



CIAO Newsletter

Centre for Informatics & Applied Optimization

School of Information Technology & Mathematical Sciences

Edition 14 – September 2006

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From the Editors

It is with great sadness that we report the passing of Professor Alex Rubinov, the Founding Director of CIAO.

Alex died on 9 September 2006 in Ballarat, surrounded by his family, following an illness diagnosed in January 2006.

News

Prof Alex Rubinov: A Celebration of His Life



Alexander Moiseevich Rubinov graduated from Leningrad State University in June 1962, and some months later returned to commence PhD research.

His supervisor was Professor Gleb Akilov. Alex Rubinov's 'scientific grandfather', and the supervisor of Akilov, was Leonid Kantorovich, a highly respected Soviet mathematician and economist who won the Nobel Prize in 1968.

Kantorovich was one of the founders of the Scientific Research Centre in Siberia, established towards the end of the 1950s near Novosibirsk.

He invited his former PhD student Akilov to work in his department, at the Research Institute of Mathematics at this Centre, and as a result Alex Rubinov moved there with Akilov.

Kantorovich's department comprised a group of young energetic and enthusiastic researchers, as well as a few experienced researchers.

In 1970 Kantorovich left this centre, and Alex left six months later, having spent a total of seven years in Siberia.

Three main topics were focussed on in the mathematical section of this department: optimization, mathematical economics and convexity. All three topics became the main direction of Alex's subsequent research.

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During his time in Siberia, Alex obtained excellent results in these areas, and prepared the following three monographs:

1. On optimization, with V.F. Demyanov, published in 1968 and translated into English in 1970.
2. On mathematical economics, with V.L. Makarov, published in 1973 and translated into English in 1977.
3. On abstract convexity, with S.S. Kutateladze, published in 1976. It took six years to publish the manuscript, which was written in 1970.

Alex was also actively engaged in the area of mathematical education. Many thousands of copies of the book "Calculus for School Teachers" by A. Rubinov and K. Shapiev were published in 1972.

Alex published seventeen scholarly books, twelve edited books and journal issues, and more than 200 refereed research papers during his lifetime.

During the past ten years at the University of Ballarat, Alex was successful in obtaining seven Australian Research Council Grants, as well as several other national competitive grants and research contracts.

He continued to work in optimization and convexity, founded the new area of monotonic analysis, and initiated new optimization approaches to data mining.

Alex supervised more than twenty research students at the University of Ballarat, and was an outstanding example and mentor to staff in CIAO and the School of ITMS.

As Director of CIAO, Alex built CIAO into an internationally recognised research centre in optimization.

Over the past five years, CIAO's research output, as measured by its own research metric, has increased almost nine fold. CIAO's annual commercial income has totalled approximately A\$2m, and its annual grant income approximately A\$500,000.

Shortly before his death, Alex was appointed Europt Fellow 2006, by the Association of European Operational Research Societies.

Along with these remarkable scholarly achievements, Alex is also recognised for his human qualities and his ability to relate well, not only to his colleagues and students, but also to industry partners and clients.

We will miss Alex enormously, both professionally and personally.

We extend our heartfelt sympathy to his wife Dr Zari Dzalilov, and his sons Eldar and Mikail.



ARC Linkage Success

We are delighted that CIAO has been successful in obtaining an ARC Linkage Grant valued at \$156,000.

The industry partner for this project is Kann Finch Architectural, and the topic is "Development of Global Optimization Techniques for the Office Design Problem"

This project deals with the efficient designing/planning of office space.

This means that all given workpoints (offices, desks and meeting rooms) can be efficiently accommodated within a given floor area.

The floor area is assumed to be two-dimensional with "hard" boundaries, and may contain columns and other structural elements (areas of discontinuity).

The main problem is to determine/evaluate the efficiency of the floor space for a given occupant. This problem involves the study of the optimal planning/placement of workpoints.

Grant Applicants: Prof A Rubinov, Dr M Mammadov.



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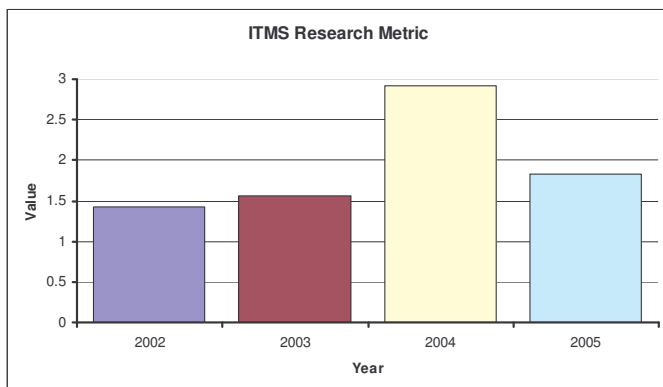
Research Performance – CIAO

CIAO continues to perform extremely well, producing high quality research over a range of research spheres, to the credit of all staff and students involved.

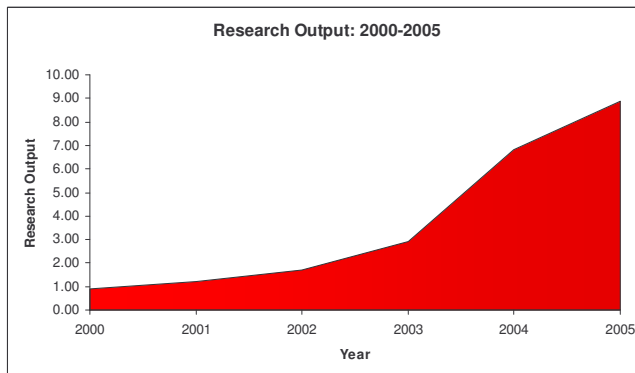
A Research Metric was devised several years ago, which we use as a tool for measuring progress in any given year. The metric includes:

- The number of research publications accepted for the annual research audit, undertaken to comply with the requirements of the Commonwealth Department of Education Science and Training (DEST). This includes books, book chapters, and peer reviewed journal publications and conference papers.
- Refereed journal publications and conference papers, edited books, and book chapters that have been accepted for publication.
- Conference and keynote presentations.
- Success in obtaining national competitive grants, Australian Research Council grants, University of Ballarat grants, and commercial consultancies, in number and dollar terms.
- Involvement with editorial boards and as Managing Editor of international journals.
- Involvement with organising non-UB conferences.
- Enrolment of and completions by research degree students.
- Presentation of lectures at other universities.

