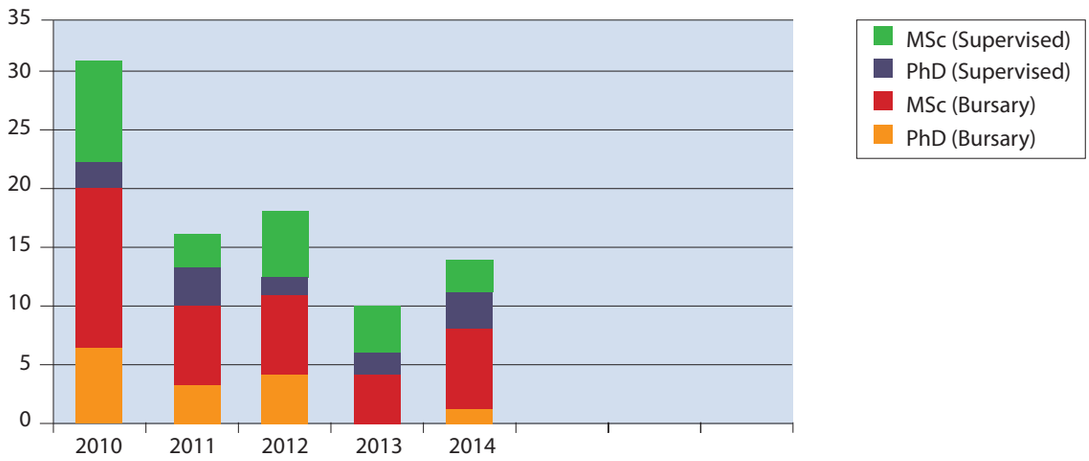
Node	Students	
	MSc	PhD
SU	0	1 (1)
UKZN	3	1
WITS	0	2
Total	**3**	**4 (1)**

Figure 3: MSc and PhD students under NITheP supervision who graduated in the period 2009 to 2014



The total output of MSc and PhD students who were under NITheP supervision and participated in the bursary programme for the period 2010 to 2014 is shown in Figure 4. The decline in the number of graduations over the past five years must be correlated with the decline in the number of bursary holders as displayed in Figure 1.

Figure 4: MSc and PhD students under NITheP supervision and in NITheP's bursary programme who graduated in the period 2010 to 2014



Publications

The publication outputs are shown in Table 16, while Figure 5 summarises the trend for the period 2007 to 2014. Figure 6 shows the citation record for the corresponding period and Figure 7 shows the contribution of the core staff and postdoctoral fellows to the total research outputs for the period 2009 to 2014.

This shows a decline, indicating a greater contribution from the NITheP network of associates and visitors to the output from NITheP. It also shows that the NITheP model of a national network of researchers is functioning well.

NITheP would like to congratulate researcher Fabio Cinti (ex Max Planck, Germany) on his article that appeared in *Nature*. The article is considered to be breakthrough finding about superfluidity of particles at very low temperatures.

Table 17: Publication output per geographical region for 2014

Geographical region	Publications
Gauteng	26
KwaZulu-Natal	24
Western Cape	21
Total	**71**

