



AMSI

AUSTRALIAN MATHEMATICAL
SCIENCES INSTITUTE

Annual Report 2004-05

National
Collaboration
in the Mathematical
Sciences



AMSI Annual Report 2004-05

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Acronyms

AGR	Access Grid Room
AMSI	Australian Mathematical Sciences Institute
ANU	Australian National University
ARC	Australian Research Council
AustMS	Australian Mathematical Society
DEST	Department of Education, Science and Training
ICE-EM	International Centre of Excellence for Education in Mathematics
MASCOS	ARC Centre of Excellence for Mathematics and Statistics of Complex Systems
MATHEON	German DFG Research Center: Mathematics for key technologies: Modelling, simulation, and optimization of real-world processes
MITACS	Mathematics of Information Technology and Complex Systems: a Network of Centres of Excellence for the Mathematical Sciences
UNSW	University of New South Wales

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About the Australian Mathematical Sciences Institute

The Australian Mathematical Sciences Institute (AMSI) is a national, collaborative venture supporting the mathematical sciences. It was established in 2002 with initial funding from the Victorian Government's Science, Technology and Innovation Infrastructure grants program. The University of Melbourne provides well-equipped premises and administrative services.

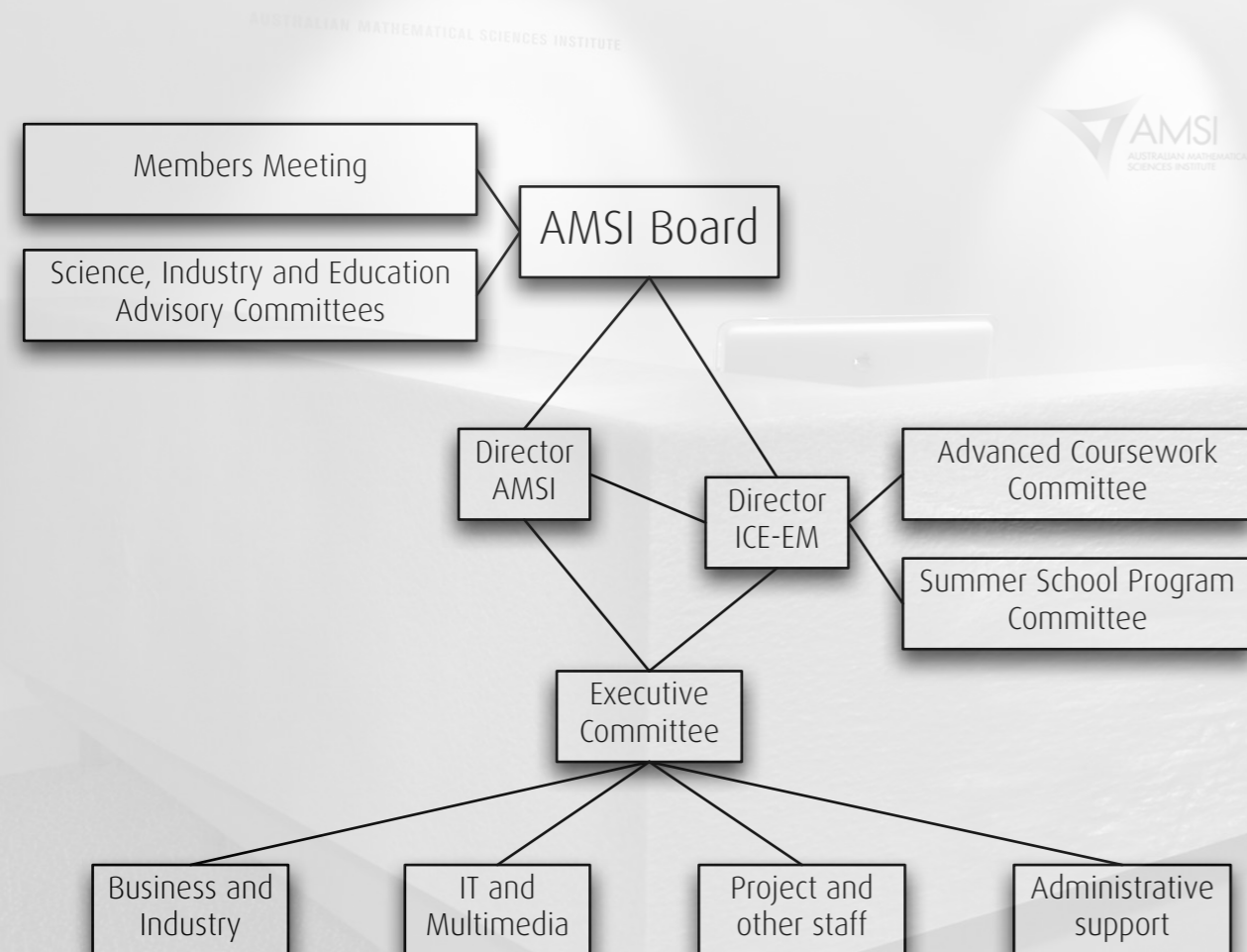
AMSI's mission is to promote and strengthen understanding and use of the mathematical sciences in Australia's culture, science and economy.

Full members of AMSI are signatories to a Joint Venture Agreement. AMSI has an independent Board and a full-time Director who manages day-to-day activities.

There are three main programs: Science, Industry and Education. Each program has an Advisory Committee that provides advice to the Board. Members meetings held twice a year also inform the Board's deliberations.

AMSI manages the International Centre of Excellence for Education in Mathematics (ICE-EM) which is funded by the Australian Government through the Department of Education, Science and Training (DEST). ICE-EM supports a vibrant education program covering school mathematics through to advanced postgraduate courses.

Some science and industry activities are conducted in collaboration with the Australian Research Council (ARC) Centre of Excellence for Mathematics and Statistics of Complex Systems (MASCOS), of which AMSI is a partner.



Full Members

The Australian National University
 La Trobe University
 Monash University
 RMIT University
 The University of Melbourne
 The University of New South Wales
 The University of Queensland
 The University of Sydney

Associate Members

Australian Bureau of Statistics
 Australian Mathematics Trust
 CSIRO
 Central Queensland University
 Curtin University of Technology
 Deakin University
 James Cook University
 Macquarie University
 Queensland University of Technology
 Swinburne University of Technology
 The University of Adelaide
 University of Ballarat
 University of Canberra
 The University of New England
 The University of Newcastle
 University of South Australia
 University of Southern Queensland
 University of Technology Sydney
 The University of Western Australia
 University of Wollongong
 Victoria University

The Board

1 July 2004 to 10 February 2005

Dr James E. Lewis (Parkview Group) (Chair)
 Ms Judith Downes (ANZ)
 Dr Tim Littlejohn (IBM/Biolateral)
 Professor Garth Gaudry (Director, AMSI)
 Associate Professor Geoff Prince (Deputy Director, AMSI)
 Professor Hyam Rubinstein (University of Melbourne) (to 31 December 2004)
 Professor Peter Taylor (University of Melbourne) (from 1 January 2005)
 Professor Don Taylor (University of Sydney)
 Associate Professor Chris Radford (University of New England)

10 February 2005 to 30 June 2005

Dr James E. Lewis (Parkview Group) (Chair)
 Ms Judith Downes (ANZ)
 Dr Tim Littlejohn (IBM/Biolateral)
 Professor Garth Gaudry (Director, AMSI)
 Professor John Hearne (Deputy Director, AMSI)
 Professor Peter Taylor (University of Melbourne)
 Professor Tony Dooley (University of New South Wales)
 Associate Professor David Panton (University of South Australia)

Report from the Chairman of the Board



James E. Lewis

The 2004-05 financial year has been one of consolidation and transition for AMSI, consolidation through increased membership, improved processes, new initiatives and additional staff, and transition through appointment of new directors to AMSI and the newly created International Centre of Excellence for Education in Mathematics (ICE-EM). The twenty-nine member institutions of AMSI have enjoyed considerable benefits and the mathematical sciences are stronger as a result of this national collaborative venture.

This year has seen our leadership capability greatly strengthened with the appointment of new directors to AMSI and ICE-EM. Professor Philip Broadbridge has been appointed as AMSI's Director and Professor Garth Gaudry as Director of ICE-EM. Both will take up their respective positions by August 2005. The Board is delighted to have secured the services of these talented individuals. I would also like to acknowledge the considerable efforts of AMSI Executive Director, Associate Professor Geoff Prince, during the appointment processes and for taking the Acting Director role in May and June 2005.

Professor Philip Broadbridge comes to AMSI from the University of Delaware, where he has been Head of Mathematical Sciences. Before this, he was Professor of Applied Mathematics and Director of the Institute for Mathematical Modelling and Computational Systems at the University of Wollongong. The AMSI Board approved his appointment because of his outstanding academic leadership and management skills, wide experience of the Australian mathematical sciences scene and eminence as an applied mathematician.

As Director of AMSI since 2003, Professor Garth Gaudry is well known to AMSI and its members. In this role, he has played a major part in consolidating and growing AMSI's influence as a powerful advocate of the mathematical sciences in this country. This was reflected most tangibly in the successful bid to DEST for the awarding of ICE-EM

to AMSI. Having relinquished the role as Director of AMSI in July 2005, Garth is ideally placed to provide focussed leadership to ICE-EM through to the end of its grant period in June 2008. His intimacy with school mathematics in Australia will be reflected in ICE-EM's large Schools Project, and his international reputation and wide network of colleagues will be critical in developing ICE-EM's international mission.