These values are calculated and collated, with the resulting metric value for the past four calendar years being:



For the period 2000-2005, overall research output for CIAO and the School of ITMS has increased nine-fold:



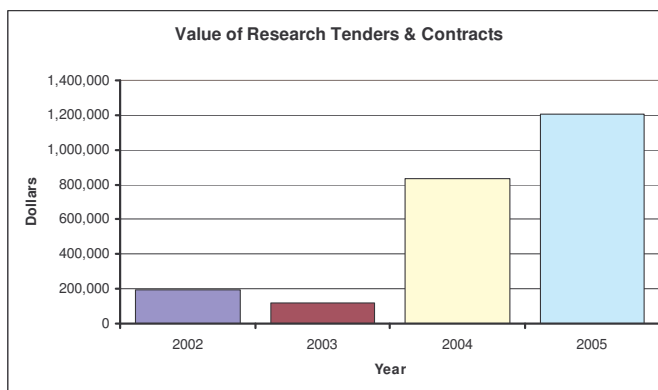
Success in obtaining funding for research through tenders and contracts has also increased steadily each year, over the past four years. Figures are:

2005: \$1,204,445

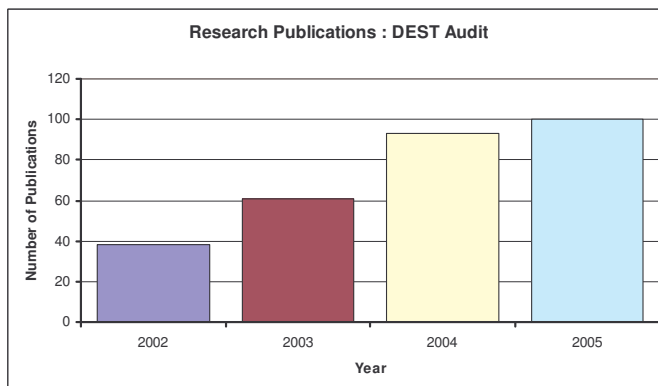
2004: \$837,914

2003: \$122,150

2002: \$194,750



The annual Department of Education Science & Training (DEST) Audit also produced a record result for CIAO, with our peer-reviewed publications breaking the 100 hundred barrier.



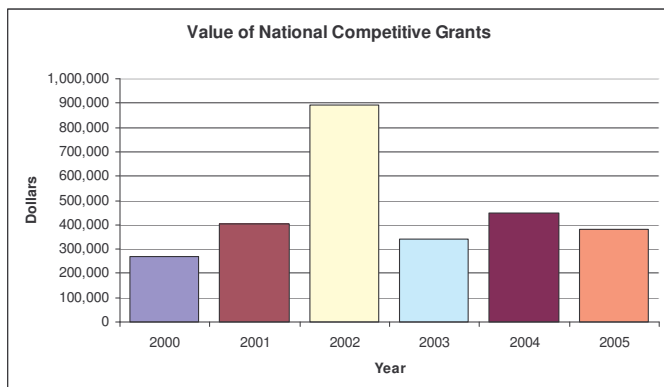
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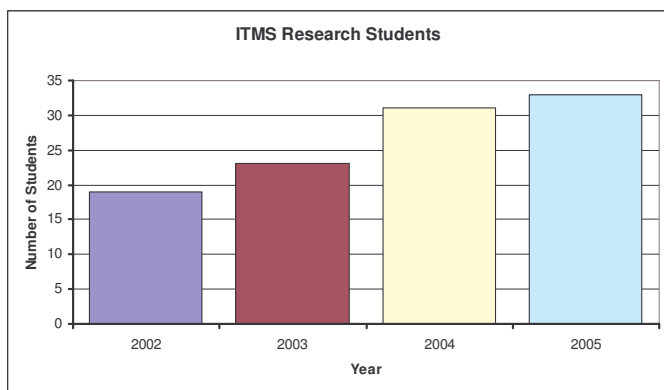
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We have also experienced consistent success with National Competitive Grants, despite the highly competitive climate.



CIAO continues to benefit from an increasing level of post-graduate research students, and the work they carry out within the School of ITMS.



News from:

CIAO Research Groups

Combinatorics, Graphs & Network Topology (CGANT)

CGANT members participated in this recent conference:

AWOCA 2006 Conference

The Seventeenth Conference of the Australasian Workshop on Combinatorial Algorithms, was held at Uluru (also known as Ayers Rock) in the Northern Territory, on 13-19 July 2006.

AWOCA 2006 followed the 31st ACCMCC meeting at Alice Springs, Northern Territory.

AWOCA 2006 was jointly hosted by CIAO, the School of ITMS at the University of Ballarat, and the School of Engineering and Logistics at Charles Darwin University.

Invited Speakers for AWOCA 2006 were:

- Amihood Amir, Bar-Ilan University, Israel
- Pino Caballero, University of La Laguna, Spain
- Charlie Colbourn, Arizona State University, USA
- Derek Corneil, University of Toronto, Canada
- Diane Donovan, University of Queensland, Australia
- Martin Grüttmüller, Universität Rostock, Germany
- Seokhee Hong, NICTA, University of Sydney, Australia
- Kunsoo Park, Seoul National University, Korea

The Program Committee included Dr Prabhu Manyem, Dr Joe Ryan and Professor Mirka Miller from ITMS. The Co-Chair with Professor Bill Smyth, McMaster University.