Figure 5: Publication trend for the period 2009 to 2014

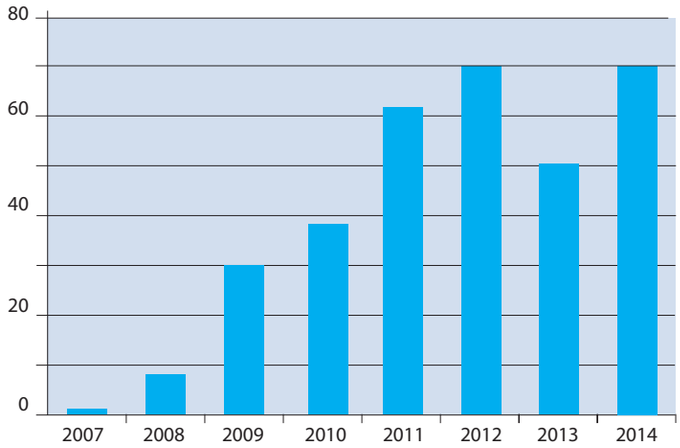


Figure 6: Citation record for the period 2007 to 2014

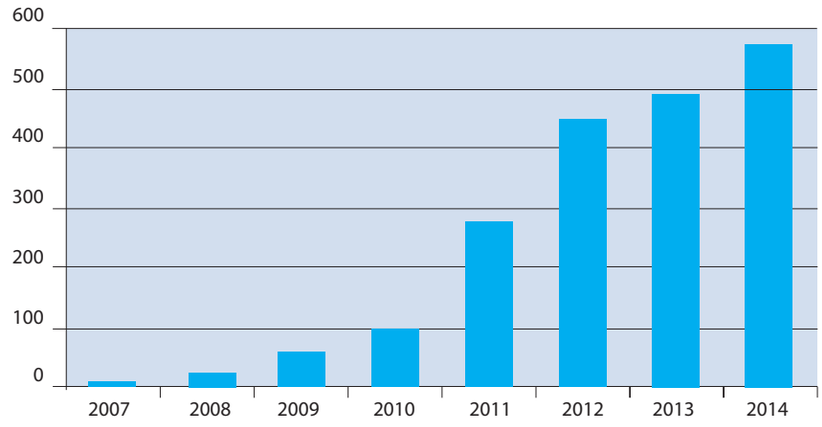


Figure 7: Contribution of core staff and postdoctoral fellows to total number of publications for the period 2009 to 2014

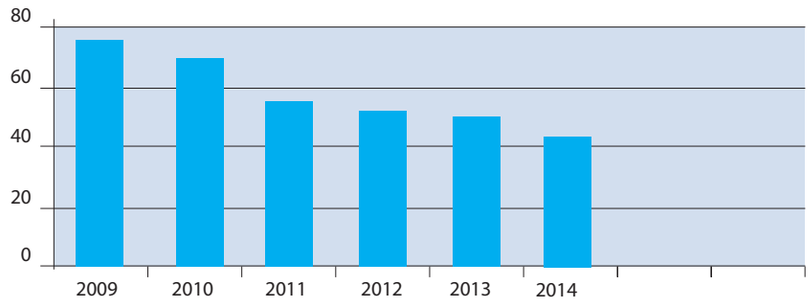
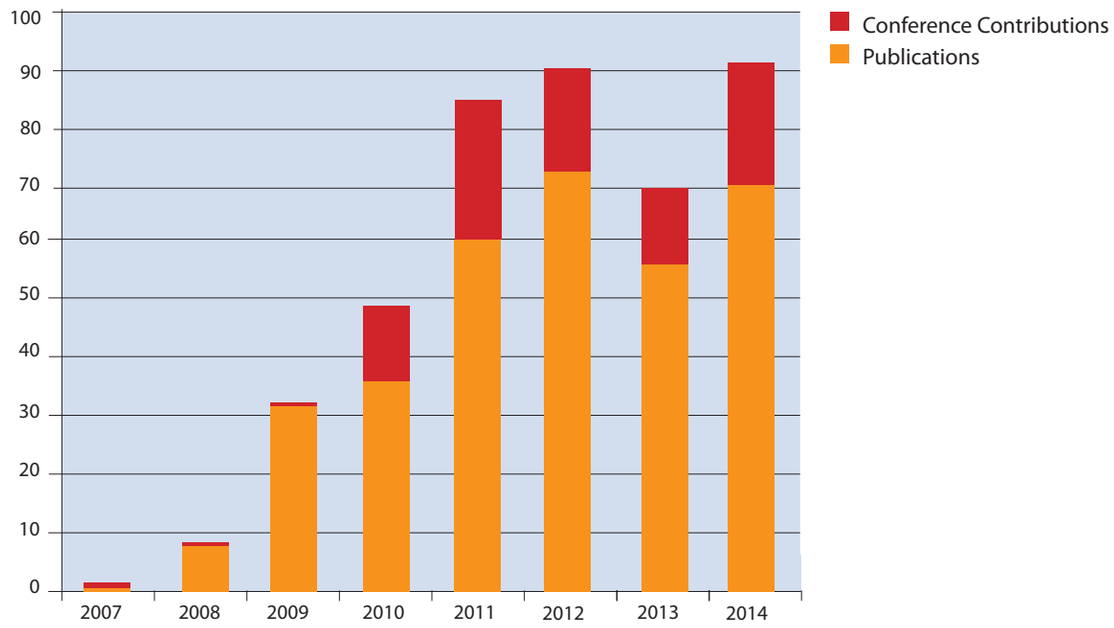