Although Professor Gaudry continues with AMSI through his role in ICE-EM, it is appropriate to mark the end of his directorship with due acknowledgement of his outstanding work. As Director, he has overseen its growth as a national collaborative venture, the appointment of an excellent team, establishment of ICE-EM and its multitudinous activities and consolidation and success of AMSI's scientific, education and industry programs. We owe much to Garth's dedication and drive during these formative years and I wish to record the Board's appreciation of a job well done.

The three committees advising the AMSI Board and management on its programs have worked particularly hard this year delivering considerable benefit to members. The Science Advisory Committee, headed by Professor Peter Hall, has overseen 13 workshops and symposia across a wide spectrum of the mathematical sciences. The Industry Advisory Committee, chaired by Dr Bob Watts and assisted by Dr Thomas Montague, the AMSI/MASCOS Industry and Marketing Manager, has progressed a number of projects and introduced the Industry Forum program. The first forum will take place in Sydney in July 2005 on healthcare risk and resources. The Education Advisory Committee, chaired by Professor Peter Taylor of the University of Canberra, has a key role in advising ICE-EM management. ICE-EM activity has been intense with the annual Summer School and BioInfoSummer, both held this year at the Australian National University, and national career expo and vacation scholarship programs held at our member institutions. Preparatory work on mathematics texts for the first

two years of secondary school has been particularly important. These texts will be piloted in 2006.

This year, Full Members were represented on the Board by Associate Professor Don Taylor of the University of Sydney (2004) and Professor Tony Dooley of the University of New South Wales (2005). Representatives of Associate Members were Associate Professor Chris Radford of the University of New England (2004) and Associate Professor David Panton from University of South Australia (2005). Each person nominated by their member groups to these important one-year posts, has contributed excellent advice and counsel to focus our effort on delivering value to members. The Deputy Director of the Institute, nominated by members according to the Joint Venture Agreement, also holds the position for a year. In 2004-05, it was held first by La Trobe's Associate Professor Geoff Prince and then by Professor John Hearne of RMIT. Our external Board members, Ms Judith Downes of the ANZ Banking Group and Dr Tim Littlejohn of IBM Global Services, continue on the Board, bringing valuable perspectives from the business world. Board meetings are also attended by Professor Tony Guttman as Director of MASCOS, the Chairs of the three advisory committees, the Executive Director (2005) and AMSI Executive Officer Ms Jan Thomas. I thank the 2004-05 Board for their enthusiastic support.

The staff of AMSI and ICE-EM have worked tirelessly to execute AMSI's mission. The AMSI and ICE-EM Director, Professor Garth Gaudry, the Executive Director Associate Professor Geoff Prince, Ms Jan Thomas the Executive Officer, Dr Nancy Lane, ICE-EM Manager and Interim Director, and Dr Michael Evans, ICE-EM Schools Project Manager, all have the Board's appreciative recognition for their exceptional efforts.

This year, once again, AMSI members have continued to support this national institute. While many challenges face the mathematical sciences in Australia, the willingness of the discipline to confront these challenges in a collaborative manner augurs well for further significant success.

The Board is pleased to have been associated with the vibrant management team at AMSI and is delighted with the achievements the Institute has delivered to the Australian mathematics community in this past year. I thank all members for their support during the year and commend the 2004-05 Annual Report to members.

A handwritten signature in black ink, appearing to read 'J. Lewis', written in a cursive style.

James E. Lewis
Chairman of the Board

Report from the Director of AMSI



Garth Gaudry

The 2004-05 financial year has been a watershed year for AMSI. It was the last year of the Victorian Government's Science Technology and Innovation (STI) grant and the first operating year for the International Centre of Excellence for Education in Mathematics (ICE-EM). It was also the last year of my directorship of the Institute. Most importantly, this year AMSI has delivered benefits to its members in a manner unprecedented in the history of the discipline in Australia.

AMSI's scientific program, under the guidance of the Scientific Advisory Committee, continues to be a cornerstone of the Institute's activities. Chair Professor Peter Hall and committee members have done a wonderful job encouraging and advising colleagues around the country. As a result, AMSI by itself and with MASCOS has conducted 16 workshops and conferences. Again, we have strongly supported participation by early career researchers to help them broaden their research training experience. This year, we have also given extra support to conference organisers to fund attendance of prominent international participants.

ICE-EM has made its presence felt this year through the annual Summer School, the Winter School in Computational Biology, BioInfoSummer 2004, the Access Grid Room (AGR) project, a national careers campaign and the Schools Materials Project and related activities for school teachers. The ICE-EM grant has made it possible to carry out a major program of activities, bringing remarkable benefits to the mathematical sciences at all levels.

Through ICE-EM, we have a significant national voice in matters of school education in mathematics and an opportunity to develop fruitful ties with countries in our region.

It is a particular pleasure to acknowledge the enthusiasm, dedication and outstanding work of Dr Nancy Lane, Dr Michael Evans, Ms Janine McIntosh and all other members of the ICE-EM staff.

Guided by Dr Bob Watts, Chair of the Industry Advisory Committee, AMSI has undertaken important initiatives in its industry program. A program of industry- focused workshops, theme programs, internships and shared student supervision has been drawn up and funding sources are actively being sought. A program of twice-yearly industry forums has been introduced. The first will be held in July 2005 in Sydney and will cover risk, resources and healthcare. It will be jointly sponsored by MASCOS. Professor Arvind Gupta, Director of the Canadian industrial mathematics network MITACS, will make the keynote address. We expect to enter into a joint collaboration agreement with MASCOS and MITACS in July 2005. Taken together, these initiatives are a good foundation for development of AMSI's engagement with industry.

As this is my last report as AMSI Director, it seems appropriate to outline some challenges facing the Institute in the next few years. The first is to find funding sources to replace the STI grant, notably for the scientific and industry programs. AMSI is a success story and a model for others to follow. So it seems realistic to believe that, in the near future, Australian and State governments will look favourably on providing further support for AMSI's dynamic and successful national ventures.

A second challenge is to increase tertiary and secondary enrolments in mathematics and statistics courses. ICE-EM already has a major national career campaign in place, which has been enthusiastically embraced by member institutions. It will take some years for the campaign to have the desired effect of convincing students and their parents that mathematics is indispensable in so many of the most rewarding careers available nationally and internationally.

Thirdly, there is the challenge of ICE-EM's AGR project. This project offers the prospect of interactive national and international research collaborations, online seminars and workshops and shared

undergraduate and postgraduate access to the wide Australian mathematical sciences community. The potential benefits are almost boundless, but a great deal of goodwill and cooperation will be necessary to achieve them. This venture will realise AMSI's mission as a national collaborative venture in a novel way.

These and other challenges now pass into the good hands of my successor, Professor Phil Broadbridge. Phil is admirably equipped to consolidate and develop AMSI in the coming years. I extend to Phil my warm welcome and wish him the very best in his new post.

During my period as Director, I have enjoyed supportive and close working relationships with many people. First and foremost I am grateful for the support I have enjoyed from the AMSI membership at large. The Board and Chairs of the advisory committees have given me invaluable advice, encouragement and assistance. I am especially grateful to Dr Jim Lewis, Chair of the Board, for the way he has guided AMSI's development and given me his unstinting support. The wisdom, experience and judgement of all these people have been the foundation of whatever successes may have been achieved.

The AMSI staff is a marvellous team whose enthusiasm and dedication I appreciate greatly. Associate Professor Geoff Prince, as Executive Director, has carried a heavy burden this year, notably during my period of extended leave. His contributions to AMSI and ICE-EM have been outstanding. Ms Jan Thomas is well known to everyone as a stalwart enthusiast for the AMSI cause. Much of what people throughout Australia enjoy through association with AMSI derives from Jan's unwavering dedication.

Finally, I wish to thank the University of Melbourne and staff of the Department of Mathematics and Statistics for the way they have contributed to making AMSI a success. Our material presence and our many activities throughout Australia would not have happened were it not for the generosity of the University of Melbourne at the outset.

A handwritten signature in black ink that reads "G. J. Gaudry". The signature is written in a cursive, flowing style.

Garth Gaudry
Director

Report from the Deputy and Executive Director



Geoff Prince

I held AMSI's Deputy Director and Executive Director positions this financial year. My term as Deputy Director finished on January 31st 2005 and I have been Executive Director since then with spells as Acting Director in May and June 2005. The Executive Director position runs until the end of January 2006 and was created by the Board to help AMSI through a transitional year. It has indeed been one of intense activity in key areas: establishing ICE-EM's AGR project, appointing Directors to AMSI and ICE-EM, and starting a new phase of AMSI's industry outreach.

In early July 2004, AMSI staged an AGR workshop at the Australian National University led by Dr Markus Buchhorn, Head, Australian National University (ANU) Internet Futures. ANU is nationally prominent in AGR development and it was a natural location for AMSI members to be briefed about the current and future status of this major e-research technology. The workshop was key to developing policy and contractual details later approved by DEST. Dr Buchhorn continues to be a key advisor to ICE-EM's AGR project.

The first round of applications for an AGR room closed in March 2005 and ICE-EM awarded funding to La Trobe University, the University of South Australia and the University of Wollongong. Construction of grid rooms at these member institutions will begin in the second half of 2005. Many other members have indicated interest in second round applications in 2005.

Toward the end of 2004, Professor Garth Gaudry informed the Board of his intention to retire as Director of AMSI at the end of July 2005. A search for a new Director was initiated and the Board asked me to coordinate the search committee. A broad consultative process resulted in the appointment of Professor Philip Broadbridge.