Authors of selected papers are being invited to send a submission to a Special Issue of *Fundamenta Informatica*. This will be edited by Professors Costas Iliopoulos from Kings College, Prof Mirka Miller and Prof Bill Smyth.

Data Mining & Informatics Research Group (DMIRG)

Datascreen

A new company, Datascreen, has been set up to commercialize the techniques and software developed from the ARC Linkage Grant on "Data mining the ADRAC database of adverse drug reactions".

There are two main products for commercialization:

1. An optimization-based tool for determining the reactions associated with sets of drugs.
2. A signal detection tool based on the ATC drug ontology and association rules, for signalling potential reactions to drugs and sets of drugs.

Other News

Dr Musa Mammadov was invited to present his work on data mining relationships between drugs and reactions in Montreal, Canada at the recent Workshop on Data Mining and Mathematical Programming.

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Associate Professor John Yearwood, Dr Musa Mammadov, Dr Peter Vamplew, Dr Liping Ma and research students Sol Hart, Arun Banerjee and Dean Webb have started to look at text clustering techniques for identifying and profiling groups in email data.

The final report to Woodside Energy on hybrid optimization algorithms, for optimising the production of Liquid Natural Gas, has been prepared and submitted. Dr Adil Bagirov and Associate Professor John Yearwood intend to meet with Woodside to explore further opportunities for research.

Decision Support

The joint study with Ballarat Health Services and the School of Nursing, on the effect of computer representations of knowledge on student learning, has been completed.

A web-based narrative based on an interactive learning environment, developed by Dr Andrew Stranieri and Associate Professor John Yearwood (based on work from an ARC Discovery Grant on Narrative and Argumentation Structures), was tested as a learning environment with third year students from the School of Nursing.

This was conducted alongside conventional case study approaches and graphical computer graphical approaches.

The group using the interactive narrative tool showed a significant improvement over the conventional learning approach.

The work has been submitted to "Artificial Intelligence and Education". Associate Professor Cecil Deans, Ms Sue Garner and Ms Sue Gervasoni will also submit the work to appropriate Nursing Journals.

Masters Student

Masters student Subhasis Mukherjee has started work on reinforcement learning, with a view to using this approach in tackling some robo-cup soccer problems using the AIBO robots.

DMIRG seminars for 2006

DMIRG has been holding regular meetings during 2006, during which the following presentations have been made:

- Associate Professor John Yearwood: Health Projects.
- Dr Rana Ghosh: CI Projects.
- Dr Andrew Stranieri: Intelligent Decision Support for E-Governance.
- Dr Peter Vamplew: Reinforcement Learning.
- Mr Bahadorreza Ofoghi: FFrameNet.

Distributed Simulation Laboratory (DSL)

DSL at SimTecT 2006 Conference

The annual conference of the Simulation Industry Association of Australia (SIAA) took place in Melbourne in May 2006. The DSL is a full member of the SIAA, and shared a large booth with collaborator Permian Pty Ltd.

The centre-piece of the booth presentation was the ADF Project, and a running display of crewmember modelling attracted much attention.

Sina Pezeshk has completed his coursework Masters with some exciting project work linking JACK software, through High Level Architecture, to a Java federate. Sina's work was also on display at the conference.



Mathematical & Statistical Analysis Research Group (MASARG)

Research Project

Development of non-linear optimisation techniques for production optimisation was completed on 31 May 2006. This project was undertaken with Woodside Energy Ltd.

PhD student Mrs Moumita Ghosh submitted her PhD thesis on this topic in June 2006.

Educational Research in Mathematics, IT and Statistics Cluster (CERMITS)

Presentation by Dr Chris Cope

Dr Chris Cope visited the University of Ballarat as a guest of CERMITS on 2 August 2006.

He works in the Department of Computer Science and Computer Engineering, at LaTrobe University in Bendigo.

During his visit to UB he presented a talk on his research, which uses phenomenography to improve teaching and learning about threshold concepts in statistics and information technology.

Threshold concepts are those concepts in a discipline which are portals to new and more powerful ways of thinking. Without a transformation to the new way of thinking students are unlikely to progress in their learning in the discipline.

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Threshold concepts are often difficult to explain and learn. Given the importance of the threshold concepts in a discipline, research would be worthwhile into how teaching and learning could be improved.

Phenomenography is a qualitative research approach of value in this context. The aim of phenomenography is to describe distinct variation in ways of experiencing a phenomenon like a threshold concept.

The outcomes of many phenomenographic studies have indicated that the different experiences of a phenomenon can be described in a hierarchy of increasing levels of understanding.

The differences between the levels of understanding provide insight into how teaching can be improved.

This seminar provided an overview of a phenomeno-graphic research approach, and a simplified example of applying the approach to the structure of sitting devices.

A description of two studies was provided, in which a phenomenographic approach has been used to investigate how to improve teaching and learning about threshold concepts. The concepts concerned are confidence intervals in statistics and information systems as social systems in IT.

Information Security Cluster (INSECT)

INSECT Seminars:

The following seminars were presented to INSECT meetings recently:

- ✓ Professor Pino Caballero Gil, CryptULL, University of La Laguna, Spain, "Link between Cryptology and Graphs".
- ✓ Dr Venkatesan Guruswami, University of Washington, USA, "Achieving Channel Capacity Against Malicious Errors".

Conference Presentations

Professor Mirka Miller will be an Invited Speaker at the Australasian Information Security Workshop : Privacy Enhancing Systems (AISW). This is part of Australian Computer Science Week 2007 multi-conference, to be hosted by the University of Ballarat and the School of ITMS.