Figure 8: Total outputs for the period 2007 to 2014



List of publications

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8. R. C. F. Caballar, I. Sinayskiy and F. Petruccione, "Open Quantum Walks with Noncommuting Jump Operators", ***American Physics Society March Meeting***, 3-7 March 2014, Denver, Colorado, USA.

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11. H. Touchette, "Nonequilibrium Markov processes conditioned on large deviations", ***Workshop on Computational Methods for Statistical Mechanics***, International Center for Mathematical Sciences, Edinburgh, Scotland, 6 June 2014.

12. H. Touchette, "Nonequilibrium Markov processes conditioned on large deviations", ***Workshop on Advances in Nonequilibrium Statistical Mechanics***, Galileo Galilei Institute, Florence, Italy, 9 June 2014.

13. H. Touchette, "Large deviations of noise-perturbed dynamical systems", ***Summer School on Nonlinear Dynamics,*** Peyresq, France, 24-29 August 2014.

14 H. Touchette, "Nonequilibrium Markov processes conditioned on large deviations", ***Workshop on Large Deviations in Statistical Physics***, NITheP Stellenbosch, South Africa, 7 November 2014.

15. H. Touchette, "Nonequilibrium Markov processes conditioned on large deviations", ***STATPHYS-KOLKATA VIII***, S. N. Bose Centre for Basic Research, Kolkata, India, 4 December 2014.

16. M. Kumar, "Double Higgs boson production at FCC-he and prospects for measurements of the Higgs boson self-coupling", 5 December, ***Kruger 2014 Workshop***.

17.. M. Kastner, Chris Engelbrecht Summer School, Stellenbosch, South Africa, invited talk: "***Long-range quantum systems out of equilibrium***", January 2014.

18. M. Kastner, Workshop "Advances in Nonequilibrium Statistical Mechanics", Galileo Galilei Institute for Theoretical Physics, Florence (Italy), invited talk, "***Supersonic propagation in long-range lattice models***", June 2014.

19.. M. Kastner, Research programme "Many-body quantum systems far from equilibrium", Aspen Center for Physics, Aspen, USA, invited talk, "***Supersonic propagation in long-range lattice models***", August 2014.

20. R. C. F. Caballar, I. Sinayskiy and F. Petruccione, "Homogeneous Open Quantum Walks", ***Proceedings of the 2014 SAIP Congress, University of Johannesburg***, South Africa, 2014.

21. R. C. F. Caballar, ***31st Jerusalem Winter School in Theoretical Physics: Frontiers in Quantum Information Science.*** 30 Dec 2013 – 9 Jan 2014, Hebrew University of Jerusalem, Israel.

2014 Financial Statements

The statement of income and expenditure, cash flow and balance sheet for 2014 are reflected below.