I oversaw a second recruitment process for the ICE-EM Director position in May. We were pleased to be able to take advantage of Professor Gaudry's ongoing

commitment to ICE-EM and appoint him Director until the end of the DEST contract in 2008. Thus AMSI enters the 2005-06 financial year with a full complement of senior staff.

On behalf of AMSI I thank Professors Peter Taylor and Rachel Webster of the University of Melbourne for their services on the two selection committees.

The 2005 year has marked a new phase of AMSI's industry outreach program with an application to DEST for funds under the Collaborative and Structural Reform scheme (CASR). Our proposal detailed a program of twice-yearly industry forums, annual theme programs, industry internships for postgraduate students and shared industry-university supervision of honours students. Irrespective of the outcome, an inaugural Industry forum will be held in July 2005 in Sydney and the application provides a plan for future funding applications.

During my term as Acting Director, AMSI has also partnered a proposal for a Centre of Excellence in Risk Analysis with a national consortium based at the University of Melbourne and headed by Professor Mark Burgman of the University's Department of Botany. This Centre is to be funded by the Commonwealth Department of Agriculture, Fisheries and Forestry and a decision regarding the successful application is expected during October 2005. This enterprise will rely heavily on the mathematical sciences and is intended to deliver quantitative tools to many government and industry sectors.

It is a pleasure to acknowledge the intense hard work of the staff and management at AMSI and the support of many member institutions during a hectic year. I also acknowledge the cooperation of La Trobe University, my home institution, in releasing me to work at AMSI.

Geoff Prince
Executive Director

Report from the Chair of the Science Advisory Committee

The Science Advisory Committee has completed another active year and AMSI is running a successful program of conferences, seminars, and workshops (see p. 19). Topics range from algebra to optimisation, cryptography and stochastic modelling.

Australian and overseas mathematical scientists have been involved. While often held at AMSI headquarters in Melbourne, the workshops are also held across Australia. Assessment of proposals is not competitive but is based purely on scientific merit and likely national impact.

One very successful event held at AMSI and organised by MASCOS, Decision Making for Complex Problems in Conservation, is being considered as a model for some future events. We anticipate there will be support for travel of invited speakers coming from abroad, especially for this type of problem solving workshop and where a strong case exists that it meets the national need.

Another workshop was organised entirely by Australian research students. It was an example of the unique opportunities AMSI can provide to assemble mathematical leaders of the future for collaboration.

Our approach to eligibility for workshops is flexible and includes bi- or multilateral proposals involving other countries and more than one site. For these proposals, AMSI supports within-Australia costs of meetings. However, AMSI does not support regular workshops, conferences or other meetings and will not usually fund special sessions at conferences. We may, however, support satellite meetings associated with major conferences.

ICE-EM forms a major part of AMSI's work. ICE-EM will present advanced scientific courses as well as specialist courses and programs for industry that assist technology transfer. Scope exists to involve prominent overseas speakers from those programs in AMSI workshops and theme programs, and vice versa.

Exciting opportunities lie ahead. My thanks to members of the Science Advisory Committee—their contributions to AMSI's successful science program are greatly appreciated.

Peter Hall
Chairman

Report from the Chair of the Education Advisory Committee

The Education Advisory Committee has been particularly dynamic in 2004-05 as ICE-EM activities have gathered momentum. Several appointments have been made, providing a solid nucleus of high quality staff based at AMSI. These are noted elsewhere in this report.

The largest project, *ICE-EM Mathematics*, is developing high quality resource material for schools. A major focus is national texts for students, also seen as a vital support resource for teachers. The core writing team of Ms Janine McIntosh (ICE-EM), Dr Bill Pender of Sydney Grammar School and Mr Peter Brown of the University of New South Wales, is ably led by Dr Michael Evans (ICE-EM) forming part of the team core. A number of other close advisers are also assisting.

ICE-EM Mathematics has developed strongly. A draft of a Year 7 text is expected by July and work has begun on a Year 8 text. Years 5, 6, 9 and 10 texts are planned.

A major media conference will be held simultaneously in Brisbane, Perth, Melbourne, Adelaide and Sydney on Tuesday 26 July 2005 to launch ICE-EM Mathematics and call for interested schools to take part in pilot testing.

Professional development for teachers is a key component of ICE-EM Mathematics, to improve materials and effectiveness of delivery. Professor Hung-Hsi Wu of the University of California, Berkeley, conducted some well-received courses at AMSI and in Sydney. Other interesting lectures for teachers have also been sponsored.

As part of a Teachers' Mathematical Content Knowledge project, a draft paper has been prepared, circulated to committee members for comment and is expected to be made public in late 2005. The paper will guide teachers and training institutions on appropriate knowledge levels.

The committee is also comparing Year 12 mathematics courses throughout Australia. A detailed study investigating Year 12 mathematics syllabuses is being undertaken by Dr Frank Barrington of the University of Melbourne and Dr Peter Brown. A related project on enrolment trends in Year 11 and 12 mathematics subjects will be conducted by Dr Helen Forgasz of Monash University. Reports are expected in late 2005.

Other significant programs include the Graduate School, the Summer School for Honours and

Postgraduate students which helps university mathematics department viability; progressive establishment of AGRs; development of a web site on contemporary mathematical topics and applications; careers fairs; monitoring job advertisements; and supporting teacher participation in mathematics conferences.

ICE-EM has also made submissions to the current enquiry by the House of Representatives Standing Committee on Education and Vocational Training about teacher training and to the Australian government on eventual development of an Australian Certificate of Education.

The committee meets about every four months and I thank all the members for their time and commitment to AMSI and ICE-EM.

Peter Taylor
Chairman

Report from the Chair of the Industry Advisory Committee

This financial year was oriented towards exploring, developing and promoting a market presence. Essentially this translated into getting out there and meeting staff of member institutions with the interest, capacity and capability to undertake industry work, and seeking and meeting potential industry partners.

We began the year by exploring possible projects to develop advanced mathematical tools for use in the resource, finance and energy sectors. Some potential areas included developing optimisation algorithms and software for underground mines, risk management techniques for banks and improving supply and demand management techniques for the energy sector.

As the year progressed, we responded to several calls for expressions of interest and tender requests from government agencies such as the Australian Taxation Office, the Bureau of Rural Sciences and DEST. The DEST proposal sought support for industry related activities such as industry forums, industry days and collaboration on industry projects with international institutes such as the Canadian MITACS network and German MATHEON Institute.

We started the industry skills audit of member institutions which revealed a wealth of industry expertise in member institutions.

From April to June 2005, we prepared for the inaugural AMSI/MASCOS Industry Forum to be held in Sydney in July 2005. The Forum aims to promote industry linkages by: learning how Canada's MITACS engages industry; telling industry and government of the benefits of collaborating with mathematical scientists; raising awareness of opportunities for mathematical scientists to work with industry; encouraging industry participants to share problems where we might help and encouraging discussion that leads to joint projects.

Looking forward, an initial proposal is that the second AMSI/MASCOS Industry Forum be held in Melbourne in March 2006. The forum will focus on the benefits of using the mathematical sciences in healthcare, to be convened by Dr Tim Littlejohn. Other developments for the coming year will include: a new industry support model for the way we encourage AMSI member staff to become involved in industry projects; development and rollout of industry material on the redesigned website and a study of how other mathematical sciences institutes interact and work with industry.

Again I would like to thank other members of the Industry Advisory Committee—Professor Bill Appelbe, Dr Tim Littlejohn and Dr Thomas Montague for their contributions during the year. I would also like to thank all those who have assisted the IAC in its endeavours to date.

Robert Watts
Chairman

Report from the Executive Officer



Jan Thomas

Activity in 2004-05 has spanned AMSI, ICE-EM and the Australian Mathematical Society (AustMS).

The 10th International Congress on Mathematical Education (ICME) in Copenhagen, 4-11 July 2004, offered an opportunity for AMSI and ICE-EM to share a display area with other Australian groups. The Australian Ambassador, Mr Matthew Peek, visited the area and met Dr John Donaldson (University of Tasmania) and others who attended the Congress.

A follow-up visit to Questacon in Canberra led to it distributing ICE-EM career material, and potential exists for other display opportunities.

In September Professor Hung-Hsi Wu from the University of California, Berkeley, conducted teacher workshops at AMSI and in Sydney. He also presented at the annual meeting of the AustMS, RMIT University, Melbourne, where AMSI/ICE-EM sponsored a successful afternoon program and reception for teachers. The 2005 annual meeting will be in Perth in September where a similar program for teachers is being planned.

Other activities with a teacher focus included a visit from Dr John Mighton, author of *The Myth of Ability* and Dr Art Benjamin, a mathematician (see p. 14 ICE-EM report). Dr Mighton's program, hosted by the Fields Institute in Canada, has been very successful with under-achieving students and in classrooms.

On the policy front, I have been involved in a DEST-funded review of statistics education led by Professor Adrian Smith of King's College, London. The focus was on universities but other issues, especially relating to schools, were raised. AMSI hosted the review team during its Melbourne visit. The final report is expected in late 2005.

An ARC Review of the Mathematical Sciences is in progress and due to report in mid 2006. Combined with other reports being prepared, including one

on mathematics enrolments in Years 11 and 12 and another on Year 12 courses, a comprehensive picture of the state of the mathematical sciences should emerge next year.

Professor Gaudry and I have visited most Australian states and New Zealand. These visits, and member meetings are invaluable for keeping in touch with members and prospective members. Issues around schools mathematics are frequently raised and submissions to a number of reviews and inquiries made. In August 2005, AMSI/ICE-EM representatives will appear at the inquiry into teacher education by the House of Representatives Standing Committee on Education and Vocational Training.