Intelligent Finance Cluster (IFC)

Research and Collaboration

Two research partnerships have been established in Chengdu, China with:

- The Financial Research Centre of China, Southwest University of Finance and Economics (SWUFE).
- The Institute of Finance, School of Management, University of Electronic Science and Technology of China (UESTC).

The Cluster has reached an understanding with each of the two Universities on research collaborations and co-authoring of research papers.

Working papers with SWUFE are being developed on the following topics:

- Questioning the effectiveness of fiscal policies for ironing out excessive volatilities of stock markets.
- Optimal exchange policies on Chinese Renminbi.
- Trends of the Chinese stock market along with the appreciation of Chinese Renminbi.

Working papers with UESTC are being developed on the following topics:

- Multilevel fractal decomposition of financial time series.
- Multilevel structural time series models for financial time series.
- Multilevel stochastic differential equations for financial time series.

An investigation is also under way on the feasibility of establishing a Shenzhen International Finance Institute, to be partnered by several universities from China and Australia.

Griffith Business School hosted an Australia-China Workshop on Finance and Economics, 24-25 August 2006, Gold Coast, for a delegation of Chinese prominent finance scholars from SWUFE.

Dr Pan and this delegation also undertook a visiting tour to Sydney – ANZ Bank and Australian Capital Market CRC, Canberra University, Griffith University at Gold Coast, the University of Queensland in Brisbane, and Monash University and CSIRO in Melbourne.



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Collaborative Centre for e-Health (CCeH)

New Staff Members

We are pleased to welcome:

- ✓ Mr John Avery: a programmer working on the Prescription Management Project.
- ✓ Ms Shahnaz Kouhbor: a software tester working on the upgrade to AHML.

Project: Schedule 4 & Schedule 8 Pharmacy Guild Project

This project has delivered its final report, feedback has been received from external reviewers, and we are now waiting for confirmation from the Pharmacy Guild that the report has been accepted. A final budget audit is being conducted and reported to the Pharmacy Guild.

Project: Barwon Division of General Practice D_Info Project

This project will produce and send an electronic Diabetes Management Plan from a General Practitioner's desktop to the Divisional Microsoft Access Database, where it will be automatically incorporated into the database.

The project has progressed through the trial phase and will soon reach conclusion. There are a few small software issues to be fixed, to ensure the recall function runs successfully.



Project: New South Wales Health and DHS Victoria HL7 Messaging Handbook

CCeH are preparing two HL7 messaging handbooks for New South Wales Health and Department of Human Services Victoria.

The first handbook, detailing HL7 version 2.4 messaging specifications for patient administration processes, has been completed.

The second handbook, detailing HL7 version 2.4 messaging specifications for pathology and diagnostic imaging orders, and results and adverse drug reactions, has reached near final draft and will be completed shortly.

Project: Queensland Health eONI Project

CCeH have been contracted by Queensland Health to carry out work on their Ongoing Needs Investigation (ONI) forms.

CCeH will:

- Produce AHML profiles to reflect the detailed eONI specification.
- Produce XML schema to reflect the detailed eONI HL7 specification.
- Develop transformation technology to change between HL7 vertical bar and HL7 XML.
- A schema that uses the same tags as the eONI HL7 schema, but which reflects HACC MDS data.
- Produce a schema of the Interactive Free Text PDF ONI that interfaces with Electronic ONI HL7 schema.
- Provide helpdesk support and access to the AHML testing facility.

Contracts are being signed and work will commence shortly.

Project: ITOL (Information Technology On Line) Program

A consortium of six stakeholders, including CCeH, has received funding of \$350,000, for the development of a new electronic prescription management system.

The system will streamline the current time-consuming process of prescription management for the elderly in residential care facilities, as well as within the community.

The project is supported by the Federal Government with funding of \$175,182 through Round 14 of the Information Technology Online (ITOL) Program of the Department of Communications, Information Technology and the Arts.

The consortium members include Bendigo and District Division of General Practice, Ballarat and District Division of General Practice, Ballarat District Nursing and Healthcare, Collaborative Centre for eHealth (CCeH), Grampians Rural Health Alliance Network and The Pharmacy Guild of Australia.

CCeH will be responsible for the design, development, testing and implementation of the system.

Current practices of medication management processes rely heavily on labour-intensive technologies – the telephone and the fax. The new web-based electronic prescription management system will enable better patient health outcomes, lead to reduced costs and significantly improve information flow between all participants of the process, including nursing staff, the prescribing doctor and the pharmacy.

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The project is unique to Australia and it is anticipated that, once implemented, it will readily roll out to other health areas such as radiology and pathology requests.

The electronic notification process will improve the flow of information between residential aged care facilities; community based health care providers, community pharmacies and general practitioners. All participants will be able to check the status of a prescription at any time via the internet.

The project has progressed through design and the software is now being developed. Extensive consultation has been carried out with end users to ensure that all requirements have been recorded and incorporated into the final design. The project will move into the trial phase at the end of this year and into the beginning of 2007.



Australian Healthcare Messaging Laboratory (AHML)

AHML has released one new Australian Standard and one new message specification for testing over the last couple of months. Message testing activities are still running high with new users registering from Argentina, Chile and Pakistan in the last few months. AHML is in the process of HL7 message certification with a large diagnostic imaging system provider. The certification process is expected to be complete by the end of October 2006.



Conferences & Seminars

- Dr Alex Kruger, Dr Musa Mammadov and Dr Adil Bagirov presented talks at a workshop on Advances in Continuous Optimization, from 30 June to 1 July 2006 in Reykjavik, Iceland.