Balance Sheet at 31 December 2014

	2014 R	2013 R
ASSETS		
NON-CURRENT ASSETS	67 074.49	55 428.04
Computers and office equipment	67 074.49	55 428.04
Intangible assets	-	-
CURRENT ASSETS	2 718 137.97	2 648 936.19
Other receivables	642 766.30	497 598.58
Petty cash	1 000.00	1 000.00
Stellenbosch University	2 074 371.67	2 150 337.61
TOTAL ASSETS		
EQUITY AND LIABILITIES		
CAPITAL AND RESERVES	2 688 273.16	2 573 425.09
Accumulated funds	2 688 273.16	2 573 425.09
CURRENT LIABILITIES	96 939.30	130 939.14
Trade and other payables	96 939.30	130 939.14
TOTAL FUNDS AND LIABILITIES	**2 785 212.46**	**2 704 364.23**

Consolidated Income Statement

for the year ended 31 December 2014

	2014	2013
	R	R
INCOME	10 612 540.63	10 107 006.00
National Research Foundation grant	10 612 356.00	10 107 006.00
Exchange rate gain	184.63	-
EXPENDITURE	10 497 692.56	10 452 711.30
Advertisements	17 086.37	10 822.08
Audit fees - current year	45 073.32	44 648.10
- under provision previous year	-	82 251.00
Affiliation and registration	4 315.10	10 435.71
Bursaries - post graduate	2 578 229.59	2 948 293.33
Computer materials and software	58 850.78	2 4 455.41
Conference fees	403 010.00	623 238.61
Consultation	-	9 150.00
Consumables	2 678.30	2 934.22
Contribution to workshops	502 109.15	266 212.44
Contribution to visiting researchers	30 000.00	-
Copying and stationery	41 900.80	43 068.73
Depreciation	23 344.26	13 491.26
Entertainment	79 438.23	93 772.15
Exchange rate loss	15.00	691.71
Furniture and equipment not capitalised	3 511.20	-
Marketing and promotions	48 655.50	30 111.63
Office administration	28 879.49	29 391.50
Postage, telephone and fax	44 262.07	45 755.36
Prizes and medals	11 000.00	4 000.00
Research costs	51 241.74	25 270.00
Repairs and maintenance	5 291.85	-
Salaries	5 350 816.22	4 665 907.99
Sundry expenses	8 431.02	7 084.51
Travel and accomodation	1 159 552.57	1 471 725.56
SURPLUS/(SHORTAGE) FOR THE YEAR BEFORE TRANSFERS	114 848.08	(345 705.30)
TRANSFERS BETWEEN NODES		
Transfers to Kwazulu-Natal	(1 946 835.00)	(2 069 836.32)
Transfers to Gauteng	(1 352 688.00)	(1 150 098.00)
Transfers from Stellenbosch	3 299 523.00	3 219 934.32
SURPLUS/(SHORTAGE) FOR THE YEAR	**114 848.08**	**(345 705.30)**

Cash Flow Statement for the year ended 31 December 2014

	2014 R	2013 R
CASH FLOW FROM OPERATING ACTIVITIES		
Shortage for the year	114 848.08	(345 705.30)
Adjustment for:		
Depreciation and amortisation	23 344.26	13 491.26
Operating loss before working capital adjustments	138 192.33	(332 214.04)
Working capital adjustments	(179 167.56)	(94 745.77)
(Increase)/Decrease in trade and other receivables	**(145 167.72)**	**37 589.66**
Decrease in trade and other payables	**(33 999.84)**	**(132 335.43)**
Cash utilised in operations	(40 975.23)	(426 959.81)
NET CASH FLOW FROM OPERATING ACTIVITIES	**(40 975.23)**	**(426 959.81)**
CASH FLOW FROM INVESTMENT ACTIVITIES		
Computers and office equipment purchased	(34 990.71)	(41 953.02)
Decrease in amount owed by Stellenbosch University	75 965.94	468 912.83
NET CASH FLOW FROM INVESTMENT ACTIVITIES	**40 975.23**	**426 959.81**
NET INCREASE IN CASH AND CASH EQUIVALENTS	-	-
CASH AND CASH EQUIVALENTS AT THE BEGINNING OF THE YEAR	1 000.00	1 000.00
CASH AND CASH EQUIVALENTS AT THE END OF THE YEAR	**1 000.00**	**1 000.00**