On trips to Canberra, often with Professor Gaudry, I have met with politicians, political advisors and bureaucrats. The Federation of Australian Scientific and Technological Societies continues to advise me of their activities and is a useful conduit to up-to-date policy in the sciences.

My thanks to all members and staff at AMSI for their support during the year, and especially to Professor Garth Gaudry whose leadership of AMSI and ICE-EM has helped create a thriving enterprise of which we can all be proud.

Jan Thomas
Executive Officer

Report from the Director of MASCOS



Tony Guttman

On 25 June 2004 MASCOS was reviewed by ARC representatives. Feedback from the review was very positive, with the ARC advising us to keep on our current path. We will have a mid-cycle review in October 2005.

The 2004-05 year produced several highlights. In October 2004, I visited the Pacific Institute for the Mathematical Sciences (PIMS) in Vancouver, Fields Institute in Toronto and Berlin-based DFG Centre for Key Technologies (MATHEON), to determine how they bring about interactions with industry, and what lessons we can draw. Subsequently, we put a proposal for a network of Pacific Rim Mathematics Institutes and in October 2005, a workshop to further this will be held at the Banff International Research Station, Canada.

Following the signing of a cooperative agreement between MASCOS and MATHEON, the Director of MATHEON, Professor Martin Grötschel visited MASCOS, and was keynote speaker at two AMSI/MASCOS-sponsored breakfast seminars in February: *Optimisation: how industry can learn from the German and Australian experience*, held at the NSW Department of State and Regional Development and *Faster, Cheaper, Better*, held at Regional Development Victoria. A total of more than 100 participants attended from industry and government.

German Consul-General, Dr Günter Gruber hosted a reception for Professor Grötschel and attended the Sydney seminar with staff from Patrick Corporation, Coles Myer, BP Australia, Holden Innovation, Visy Industries and BHP Billiton.

As Professor Grötschel explained to his audiences, mathematics can be used whenever something needs to be formalised or quantified. It is not enough for industry to say it wants operations to be more efficient or more profitable. Rather, some aspect of operations need to be analysed and required measurable output agreed upon. Mathematics is particularly useful when complex systems arise.

Another successful AMSI/MASCOS activity was the workshop on *Decision Making for Complex Problems in Conservation*. With concern for protecting the environment at an all-time high, environmental scientists and natural resource managers invest considerable time and resources in collecting and analysing data to quantify ecological impact. The workshop examining these issues was held at AMSI on 27 February - 4 March 2005. Organised by Professor Mark Burgman (the University of Melbourne) and MASCOS Associate Investigator Professor Colin Thompson, it sought to identify problems which could be addressed by the new theory of Info-Gap Modelling, developed by Professor Yakov Ben-Haim of the Technion, Haifa, Israel. Professor Ben-Haim attended throughout and breakthroughs were made in several important problems in conservation. The success of the workshop is providing a model for further MASCOS and AMSI activities.

In March 2005, MASCOS held a Business Development Workshop at AMSI, to refine our focus on links with industry. This workshop sharpened our view of the most likely areas of mathematics applicable to solving industrial problems within the AMSI/MASCOS areas of interest.

AMSI/MASCOS will host a major industry forum in July, continuing a productive collaboration on industry and scientific programs.

Tony Guttman
Director

Report from the ICE-EM Director and Manager

ICE-EM has initiated a vibrant and exciting educational program in 2004-05 that is now a major part of AMSI.

With funding from DEST in mid-June 2004, AMSI made a number of staff appointments to establish ICE-EM. Dr Nancy Lane was appointed Manager in August 2004, and acted as Interim Director until Professor Garth Gaudry was appointed Director from 1 January 2005. Other staff appointments included Dr Michael Evans as Schools Project Manager, Ms Janine McIntosh as Schools Project Officer, Mr Richard Barker as Business and Marketing Manager, Mr Raoul Callaghan as IT Manager and Mr Cameron Mitchell as Multimedia Manager.

In its first full year of operation, ICE-EM undertook major programs targeting undergraduate, honours and postgraduate students.

One of ICE-EM's first activities was the Mathematics and Computational Biology Winter School held in July 2004. This was presented jointly with the Division of Genomics and Computational Biology of the Institute for Molecular Bioscience at the University of Queensland. The Winter School attracted more than 190 participants. International speakers included Dr Nicolas Smith (Bioengineering Institute at the University of Auckland, NZ) and Dr Michael Langston (University of Tennessee and the US Department of Energy's Oak Ridge National Laboratory). Topics covered complex biological systems, pattern analysis and data mining, computational modelling and visualisation of cells, computational complexity, and parallel computing and simulation.

Also in July, ICE-EM held a workshop for AMSI members at the ANU to discuss the AGR program. The purpose of AGRs is to enable cooperative teaching and research across universities here and overseas. ICE-EM announced grants of up to \$70,000 to develop AGRs and three universities were selected in the first round—the University of Wollongong, La Trobe University and the University of South Australia. A second round has been announced, with a closing date in August 2005.

In December, ICE-EM sponsored BioInfoSummer 2004: The ICE-EM Summer Symposium in Bioinformatics. This was a joint activity with the Centre for Bioinformatics at the ANU. The theme was 'Genome to Phenome Modelling'. International speakers included Dr Bill Pearson (University of Virginia, USA), Dr Romeo Rizzi (University of Turin, Italy), Professor Allen Rodrigo (Bioinformatics Institute, Auckland, NZ), Professor Terry Speed (University of California, Berkeley, USA) and Professor Ziheng Yang (University College London, UK). About 110 attended, and ICE-EM provided \$500 travel and accommodation scholarships for 28 students from AMSI member institutions.

The ICE-EM/AMSI Summer School was held mid-January to early February. Dr Markus Hegland was Director and the ANU Mathematical Sciences Institute managed the event. A total of 119 enrolled. Topics and speakers were:

- Four-week courses: *Measure Theory* - Dr Marty Ross; *Partial Differential Equations* - Professor Neil Trudinger, ANU and Dr Andrew Hassell, ANU; and *Machine Learning* - Dr Alex Smola, ANU, Dr SVN Vishwanathan, ANU, Dr Aapo Hyvarinen, Helsinki, and Dr Matthias Franz, Max-Planck Institute.
- First session two-week courses: *Commutative Algebra* - Dr Ruth Kantorovitz, University of Illinois/ANU; *Combinatorial Matrices* - Dr Ian Wanless, ANU; *Bootstrap Methods and Edgeworth Expansion* - Professor Peter Hall, ANU; *Fluid Mixing* - Dr Stephen Cox, University of Adelaide and Dr Jim Denier, University of Adelaide; and *Finite Volume Methods* - Professor Ian Turner, QUT.
- Second session two-week courses: *Algebraic Geometry* - Dr Paul Norbury, University of Melbourne; *Combinatorial Geometry* - Dr Ben Burton, RMIT; *Analysis of Survey Data* - Professor David Steel, University of Wollongong; *Stochastic Process Modelling* - Dr Daryl Daley, ANU; and *Nonlinear Optimisation Methods* - Associate Professor Rob Womersley, UNSW.

Other courses were available to students through collaboration with the Australian Partnership for Advanced Computing Summer School and the National ICT Australia's Machine Learning Summer School. Social events were held jointly among the three Summer Schools. CSIRO Mathematical and Information Sciences sponsored the closing dinner and a prize to attend the International Statistical Institute, awarded to Jessica Kasza from the University of Adelaide.

Preparations are in train for the 2006 ICE-EM/AMSI Summer School, to be held at RMIT University, Melbourne, from 16 January-10 February 2006. The Director will be Professor Kathy Horadam. The 2007 Summer School will be held at the University of Sydney from 15 January-9 February with Director Dr Ruibin Zhang.

Courses from the 2003 University of Melbourne Summer School (Knot Theory, Enumerative Combinatorics) and the 2004 University of NSW Summer School (Combinatorial Matrices and Graph Theory, Topics in Number Theory) are available on the ICE-EM website. Selected 2005 courses will be added as soon as they have been edited.

In 2004, ICE-EM summer Vacation Scholarships were awarded to 42 undergraduates at 15 AMSI member universities. These students completed research projects guided by university staff. Descriptions of

their projects can be found on the ICE-EM website. In 2005, summer Vacation Scholarship students are expected to participate in CSIRO's Big Day Out, with financial support from AMSI.

Planning is well under way for the inaugural ICE-EM Australian Graduate School in Mathematics, to be held from 4-22 July 2005. Director of the Graduate School is Professor Mark Gould, and the coordinator is Ms Helen Grey. Associate Professor Peter Adams, Dr Min-Chun Hong and Mr James Wood are members of the local organising committee.

International speakers invited to present courses include: *Algebraic structures* - Assistant Professor Stephen Bigelow, University of California, Santa Barbara, and Professor Mark Kisin, University of Chicago; *Dynamical systems* - Dr Jeroen Lamb, Imperial College, London, and Professor James Meiss, University of Colorado at Boulder; and *Stochastic processes* - Professor Robert Adler, Technion (Israel) and Professor Warren Ewens, University of Pennsylvania. Students will have the opportunity to present a talk about their own research. This will provide valuable professional development experience. About 60 students have been accepted for the Graduate School, including two from New Zealand and one from Hong Kong.

As well as promoting postgraduate education, ICE-EM also offered programs for mathematics teachers.