- Dr Alex Kruger, Dr Musa Mammadov and Dr Adil Bagirov presented talks at EURO XXI, the 21st European Conference on Operational Research Conference held in Reykjavik, Iceland, 2-5 July 2006.
- Dr Musa Mammadov and Dr Adil Bagirov presented talks at a workshop on Mathematics and Medical Diagnostics held in Erice, Sicily, Italy, from 10-20 July 2006.
- Mr Peter Martin presented his paper "Achieving Skills in Industrial Training" at the 7th International Conference on Teaching Statistics held in Salvador, Brazil, 2-7 July 2006.
- Dr Charlynn Miller presented a paper titled "Retaining Mature-Age Students at University: A Student Services Perspective" at the HERDSA Conference in Perth, Western Australia, in July 2006.
- Professor Sid Morris attended the Summer Topology Conference 2006 in Statesboro, Georgia and presented a paper titled "The Lie Theory of Pro-Lie Groups".
- Dr Robyn Pierce and co-author Vicki Steinle of the University of Melbourne presented their paper, "Incomplete or Incorrect Understanding of Decimals: An Important Deficit for Student Nurses" at the 30th Conference of the International Group for the Psychology of Mathematics Education, PME30, in July 2006, Prague, Czech Republic.
- Dr Andrew Stranieri recently presented a paper titled "Open Texture Conquered?" to the Second International Meeting on Artificial Intelligence and Law, at the National University, Mexico.
- Dr Xinwen Wu attended Laura Chappell's 2006 Security Workshop in Network Analysis and Host Forensics, 17-18 July 2006, in Melbourne.
- A/Prof John Yearwood presented a paper titled "Interactive Narrative by Thematic Connection of Dramatic Situations" to NILE 2006, the 4th International Narrative and Interactive Learning Environments Conference, 8-11 August 2006, in Edinburgh, Scotland.
- Dr David Yost presented a paper at the International Conference on Analytic Topology and its Applications, 10-14 July 2006, in Rotorua, New Zealand.



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International Workshop Report: Erice, Italy

Mathematics and Medical Diagnosis: An International Workshop, Erice, Italy, 10-20 July 2006

The ancient Sicilian town of Erice played host to this, which was co-ordinated by the International School of Mathematics, the "Ettore Majorana" Foundation and the Centre for Scientific Culture.

The object of the workshop was to present state-of-the-art applications of optimization methods in the area of mathematical diagnostics, through the description of new models and algorithms, and the discussion of primarily medical real-world applications.

The host city of Erice, famous for its medieval churches and castles, houses a major scientific centre, which conducts similar workshops in a wide range of scientific fields.

CIAO was well represented at the workshop with an invited lecture from Dr Adil Bagirov, as well as two talks by Dr Musa Mammadov.

Dr Bagirov presented a lecture on a nonsmooth optimization approach to cluster analysis problems. This lecture was greeted with great interest by the leading mathematical data analysis experts who were present.

Dr Mammadov presented a talk on an optimization approach used to study drug-drug interactions, in its role as a factor for adverse drug reactions. This talk generated a lot of interest among mathematicians.

Dr Mammadov's second talk was on a current collaboration project with other CIAO members – Dr Cameron Hurst, Dr Zari Dzalilov and A/Prof John Yearwood – as well as the Royal Children's Hospital in Melbourne, on the development of a new clinical scoring system in cystic fibrosis.

A major objective of the workshop was to bring together mathematicians, statisticians, clinicians and other researchers involved in medical diagnostics.

The workshop served as an important stepping stone for the future development of a common language between disciplines in the area: a language crucial to prevent miscommunication, research overlap and redundancy.

Some interesting background on Erice

According to legend, Erice, son of Venus, founded a small town on top of a mountain (750 metres above sea level) more than three thousand years ago.

The historian Thucydides (500 BC) said that the Elymi – founders of Erice – were survivors of the destruction of Troy. Ancient historians agreed that Erice was the oldest city in Europe.

Homer (1000 BC), Theocritus (300 BC), Polybius (200 BC), Virgil (50 BC), Horace (20 BC) and others have celebrated this magnificent part of Sicily in their poems.

In Erice you can admire the Castle of Venus, the Cyclopean Walls (800 BC) and the Gothic Cathedral (1300 AD). Today Erice is a mixture of ancient and medieval architecture.

Other masterpieces of ancient civilization, such as Motya (Phoenician), Segesta (Elymian) and Selinunte (Greek) are to be found in the neighbourhood.

On the Aegadian Islands – theatre of a decisive naval battle of the first Punic War (264-241 BC) – suggestive neolithic and Paleolithic vestiges are still visible: the grottoes of Favignana, the carvings and murals of Levanzo.

Less than one hour's drive from Erice, you can admire the splendid beaches of San Vito Lo Capo, Scopello, Cornino, and the wild rocky coast around Mount Cofano.



Photo above: Dr Musa Mammadov (far left) and Dr Adil Bagirov (third from right) enjoying dinner with other conference delegates.

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Conferences & Workshops: Organised by CIAO and CIAO members

➤ Beijing Workshop on Financial Computation and Risk Management, 2 July 2006

The Intelligent Finance Cluster of CIAO co-organised a Beijing Workshop on Financial Computation and Risk Management, with the Center for Forecasting Science (CFS), Chinese Academy of Sciences (CAS), Beijing.

The Workshop was chaired by Prof Wang Shouyang, Director of this Centre, Deputy Director of the Institute of Mathematics and System Sciences of CAS.

Dr Heping Pan presented a principal talk on "Intelligent Finance towards integration and unification of economic, fundamental, technical, news and strategic analysis of global financial markets".

Commercial Projects

New Projects

cBallarat – ICT Strategy IT2030

The City of Ballarat has called for a review of the cBallarat IT2010 Strategy document which was produced in 1993.

The City is seeking expert consultants to facilitate and develop the fourth generation of the IT2010 strategy which will be known as IT 2030.