ICE-EM arranged for Professor Hung-Hsi Wu, Professor of Mathematics at the University of California, Berkeley, to give two workshops for middle years (5 to 8) teachers: a fractions workshop in Melbourne in September 2004 and a geometry workshop in Sydney in October 2004. The workshops concentrated on the mathematical content knowledge needed to teach at middle school level. ICE-EM provided funding for interstate teachers to attend.

Also in September, ICE-EM offered a special afternoon session for teachers at the Australian Mathematical Society Conference in Melbourne. Presentations were made by Dr Marcel Jackson, La Trobe University; Dr Danny Calegari, California Institute of Technology, USA; Dr Catherine Greenhill, University of New South Wales; and Professor Neil Sloane, Shannon Labs AT & T, USA. The calibre of speakers attracted many regular conference participants as well. ICE-EM provided travel support for teachers from regional areas.

This was followed several months later by very successful visits from Dr John Mighton and Dr Art Benjamin. Dr Mighton is an award-winning writer and mathematician from Canada who started a volunteer teaching program called JUMP - Junior Undiscovered Math Prodigies. In May 2005, he gave a public lecture at the University of Melbourne and

two fully-booked teacher professional development sessions with the Mathematical Association of Victoria.

Dr Benjamin is a professor of mathematics and a magician. In his dynamic Mathemagics shows, he demonstrated his secrets for performing mental calculations faster than a calculator. ICE-EM sponsored his keynote presentation at the Mathematics Association of South Australia annual conference in April with the University of South Australia, and nine public performances in June arranged through Monash University, La Trobe University and the University of Ballarat.

ICE-EM has begun projects to improve student learning in mathematics and encourage students to study mathematics to their highest ability to expand their career prospects.

The *ICE-EM Mathematics* program will comprise a series of student mathematics textbooks for Years 5 to 10, teacher professional development, multimedia and continuing teacher support. This program is being undertaken in conjunction with the Australian Mathematics Trust. The writing committee comprises Dr Michael Evans, Ms Janine McIntosh, Dr Bill Pender (Sydney Grammar School) and Mr Peter Brown (UNSW). The mathematics curriculum has been mapped for all states and territories, and selected resources from overseas have been reviewed.

A broad topic outline has been developed for the textbook series, and drafts of the first six chapters of the Secondary 1 and 2 books are nearing completion. The cover and layout have been designed. An Australia-wide campaign to launch the pilot project will be carried out in late July 2005, with about 100 schools expected to participate. The first round of teacher professional development will be held in late November to early December, in preparation for the 2006 school year.

The Teachers' Mathematical Content Knowledge project will outline content knowledge required by mathematics teachers at various year levels as a basis for in-service professional development, pre-service education and more clearly articulated content standards as various states review teacher registration requirements. Following an initial meeting held in Melbourne in October 2003, workshops were held in Brisbane in August and in Adelaide in November 2004. Each involved about 30 invited participants, consisting of mathematicians, mathematics educators and teachers.

The project is headed by Professor Peter Galbraith of the University of Queensland. Chairs of year-level groups are as follows:

- Early years – Dr Barbara Clarke (Monash University)
- Middle years – Dr Marj Horne (Australian Catholic

University) and Mr Graham Meiklejohn (Consultant, Queensland)

- Senior years – Dr Bill Pender (Sydney Grammar School)

Professor Galbraith has submitted a draft report, which will be circulated more widely for comment.

Ms Janine McIntosh undertook a survey of the mathematics that is taught in teacher education courses, as reported on Australian university websites. Survey results were included in a submission to the House of Representatives Standing Committee on Education and Vocational Training. The findings received extensive media coverage.

Mr Peter Brown (UNSW) and Dr Frank Barrington (University of Melbourne) are working on a comparison of pre-tertiary year 12 mathematics courses to provide data on the content of intermediate and advanced courses throughout Australia. They will also undertake a preliminary study of the assessments and examinations. In a related project, Helen Forgasz (Monash University) is tabulating and analysing enrolment statistics for Year 12 mathematics subjects across all states from 1990 to 2005.

The Maths and ... careers posters, the *Careers in Mathematics: The Possibilities Are Infinite* brochure and the *Maths Ad(d)s* careers booklet developed by La Trobe University were provided free to all AMSI member institutions. They have also been distributed at mathematics competitions, teacher conferences and public lectures, and at careers expos in Melbourne, Perth, Adelaide, Brisbane, Canberra and Sydney. The ICE-EM sponsored booths were staffed by AMSI member institutions and were so successful that bookings will be made again for 2006.

With CSIRO Mathematical and Information Sciences and the Australian Bureau of Statistics, ICE-EM is developing a website that will feature interviews with young mathematicians and statisticians about contemporary mathematics applications. The site will include video clips, audio clips, photos and text.

DVDs of six presentations from the 2003 International Congress in Industrial and Applied Mathematics were distributed to all AMSI members and to state and national mathematics teacher associations. They are also available for sale through the ICE-EM website.

ICE-EM has promoted its activities nationally and internationally. About 30,000 copies of the *ICE-EM Update* newsletter were distributed in October 2004 and April 2005, and two issues of an email news bulletin were sent to Australian expatriate mathematicians.

Ms Jan Thomas arranged for ICE-EM to share a booth at the 10th International Congress on

Mathematics Education, held in July 2004 in Copenhagen. ICE-EM publicity materials were handed out. In December, Professor Gaudry took part in the workshop *Numeracy and Beyond* at the Banff International Research Station in Canada and made a presentation about the work of ICE-EM. In April, Dr Lane made a presentation about ICE-EM at a reception for mathematicians and mathematics educators at the Australian embassy in Washington, DC. The event was organised through DEST.

ICE-EM staff met with DEST's Australian Education International counsellors in May to discuss opportunities for raising international awareness of ICE-EM's activities. Plans are underway to increase international marketing of ICE-EM and offer subsidies for international students to attend BioInfoSummer 2005, the 2006 Summer School and Graduate School. Promotional brochures and leaflets are also being produced. Professor Gaudry will visit the United States in October and Thailand in November 2005 to assess the potential for increased collaboration.

Garth Gaudry
Director

Nancy Lane
Manager



Committee Membership

Executive Committee

Professor Garth Gaudry (Director)
Professor John Hearne (Deputy Director)
Dr Nancy Lane (Manager, ICE-EM)
Associate Professor Geoff Prince (Executive Director)
Ms Jan Thomas (Executive Officer)

Education Advisory Committee

Professor Peter Taylor (Australian Mathematics Trust) (Chair)
Mr Bill Akhurst (Australian Mathematics Trust)
Dr Frank Barrington (University of Melbourne)
Mr Peter Brown (UNSW)
Ms Elizabeth Burns (Loreto Mandeville Hall)
Ms Teresa Dickinson (Australian Bureau of Statistics)
Professor Peter Galbraith (University of Queensland)
Dr Bill Pender (Sydney Grammar School)
Professor Cheryl Praeger (University of Western Australia)
Ms Jan Thomas (Australian Mathematical Society and AMSI)

Scientific Advisory Committee

Professor Peter Hall (Australian National University) (Chair)
Professor Garth Gaudry (Director, ex officio)
Professor Frances Kirwan (University of Oxford)
Professor Leon Simon (Stanford University)
Professor Terry Speed (University of California, Berkeley; Walter and Eliza Hall Institute)
Professor Terry Tao (University of California, Los Angeles, Clay Mathematics Institute)
Professor Neil Trudinger (ANU)

Industry Advisory Committee

Dr Robert Watts (Chair)
Professor Bill Appelbe (Victorian Partnership for Advanced Computing)
Dr James E. Lewis (Parkview Group)
Dr Tim Littlejohn (IBM/Biolateral)
Dr Thomas Montague (AMSI and MASCOS)

Program Committee for the 2005 ICE-EM/AMSI Summer School held at ANU

Dr Markus Hegland (Australian National University) (Chair)
Dr Ian Doust (UNSW)
Dr Gary Froyland (BHP Billiton, UNSW)
Professor Garth Gaudry (AMSI)

Dr Andrew Hassell (ANU)
Professor John Hearne (RMIT University)
Professor John Hutchinson (ANU)
Dr Andrew Mathas (University of Sydney)
Dr Steve Roberts (ANU)
Professor Ian Turner (Queensland University of Technology)
Professor Matt Wand (UNSW)

Program Committee for the 2006 ICE-EM/AMSI Summer School to be held at RMIT University

Professor Kathy Horadam (RMIT University) (Chair)
Professor Robert Bartnik (Monash University)
Professor Lou Cacetta (Curtin University of Technology)
Dr Andrew Hassell (ANU)
Professor John Hearne (RMIT University)
Dr Markus Hegland (ANU)
Dr Lynne McArthur (RMIT University)
Dr Paul Norbury (University of Melbourne)
Dr David Nott (UNSW)
Associate Professor Tim Pentilla (University of Western Australia)
Associate Professor Geoff Prince (AMSI)
Dr Catherine Seaton (La Trobe University)
Professor Rodney Wolff (Queensland University of Technology)
Dr Rui bin Zhang (University of Sydney)

Advanced Coursework Committee

Professor Neil Trudinger (Chair) (ANU)
Professor Michael Eastwood (University of Adelaide)
Professor Garth Gaudry (Director, ex officio)
Professor Mark Gould (University of Queensland)
Dr Markus Hegland (ANU)
Professor Kathy Horadam (RMIT University)
Professor Nalini Joshi (University of Sydney)
Professor Matt Wand (UNSW)

Human Resources

Salaried

Professor Garth Gaudry (Director of AMSI for the full year and Director of ICE-EM from 31 January 2005)
Associate Professor Geoff Prince (Executive Director) 0.2 from 1 July to 31 January 2005 and 0.6 from 2 February 2005
Dr Nancy Lane (Manager and Interim Director, ICE-EM) from 16 August 2004
Ms Jan Thomas (Executive Officer)
Mr Richard Barker (Business and Marketing Manager) 0.6 from 21 March 2005
Mr Raoul Callaghan (IT Manager) from 4 August 2004
Ms Edwena Dixon (Administrative Assistant)
Dr Michael Evans (Schools Project Manager) from 1 December 2004
Mr Graham Keen (Executive Assistant)
Ms Janine McIntosh (Schools Project Officer) from 31 January 2005
Mr Cameron Mitchell (Multimedia Manager) 0.4
Dr Thomas Montague (Industry/Marketing Manager)

Casual staff

Ms April Ellis from 14 to 24 June 2005
Mr Theo Hughes from 26 February 2005
Ms Alexandra Keay from 22 June 2005
Ms Angel Lam from 11 March 2005
Mr Duane Leslie from 5 March 2005
Ms Deborah Sheppard from 27 May 2005
Ms Karen Skepper from 13 December 2004 to 30 June 2005
Ms Georgina Wiles from 2 August to 10 September 2004

Consultants

Mr Richard Barker (Southbank Consulting Group)
Dr Frank Barrington (University of Melbourne)
Mr Peter Brown (UNSW)
Dr Helen Forgasz (Monash University)
Dr Bill Pender (Sydney Grammar School)

Media and Publicity

Ms Diana Wolfe (Wolfe Words)

AMSI/MASCOS Fellows

Professor Ian Enting (Professorial Fellow, The University of Melbourne)
Dr Iwan Jensen (Research Fellow, The University of Melbourne)
Dr Robert Parviainen (Research Fellow, The University

of Melbourne)
Dr John Roberts (Visiting Fellow, UNSW)
Dr Michael Stewart (Visiting Fellow, The University of Sydney)

Key Activities

The activities listed here complement and expand on those already noted.

BOARD AND COMMITTEE MEETINGS

Board meetings

1 September 2004 (AMSI)
3 December 2004 (teleconference)
27 January 2005 (teleconference)
10 February 2005 (ANU)
27 April 2005 (teleconference)
3 May 2005 (teleconference)
18 May 2005 (teleconference).

Table of Board attendances

James E. Lewis	6 of 7
Tim Littlejohn	6 of 7
Judith Downes	5 of 7
Hyam Rubinstein (to 31 December 2004)	2 of 2
Peter G. Taylor (from 1 January 2005)	1 of 5
Garth Gaudry	5 of 5
Geoff Prince (to 10 February 2005)	5 of 7
John Hearne (from 10 February 2005)	4 of 4
Don Taylor (to 10 February 2005)	4 of 4
Chris Radford (to 10 February 2005)	4 of 4
Tony Dooley (from 10 February 2005)	2 of 3
David Panton (from 10 February 2005)	3 of 3

Members meeting

10 February 2005 at the Australian National University
Previous meeting: 16 June 2004 at La Trobe University
Next meeting: 22 July 2005 at the University of Sydney

Education Advisory Committee meetings

The EAC met on 30 September 2004, 22 November 2004, 19 February 2005 and 30 April 2005.

Advanced Coursework Committee meetings

The ACC met on 6 August 2004 and 24 January 2005.

AMSI SCIENCE PROGRAM

Sponsored workshops

Winter School in Mathematics and Computational Biology
The University of Queensland, 5-9 July 2004

Polynomial-Based Cryptography
AMSI, 7-12 July 2004

Managing Fraud, Risk and Churn: Data Mining in the Real World
Price Waterhouse Coopers, Sydney, 13 August 2004

Key Activities

Stochastic Control, Communications and Numerics Perspective
University of South Australia, 29 September - 1 October 2004

12th Biennial Computational Techniques and Applications Conference (CTAC 2004)
The University of Melbourne, 30 September - 1 October 2004

Foundations and Methodologies of Mathematical Physics
Calypso Plaza, Coolangatta, 30 November - 1 December 2004

The International Conference on Optimization: Techniques and Applications 6 (ICOTA 6)
University of Ballarat, 9-11 December 2004

2004 World Conference on Natural Resource Modelling
RMIT University, 12-15 December 2004

Workshop on Asymptotics and Non-Parametrics (to mark the 65th birthday of Professor John Robinson)
The University of Sydney, 31 March - 1 April 2005

AMSI/MASCOS sponsored workshops

Short Course on Monte Carlo Methods in Finance
The University of Melbourne, 6-23 August 2004

Workshop on Integrable Systems, Rigorous Asymptotics and Applications
AMSI, August 22-23, 2004

Actuarial Models for Disability Financing
Grace Hotel Sydney, 22 November 2004

Modern Developments in Lie Theory, Quantum Theory and Statistical Mechanics
Calypso Plaza, Coolangatta, 2-4 December 2004

Australian Postgraduate Workshop on Stochastic Processes and Modelling
The University of Queensland, 7-11 February 2005

AMSI/MASCOS Workshop on Algebraic Dynamics
The University of New South Wales, 14-18 February 2005

Decision Making for Complex Problems in Conservation
AMSI, 27 February - 4 March 2005

INDUSTRY PROGRAM

AMSI/MASCOS and the German Research Centre for Mathematics of Key Technologies (MATHEON)

Director of MATHEON, Professor Martin Groetschel—guest speaker at:
Optimization: How Industry Can Learn from the German and Australian Experience

Sponsored by the NSW Department of State and Regional Development in Sydney, 8 February 2005
Faster, Cheaper, Better: International Case Studies In Supply Chain / Value Chain, Transportation and Logistics Optimisation

Sponsored by Regional Development Victoria in Melbourne, 15 February 2005

EDUCATION PROGRAM

Sponsored public lectures

Flexibility in a rigid world, Dr Marcel Jackson (La Trobe University), RMIT University, 29 September 2004

3-manifolds, tessellations and the million dollar question, Associate Professor Danny Calegari (California Institute of Technology), RMIT University, 29 September 2004

Proving results in Ramsey theory by flipping a coin, Dr Catherine Greenhill (UNSW), RMIT University, 29 September 2004

Key Activities

The grand tour in four dimensions and other mysteries, Professor Neil Sloane (Shannon Labs AT & T, USA), RMIT University, 29 September 2004

Epidemic modelling of SARS using Bayesian inference, Dr Emma McBryde (Queensland University of Technology), AMSI, 22 March 2005

Nurturing mathematical talent in every child, Dr John Mighton, The University of Melbourne, 23 May 2005
Mathemagic: Dr. Art Benjamin, University of South Australia, 29 April 2005, La Trobe University, University of Ballarat and Monash University, 22-24 June 2005, with over 2,000 people attending

ICE-EM teacher events

Workshop for teachers of the middle years: *Mathematical knowledge for teaching fractions*, Professor Hung-Hsi Wu, Melbourne, 20-24 September 2004

Workshop for teachers of the middle years: *Mathematical knowledge for teaching geometry*, Professor Hung-Hsi Wu, Sydney, 5-8 October 2004

Teachers Day at the annual conference of the Australian Mathematical Society, RMIT University, Melbourne, 29 September 2004

Workshops on mathematical content required to teach mathematics, Brisbane on 29 August 2004, Adelaide on 21 November 2004

Two teacher workshops on the JUMP program, Dr John Mighton, Mathematical Association of Victoria, Melbourne, 23 May 2005

Schools Materials workshop, Sydney, 1 August 2004

Tertiary summer schools

BioInfoSummer 2004: ICE-EM Summer School in Bioinformatics
Australian National University, Canberra, 6-10 December 2004

ICE-EM/AMSI Summer School in Mathematics
Australian National University, Canberra, 10 January - 4 February 2005

Careers

Hosted mathematical sciences careers booths at careers expos in

- Melbourne, 11-13 March 2005
- Perth, 29-30 April 2005
- Adelaide, 6-7 May 2005
- Brisbane, 13-15 May 2005
- Canberra, 20-21 May 2005
- Sydney, 17-18 June 2005

Presentations at mathematical events

Mathematics Association of Victoria Conference, Melbourne, 2-3 December 2004. Presentation by Ms Jan Thomas, Dr Michael Evans and Dr Nancy Lane.

Workshop *Numeracy and beyond*, Banff International Research Station, Canada, 6-8 December 2004. Presentations by Professor Garth Gaudry.

Workshop of the Australian Society of Operations Research, 7 December 2004. Presentation by Associate Professor Geoff Prince.

Key Activities

Australian Association of Mathematics Teachers Conference, Melbourne, 17-20 January 2005. Presentations by Dr Nancy Lane, Ms Jan Thomas and Dr Michael Evans.

Heads of Mathematics Faculties of Private Schools, Geelong, 24 February 2005. Presentation by Dr Michael Evans.

VCE Teachers Day, Monash University, 25 February 2005. Presentations by Dr Michael Evans.

National Science Foundation East Asia and Pacific Summer Institute, Washington DC, 5-6 April 2005. Presentations by Dr Nancy Lane.

An Introduction to ICE-EM for mathematicians and mathematics educators invited by the Department of Education, Science and Training, Australian Embassy, Washington DC, 6 April 2005. Presentation by Dr Nancy Lane.

Mathematical Association of South Australia Annual Conference, Adelaide, 28-29 April 2005. Presentations by Dr Michael Evans and Ms Janine McIntosh.