This project will be comprised of the following major stages:

1. A review of the current strategy IT 2010 and an assessment of the progress of components of the same in the current environment and economy of the region.
2. The development and conduct of a consultation process with key stakeholders of business and community in the region for the purposes of the review and gaining meaningful input the 4th generation of the Strategy- IT 2030.
3. The development of the 4th generation of the Strategy IT 2030 draft document for review and appraisal by cBallarat, the stakeholder groups and the City of Ballarat.
4. Production of the final approved version of the Strategy IT 2030 in appropriately presented hard and soft copy versions suitable for marketing and collateral for

distribution within and external to the region as per 2.5 below.

5. A Marketing and Communications Plan is to be developed for all the stages outlined above. This must include the ongoing use of IT 2030 as marketing collateral for State, National and International investment attraction and the promotion of Ballarat as the regional IT Capital of Australia.

CIAO personnel involved: A/P J Yearwood, Prof S Morris, Dr A Stranieri, Mr S Ivkovic, Mr Chris Lynton-Moll, Mr G Simmonds, Ms K Winnell, Mr W Hurst.

VicSport – Database Management Project

VicSport have called for an assessment on the current status of database management tools used by Victorian State Sporting Associations (SSA)

The intention is to obtain a clear understanding of current database tools being utilised, and to provide recommendations for the development of a more streamlined and effective tool to be used across State Sporting Associations.

This proposed project will be completed using a collaborative approach with VicSport.

Key stakeholders in this project are VicHealth, and Sport and Recreation Victoria, along with the many and varied sporting associations within Victoria.

The main task of the proposal is to speak with leaders within each state sporting association to determine their current membership management and reporting tools.

CIAO personnel involved: Dr A Stranieri, Mr C Foale.



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Recently submitted proposals

Central Victoria Greenhouse Alliance – Solar Cities

The Central Victorian Greenhouse Alliance has requested the University of Ballarat to provide assistance and support, to develop the evaluation component of their Solar Cities submission to the Department of Environment and Heritage, Australian Greenhouse Office.

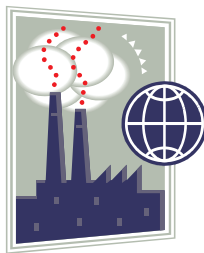
This is a seven-year project, with CIAO and the Centre for Regional Innovation and Competitiveness (CRIC) undertaking to survey and monitor household energy use.

An extensive database will be developed to collate survey data, meteorological data and energy usage data from power companies, and to undertake statistical analysis of the collated data.

The Central Victorian Greenhouse Alliance (CVGA) is an organisation made of 13 local government and representation of 11 other organisations including businesses, government and community organisations.

The CVGA has set a target to reduce regional greenhouse emissions by 30% below the levels set in 2000 by 2010, with a target of zero net emissions by 2020.

CIAO personnel involved: Dr J Harvey, A/P J Yearwood, Mr W Hurst.



Current Projects

Virtual Reality Facility at UB

The Virtual Reality capability proposed is a new initiative and will involve the purchase of new technology.

UB has great research strength in areas such as optimization, data mining and simulation. However it is not easy to describe this capability to potential research consultancy clients.

It is our intention to build a virtual reality capability which allows us to describe and demonstrate these capabilities better. The VR capability itself will build on our multimedia and simulation expertise.

The VR capability will allow research findings to be presented to participating organisations in an interactive and visual way.

This would enhance UB's engagement within the community by being able to offer a facility where design and or research outcomes can be visually represented.

Areas of UB application include optimization scenarios, virtual design applications, data mining visualisation, virtual walk-through of localities, and in the area of health informatics, graphic representation of drug interactions and design.

CIAO personnel involved: A/P J Yearwood, Dr Peter Vamplew, Mr G Stevens, Mr W Hurst.

Information City Australia – ADRAC Commercialisation

CIAO has received notification from Information City Australia (ICA) that it was successful in gaining \$50,000 in funding to develop a Business Plan for the Adverse Drug Reaction (ADRAC) project.

ADRAC will be incorporated as a company, with a further \$150,000 reserved for follow on funding.

This project will commercialise CIAO knowledge which has been developed over the past three years in the application of optimization and data mining techniques to determining suspected adverse drug reactions.

CIAO personnel involved: Associate Professor J Yearwood, Dr M Mammadov, Mr S Ivkovic, Mr W Hurst.

Shell – Optimization of LNG Production

CIAO Researchers are liaising with Shell on a project which will involve the application of global optimization techniques previously developed Woodside.

While the developed IP is the property of Woodside, Woodside are keen to on sell the CIAO technology to Shell. This will lead to CIAO researchers working on further development of the optimization algorithms with Shell.

The original project with Woodside was the application of global optimization techniques to the production of Liquefied Natural Gas (LNG), and in determining the optimal location for well placement.

CIAO personnel involved: Dr A Bagirov, A/P J Yearwood.



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CIAO Projects

Project Report: Virtual Battlefields

> Project Leaders: Dr Philip Smith & Dr David Stratton

> PhD Student: Mr Tim Pokorny

> Research Group: Distributed Simulation Laboratory, ITMS

Australian Research Associates:

> Dr John Wharington, Defence Science & Technology Organisation (DSTO)

> Mr Hossein Zadeh, RMIT University

Project Value: \$336,000

Project Title: Applying the Lessons of the Virtual Battlefield to Financial Modelling – Investigating Innovative Use of Distributed Simulation

Description of this ARC Linkage Grant Project:

Underpinning the development of distributed simulation in the defence community, the High Level Architecture (HLA) has gained acceptance due in part to its support for a broad level of interoperability.

Encompassing a framework that loosely couples together simulation components developed and deployed on a diverse range of platforms, the HLA has the potential to enable increasing interoperation between otherwise disparate simulations.

Long supported for the simulation efforts of the defence domain, use of the HLA within the wider business community has thus far been minimal.

In domains where a wide variety of proprietary, customised simulation tools and generic desktop applications alike are used for simulation purposes, use of the HLA can help enable increased reuse and interoperability.

Offering a common, standardised, low-level infrastructure, the HLA would allow simulation models otherwise isolated from one another to be used together.