Mathematical Association of Victoria Regional Conference, Wodonga, 13 May 2005. Presentation by Dr Michael Evans.

Newcastle Mathematics Association, Newcastle, 16 June 2005. Presentation by Dr Michael Evans and Ms Janine McIntosh.

Professional development day for 200 teachers, MLC, Melbourne, 20 June 2005. Presentation by Dr Michael Evans.

Professional development day for 200 teachers, Moorabbin, Victoria, 22 June 2005. Presentation by Dr Michael Evans.

Board of the Australian Mathematics Trust, University of New South Wales, 28 June 2005. Presentation by Associate Professor Geoff Prince.

VISITORS TO AMSI

Extended period

Dr Simon Clarke, Monash University
Professor Richard Huggins, Australian National University
Dr Emma McBryde, Queensland University of Technology
Professor Willy Sarlet, University of Ghent, Belgium
Dr John Schutz, La Trobe University
Dr Andrew Stacey, RMIT University
Professor Hung-Hsi Wu, University of California, Berkeley

Short term visitors

Dr Neville Bartlett (President, Statistical Society of Australia Inc.)
Dr Arthur Benjamin (Harvey Mudd College, California)
Mr Jonathan Bloom (Harvard University)
Ms Margaret Brett (Senior Science Policy Analyst, Department of Primary Industries)
Mrs Pat and Mr Alan Dean (University of Mary Washington)
Mr Tony Fernando (Branch Manager, Market Development Branch, Australian Education International)
Professor David Finlay (President, Australian Council of Deans of Science)
Professor Arvind Gupta (Executive Director, MITACS, Canada)
Dr Mark Hodge (Chief Executive Officer, Australian Aerospace and Defence Innovations Ltd.)
Professor Ian James (Murdoch University; Statistics Review panel)
Dr Richard Jarrett (Leader, Reliability and Asset Management, CSIRO)
Professor Frances Kirwan (President, London Mathematical Society, University of Oxford)
Dr Edwin van Leeuwen (BHP Billiton)
Dr John Mighton (JUMP Program, Fields Institute, Toronto)
Mr Ian Mitchell (Scientific Development Manager, Cadbury Schweppes Pty. Ltd.)

Key Activities

Mr Geoff Price (Managing Director, Geopex Ltd)
 Professor Ivan Reilly (University of Auckland)
 Professor Adrian Smith (University of London; Statistics Review panel)
 Mr Greg Taylor (Chairman, Board of the Australian Mathematics Trust)
 Professor David Vere-Jones (Victoria University of Wellington; Statistics Review panel)
 Professor Graeme Wake (Director, Mathematics in Industry Study Group)

MEETINGS HOSTED BY AMSI

Monthly committee meetings and public lectures of the Victorian chapter of the Australian Society for Operations Research

AGM of the Australian Mathematical Sciences Council, 15 August 2004

Victorian branch of Australian and New Zealand Industrial and Applied Mathematics, 20 July 2004

Meetings of the Mathematics Challenge for Young Australians Problems Committee

Hearings of the Review of Statistics in Australia, 21-22 February 2005

AMSI MEETS GOVERNMENT

Science meets Parliament, Canberra, 8-9 March 2005. Involvement by Garth Gaudry and Jan Thomas.

ICE-EM and AMSI have made representations to federal and state parliamentary education enquiries.

Parliament of Victoria Education and Training Committee's Inquiry into Suitability of Current Pre-Service Teaching Training Courses. AMSI and ICE-EM provided a submission to this inquiry on 28 April 2004. Dr Nancy Lane, Associate Professor Geoff Prince and Ms Jan Thomas presented evidence to this committee on 15 November 2004.

Parliament of Victoria Education and Training Committee's Inquiry into the Promotion of Mathematics and Science Education. Ms Jan Thomas made a written submission to this inquiry in mid-December 2004. Dr Nancy Lane, Dr Michael Evans and Ms Janine McIntosh presented evidence to this committee on 18 April 2005.

Commonwealth House of Representatives Standing Committee on Education and Vocational Training's Inquiry into Teacher Education. ICE-EM and AMSI staff prepared a major submission to this inquiry. The submission is available on the web at www.aph.gov.au/house/committee/evt/teachereduc/subs.htm (submission number 58). Professor Garth Gaudry, Ms Jan Thomas and Ms Janine McIntosh will be presenting evidence in August 2005.

Financial Statements

Australian Mathematical Sciences Institute Statement of Financial Performance

	July 2004 to June 2005	
	\$	\$
Income		
State of Victoria - STI Grant	250,000	
Consortium member contributions	580,000	
Commercial income	3,782	
Collaboration partner (MASCOS) contributions: -		
2004 distribution (July 04)	466,409	
2005 distribution (Jan 05)	<u>504,177</u>	
		1,804,368
Total Income		
Expenditure		
Personnel		
Salaries	636,666	
Salary credit from ICE-EM re 03/04 year	-87,935	
Internal- University of Melbourne (Maths & Stats admin.)	16,318	
Salary- non University (Fellowships)	16,600	
PhD scholarships	<u>20,000</u>	
		601,649
Materials, Supplies and Services		
Salary support		
Australian Mathematical Society	-4,359	
CSIRO	-73,858	
Supplies		
Consumable materials & provisions	11,320	
Services		
Contracted or professional services	95,836	
Internal services - University of Melbourne	15,252	
Utilities	6,459	
General expenses		
Printing/photocopying/subscriptions	22,640	
Minor works - re security	3,538	
Public relations & promotion		
Domestic advertising & promotion	18,963	
Entertainment		
Domestic advertising & promotion	11,387	
Collaboration partner contribution - MASCOS		
2004 contribution	100,000	
2005 contribution	100,000	
Finance - FBT and payroll tax	<u>3,822</u>	
		311,000
Equipment		
Computer software & services	9,665	
Expensed assets	16,663	
Hire of equipment	127	
Minor equipment components	<u>2,481</u>	
		28,936
Travel & conferences		
Travel & accommodation-domestic	70,660	
Travel & accommodation-I' national	35,792	
Conducting/attending seminars, conferences, workshops	63,315	
Living away from home	<u>22,956</u>	
		192,723
		1,134,308
Total Expenditure		
		670,060
Net of actual income over expenditure		<u>670,060</u>
Expenditure by Program		
	AMSI	AMSI/MASCOS
Personnel		
Staff	150,680	112,058
Research fellows, less sponsor salary support		228,453
Scholarships		36,600
	150,680	377,111
Administration		
	235,161	91,035
Advisory committee projects		
	80,321	
Partner contribution - MASCOS (for 04 and 05)		
	200,000	
	<u>666,162</u>	<u>468,146</u>
		<u>1,134,308</u>

Financial Statements

Australian Mathematical Sciences Institute Statement of Financial Position

		As at 30th June 2005	
		\$	\$
Assets			
Cash	AMSI	889,677	
	AMSI/MASCOS Ref. general note (c)	871,589	
			1,761,266
Property, plant and equipment			
	Capitalised expenditure (Note 1)		0
Total Assets		<u>1,761,266</u>	
Liabilities			
	Provisions for employee entitlements (Note 2)		0
Equity			
	Retained funds brought forward		
	AMSI	722,057	
	AMSI/MASCOS	369,149	
			1,091,206
	Profit/(Loss) for the year		
	AMSI	167,620	
	AMSI/MASCOS	502,440	
			670,060
Total liabilities and equity		<u>1,761,266</u>	

Note 1 The requirement of the University of Melbourne is that Departments treat all assets as having been fully expensed in the period of purchase.

Note 2 Employee entitlement monies are deducted from AMSI funds by the University of Melbourne on an accrual basis.

General note to the accounts

- (a) The financial accounts and payroll records are maintained for AMSI by the University of Melbourne in its role as lead agency for the JV consortium. Expenditure authorisations and income/expense allocations are the responsibility of AMSI personnel using UoM policies and procedures.
- (b) AMSI directors, the chairman and members of the Board plus members of advisory committees are reimbursed for travel related costs incurred in attending meetings. No other payments are made to Board or committee members.
- (c) As a party to the Collaboration Agreement that obtained an ARC Centre of Excellence Grant to establish MASCOS, AMSI makes an annual contribution of \$100,000 to MASCOS and in turn receives an annual allocation from MASCOS (2005 \$504,177). Use of these monies for research and industry linkage activities is administered by an advisory committee consisting of the Director of AMSI, the Director of MASCOS and Professor Ian Sloan of the University of New South Wales, a member of the MASCOS executive. Separate financial records pertaining to the annual allocation from MASCOS are maintained within AMSI under the heading AMSI/MASCOS.

Financial Statements

International Centre of Excellence for Education in Mathematics Statement of Financial Performance

		July 2004 to June 2005	
		\$	\$
		Income	
	Department of Education, Science and Training		3,000,000
Course Fees & Charges:			
	BioInfoSummer 2004		11,955
	Summer school 2005 (Jan/Feb)		4,014
Sponsorships:			
	BioInfoSummer 2004		454
	Summer school 2005		12,181
	Contemporary maths. applications		16,200
Other Income			
	Sale of materials		1,308
	Event registrations		2,400
	Expense recovery		470
			<u>48,982</u>
Total Non Grant Income		48,982	
Total Income		<u>3,048,982</u>	
Expenditure			
Personnel			
	Salaries		495,764
	From AMSI re 03/04 year		87,935
	Under Graduate vacation scholarships		69,300
			<u>652,999</u>
Materials, Supplies and Services			
Salary support			
	Australian Mathematical Society		-10,170
Supplies			
	Consumable materials		4,661
Services			
	Contracted or professional services		37,864
	Internal services		21,552
	Utilities		1,134
General expenses			
	Printing, copying, subscriptions		31,359
Public relations & promotion			
	Domestic marketing & promotion		45,918
Entertainment			
	Finance - FBT and payroll tax etc		1,639
			<u>139,653</u>
Equipment			
	Computer software & services		4,027
	Expensed assets		46,039
	Minor equipment components		106
			<u>50,172</u>
Travel & conference			
	Travel & accommodation-domestic		72,810
	Travel & accommodation-' national		7,959
	Conducting/attending seminars, conferences, workshops		199,929
	[Includes cost of 2005 Summer School \$181,818]		10,670
	Living away from home allowance		10,670
			<u>291,368</u>
Total Expenditure		<u>1,134,192</u>	
Net of actual income over expenditure		<u>1,914,790</u>	
Expenditure by Program		\$	
Higher Education		286,193	
	(Summer School, Access Grid Rooms, student access to researchers)		
	Schools		90,878
	(Teacher PD, promotion of careers in mathematics, schools materials for students and teachers).		
Research, business & industry		32,527	
	(Advanced specialist courses)		
Internationalisation of the mathematical sciences		9,863	
	(Marketing and promotion)		
Personnel		583,699	
	(Note: student vacation scholarships included in Higher Education above)		
Administration		131,032	
		<u>1,134,192</u>	

Financial Statements

International Centre of Excellence for Education in Mathematics Statement of Financial Position

As at 30th June 2005	
\$	
Assets	
Cash	3,349,105
Property, plant and equipment Capitalised expenditure (Note 1)	0
Total Assets	<u>3,349,105</u>
Liabilities	
Provisions for employee entitlements (Note 2)	0
Equity	
Retained funds brought forward	1,434,315
Profit/(Loss) for the year	1,914,790
Total liabilities and equity	<u>3,349,105</u>

- Note 1 The requirement of the University of Melbourne is that Departments treat all assets as having been fully expensed in the period of purchase.
- Note 2 Employee entitlement monies are deducted from AMSI funds by the University of Melbourne on an accrual basis.

General note to the accounts


The financial accounts and payroll records are maintained for ICE-EM by the University of Melbourne in its role as lead agency for the JV consortium. Expenditure authorisations and income/expense allocations are the responsibility of ICE-EM personnel using UoM policies and procedures.

Audit Statements

File Ref: 5501170
J1/gras19
RN: 2005062
Auds.

26 August 2005

The Minister for Innovation
Department of Innovation, Industry and Regional Development
13th Floor, 55 Collins Street
Melbourne 3000


THE UNIVERSITY OF
MELBOURNE

AUSTRALIAN MATHEMATICAL SCIENCES INSTITUTE

The audit opinion is prepared for the purpose of the Grant Agreement dated 2 November 2002 ("the Agreement") between the Minister for Innovation and The University of Melbourne.

AUDIT SCOPE

We have conducted an independent audit in accordance with Australian Auditing Standards of the attached Financial Statement of Income and Expenditure for the period 1 July 2004 to 30 June 2005 which specifies an amount of \$1,134,307.82 of expenditure on the Program, and an amount of \$580,000 of contributions by Consortium Members towards the Program ("Member Contributions"), in order to express an opinion on it for the purposes of the Agreement.

Our audit involved an examination, on a test basis, of evidence supporting the amount of expenditure incurred, including all Grant funds, and the amount of income and contributions received. This included an examination of Melbourne University's financial records and receipts, and an evaluation of the policies and procedures used to calculate the expenditure of the Program and Member Contributions. These procedures have been undertaken to form an opinion as to whether the methodology used to calculate the expenditure and Member Contributions is in accordance with the Agreement, and that the figures stated are true and fair.

This audit opinion expressed in this report has been formed on the above basis.


AUDIT OPINION

We confirm that in our opinion:

- Melbourne University has incurred \$1,134,307.82 in expenditure on the Program;
- the contributions of Consortium Members to the Program are \$580,000 cash (see attached schedule);

in accordance with the terms of the Agreement.

I trust this information is of assistance to you and advise that any queries can be directed to me on (03) 8344-0846.

Yours sincerely,

PJ McGrath
Director, Internal Audit

Internal Audit Office
The University of Melbourne Victoria 3010 Australia
Telephone: +61 3 8344 0844 Fax: +61 3 8344 0847
Email: internalaudit-queries@unimelb.edu.au


THE UNIVERSITY OF
MELBOURNE

**Financial Statement of Income and Expenditure
for the Period 01/07/2004 - 30/06/2005**

Project Title: STI Infrastructure Grant to Establish the Australian Mathematical Sciences Institute

Grantor: State of Victoria - Department of Innovation, Industry and Regional Development

Chief Investigator: Professor Garth Gaudy

Our Reference: 79949

\$

INCOME	
State of Victoria - Department of Innovation, Industry and Regional Development	250,000.00
Consortium Member Contributions	580,000.00
Collaboration Partner (MASCOS) Contribution	970,286.50
Commercial Enterprise Income	666.16
Other Income	3,115.64
Total Income for the reporting period	<u>1,804,368.30</u>
EXPENDITURE	
Personnel	601,649.39
Materials, Supplies & Services	311,000.05
Equipment	28,935.53
Training	-
Travel	192,722.83
Total Expenditure for the reporting period	<u>1,134,307.82</u>
Surplus/(Deficit) for the reporting period	<u>670,060.48</u>
Carryforward Surplus/(Deficit) from 30 June 2004 previously reported	<u>722,057.60</u>
Prior Period Adjustment - Note 1	<u>389,148.72</u>
Adjusted Carryforward Surplus/(Deficit) from 30 June 2004	<u>1,091,206.32</u>
Surplus/(Deficit) Balance as at 30 June 2005	<u>1,761,266.80</u>

Notes:
Note 1: Adjustment to the carryforward surplus resulting from the inclusion of \$426,665.00 income and \$37,516.28 expenditure comprising \$37,226.28 in Personnel expenditure and \$290.00 in Materials, Supplies and Services relating to the Centre of Excellence (MASCOS) that was not reported in the June 2004 statement.

I certify that:
a) all funds received have been expended for the purposes for which they are provided; and
b) the expenditure shown above has taken place and is correct.


Françoise Larkin
Deputy Director, Department of Financial Operations

26/8/05
Date

Department of Financial Operations
5th Floor Raymond Priestley Building
The University of Melbourne Victoria 3010 Australia
Telephone: +61 3 8344 4245 Fax: +61 3 9347 7463

File Ref: 5501170
J1/gras19
RN: 2005062
Auds.

8 August 2005

Ms Fiona Buffinton
Chief Executive Officer
Australian Education International
Department of Education, Science and Training
GPO Box 9880
CANBERRA ACT 2601


THE UNIVERSITY OF
MELBOURNE

Dear Fiona,

Establishment of an International Centre of Excellence for Education in Mathematics

I advise that an audit has been conducted of the financial statement for the Establishment of an International Centre of Excellence for Education in Mathematics Project for the period 1 July 2004 to 30 June 2005.

Please find enclosed the financial statement certified by the Deputy Vice-Chancellor (Research) and the Director, Internal Audit in accordance with clauses 12.6 and 12.7 of the agreement between the Department of Education, Science and Training and the University of Melbourne.

Clause 12.6(i) of the agreement requires a statement of the balance of the bank account referred to in clause 4.1. In this regard, the University does not operate separate bank accounts for individual grants, but utilises its main bank account for the purpose of depositing and expending grant funds. The University's General Ledger structure enables the income and expenditure for each grant to be identified separately.

If there are any queries regarding this statement please contact me on (03) 8344-0846 or Fax: (03) 8344 0847.

Yours sincerely,

PJ McGrath
Director, Internal Audit

cc: Professor G Gaudy
Director - ICEEM

Internal Audit Office
The University of Melbourne Victoria 3010 Australia
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Email: internalaudit-queries@unimelb.edu.au


THE UNIVERSITY OF
MELBOURNE

**Financial Statement of Income and Expenditure
for the Period 01/07/2004 - 30/06/2005**

Project Title: Establishment of an International Centre of Excellence for Education in Mathematics

Grantor: Australian Government
Department of Education, Science and Training

Chief Investigator: Professor Garth Gaudy

Our Reference: 79663

\$

INCOME	
Department of Education, Science and Training	3,000,000.00
Course Fees and Charges	15,968.19
Sponsorships	28,835.42
Fees and Services	2,400.00
Commercial Enterprise Income	1,402.50
Housing & Accommodation Services	376.00
Total Income for the reporting period	<u>3,048,982.11</u>
EXPENDITURE	
Personnel	652,998.38
Supplies & Services	139,653.32
Equipment	50,171.84
Training	-
Travel	291,268.27
Total Expenditure for the reporting period	<u>1,134,191.81</u>
Surplus/(Deficit) for the reporting period	<u>1,914,790.30</u>
Carryforward Surplus/(Deficit) from previous period	<u>1,434,315.14</u>
Surplus/(Deficit) Balance as at 30 June 2005	<u>3,349,105.44</u>

We certify that:
- the Financial Statement of Income and Expenditure presents fairly the expenditure for the International Centre of Excellence for Education in Mathematics project; and
- the Funding was expended for the Project and in accordance with the agreement.


PJ McGrath
Director, Internal Audit
05-August-2005


PJ McGrath
Director, Internal Audit
05-August-2005





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