However, while capable of supporting such a goal, use of the HLA beyond the defence domain would require expert skills and training in a technology perceived as complex and costly. Restricting a broader uptake of the HLA, the removal of this requirement is the central focus of this study.

Developing methods that allow the interpretation of generic models as HLA components, this research seeks to help enable the benefits of the HLA to be realised in domains where desktop commodity applications are the norm.

Tenders/Consultancies/Grants

Research Infrastructure Block Grants

The following Grants were recently awarded to staff in the School of ITMS:

- ✓ Dr Charlynn Miller
\$3,845 for Podcasting Hardware
- ✓ Dr Adil Bagirov, Dr Musa Mammadov,
A/Prof John Yearwood
\$30,287 for a Research Assistant in Optimization
and Data Mining
- ✓ Dr Adil Bagirov
\$1,500 for specialised Optimization Software
- ✓ Dr Charlynn Miller & Dr Robyn Pierce (ITMS)
Dr Robbie Johnston & Dr Rob Davis
(School of Education)
\$7,920 for an electronic voting system, that can be
used for classroom feedback and surveying

ITMS Colloquia & Seminars

ITMS Colloquia Series 2006

The 2006 Colloquia Series continues to attract diverse speakers and a high level of professional expertise.

Recent visiting speakers have included:

- Dr Janet Wiles, University of Queensland
Complex Systems from Genes to Minds
- Prof Philip McKerrow, University of Wollongong
A Christian Perspective on Intelligent Robots,
- Dr Henry Gardner, Australian National University
Design Patterns for e-Science
- Prof Terry Mills, La Trobe University
50 Years of Queueing in the Emergency Department

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CGANT Seminars 2006

The CGANT research group hosted a number of seminars for its members and other interested academics in ITMS:

- Dr Mikail Rubinov, NISAD and School of Psychiatry, University of New South Wales: “Spatiotemporal expression of nonlinear brain activity in schizophrenia: a graph theoretical analysis”.
- Professor Askar Ali Abiyev, Department of Mathematics, Gaziantep University, Turkey: “Magic squares - possible engineering applications”.
- Dr Roman Kuzel, University of West Bohemia, Czech Republic: “Trestles and Walks in Graphs”.
- Professor Diane Donovan, University of Queensland: “Change detection in dynamic enterprise networks”.
- Alison Thomson, PhD Candidate, University of Melbourne: “Routing in Chordal Ring Networks”.
- Inuka Jayasekera, PhD Candidate, Kings College, London: “Fast Practical Exact and Approximate Pattern Matching in Protein Sequences”.



Staff News

Confirmation of Candidature

We extend our congratulations to:

▪ Mrs Kathleen Keogh

PhD topic: Collaborative software agents in disaster management teams

Principal Supervisor: Prof Liz Sonenberg

Associate Supervisor: Dr Wally Smith

Both supervisors are from the Department of Information Systems, University of Melbourne.

Second PhD Awarded

- Congratulations to Dr Nadia Sukhorukova on obtaining her second PhD. The topic of her research was polynomial splines, and the degree has been approved by St Petersburg State University, Russia.



Congratulations

- Congratulations to Dr Eldar Hajilarov on the recent birth of his second child, a baby son named Emil.



Post-Graduate News

Thesis Submission

- ✓ Mrs Moumita Ghosh submitted her PhD thesis for examination in June 2006.

Thesis topic: “Development of non-linear optimization techniques for production optimization”.

Principal Supervisor: Dr Adil Bagirov.

Associate Supervisor: Professor Alex Rubinov.

- ✓ Ms Thi Minh Thu Vuong submitted her Masters thesis for examination in June 2006.

Thesis topic: “Complemented and uncomplemented subspaces of banach spaces and banach algebras”.

Principal Supervisor: Dr David Yost.

Confirmation of Candidature

We extend our congratulations to the following students, who recently and successfully completed their Confirmation of PhD Candidature:

▪ Mr Arun Banerjee

PhD topic: Multi-label Classification of Shorter Featured Datasets using Optimization Techniques

Principal Supervisor: Dr Musa Mammadov

Associate Supervisor: A/Prof John Yearwood

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▪ Ms Alyx Macfadyen

PhD topic: Facilitating the Representation of Interaction in Scenario-Based Three Dimensional Environments using an Interaction Framework

Principal Supervisor: Dr Andrew Stranieri

Associate Supervisor: A/Prof John Yearwood

▪ Mr Solomon Hart

PhD topic: Semi-Supervised Topic Emergence in Time-Varying Text Streams

Principal Supervisor: A/Prof John Yearwood

Associate Supervisor: Dr Adil Bagirov

Visiting PhD Student

- Ms Mahbobeh Hosseinyazdi

Ms Hosseinyazdi is currently visiting us from Iran. She is here to work with Dr Eldar Hajilarov, to complete her PhD in the field of "Linear Systems and Optimization Over Lattices".

Congratulations

- Congratulations to PhD Students Bahadorreza Ofoghi and Armita Zarnegar on the recent birth of their first child, a baby daughter named Rocha.

Visitors to CIAO

Recent visitors from the North China Water Conservation and Electric Power University were:

- Vice President Prof Xinglin Cao
- Vice President Prof Baoguo Wang
- Associate Professor Fule Han

The Research Group CGANT recently hosted the following visitors:

- ✓ Professor Askar Ali Abiyev
Gaziantep University, Turkey
- ✓ Associate Professor Diane Donovan
University of Queensland
- ✓ Dr Roman Kuzel
University of West Bohemia, Czech Republic

The Research Cluster INSECT recently hosted the following visitors:

- ✓ Dr Venkatesan Guruswami
University of Washington, Seattle, USA

Dr Guruswami is a graduate of the Melbourne Institute of Technology. His thesis received the ACM award for the best doctoral dissertation in Computer Science, and he is a recipient of the Packard Fellowship in 2005.

For more information:

<http://www.cs.washington.edu/homes/venkat/>
<http://www.cs.washington.edu/homes/venkat/cv05/CV.pdf>

While visiting INSECT, Dr Guruswami continued his ongoing research work, supported by a Seed Funding Grant, with:

- Dr Xinwen Wu on List Decoding with respect to the Lee Metric, potential applications to the Protection of Intellectual Property, and Traitor Tracing Algorithms.
- Dr Prabhu Manyem on Logical Characterisations of NP-Optimisation problems.

- ✓ Professor Pino Caballero Gil
Leader of the CryptULL Research Group
University of La Laguna, Spain

For more information: <http://webpages.ull.es/users/cryptull/>

Publications

Special Editions

A Special Issue of the Journal of Global Optimization, dedicated to Professor Alex Rubinov on his 65th birthday, was published in June 2006.

Editorship

Dr Heping Pan has been invited to serve as an editor for a new international journal on financial system engineering. The invitation was received from Prof Wang Shouyang, Director of the Center for Forecasting Science (CFS), Chinese Academy of Sciences (CAS), Beijing, China.

Books : Accepted

Morris, S. & Hofmann, K., The Lie Theory of Connected Pro-Lie Groups", The European Mathematical Society Publishing House.

Books : Published

Morris, S. & Hofmann, K., The Structure of Compact Groups, Second Edition, 2006, Studies in Mathematics, 25, DeGruyter.

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Journal Papers : Submitted

Dr Charlynn Miller and Honours student Leon Newnham have submitted a paper to ASCILITE, the Australasian Society for Computers in Learning in Tertiary Education.

Journal Papers : Published

1. Bagirov, A.M., Ghosh, M. and Webb, D., A derivative-free method for linearly constrained nonsmooth optimization, *Journal of Industrial and Management Optimization*, 2 (2006), no. 3, 319-338.
2. Bagirov, A.M., Mason, L.T. and Ghosh, M., Application of derivative-free methods for production optimization, *Appl. Comput. Math.* 5 (2006), no.1, 94-105.
3. Bagirov, A.M. and Ugon, J., Piecewise partially separable functions and a derivative-free method for large-scale nonsmooth optimization, *Journal of Global Optimization*, Vol. 35, No. 2, 2006, 163-195.
4. Koh, K.M., Miller, M., Smyth, W.F., Wang, Y., On optimum summable graphs, *AKCE International Journal of Graphs & Combinatorics*, Vol.3, No.1, pp.45-57, 2006.
5. Kruger, A., About regularity of collections of sets, *Set-Valued Anal.* 14 (2006), 187-206.
6. Kruger, A., Stationarity and regularity of real-valued functions, *Appl. Comput. Math.* 5 (2006), no.1, 79-93.
7. Pierce, R. and Stacey, K., Enhancing Mathematics by Association with Simple Pleasures from Real World Contexts, *Zentralblatt für Didaktik der Mathematik (ZDM)*, June 2006.
8. Pineda-Villavicencio, G., Gomez, J., Miller, M., Perez-Roses, H., New largest graphs of diameter 6, *Electronic Notes in Discrete Mathematics*, V.24, pp.153-160, 2006.
9. Rubinov, A.M., Methods for global optimization of nonsmooth functions with applications (survey), *Appl. Comput. Math.* 5 (2006), no.1, 3-15.
10. Teska, J., Kuzel, R., Miller, M., Divisibility conditions in almost Moore digraphs with selfrepeats, *Electronic Notes in Discrete Mathematics*, V.24, pp.161-163, 2006.
11. Yost, D., Przeslawski, K., "Decomposability of Polytopes", *Discrete and Computational Geometry* accepted for publication.

Conference Papers : Submitted

Ofoghi, B. & Sukhorukova, N., Curve clustering based on polynomial splines and nonsmooth optimization, Australian Computer Science Week ACSW 2007. This paper is part of a research project, which is financed with Seed Funding provided by CIAO in 2006.

Conference Papers : Accepted

- Bahadorezza Ofoghi and Associate Professor John Yearwood will present a poster on "Semantic Frames for Question Answering Systems" at AI 2006: The Australian Joint Conference on Artificial Intelligence, Hobart, Tasmania, 4-8 December 2006.
- Vamplew, P, Ollington, R & Hepburn, M. "Enhanced Temporal Difference Learning Using Compiled Eligibility Traces", accepted for AI 2006: The Australian Joint Conference on Artificial Intelligence, Hobart, Tasmania, 4-8 December 2006. The conference had a paper acceptance rate of just 13%.

Conference Papers : Published

1. Dafik, Miller, M., Ryan, J., Baca, M., Super edge-antimagicness for a class of disconnected graphs, *Proceedings of AWOCA 2006* (J. Ryan, Dafik (eds.)), pp.67-75.
2. Kruger, A., Stationarity and regularity concepts for set systems, IFIP International Federation for Information Processing, Vol. 202, Systems, Control, Modeling and Optimization, eds. F. Ceragioli, A. Dontchev, H. Furuta, K. Marti, L. Pandolfi, Boston: Springer, 2006, 205-214.
3. Lin, Y., Brankovic, L., Miller, M., Tang, J.M., On graphs of maximum size with given girth, *Proceedings of AWOCA 2006* (J. Ryan, Dafik (eds.)), pp.10-17.
4. Manyem, P., Polynomial-time optimization classes: Syntactic hierarchy, *Proceedings of AWOCA 2006* (J. Ryan, Dafik (eds.)), pp.37-53.
5. Martin, P., Achieving success in industrial training - an invited paper, *Proceedings of 7th International Conference on Teaching Statistics*.
6. Heping Pan (2006): "Multilevel Stochastic Dynamic Process Models and Possible Applications in Global Financial Markets", Special Session on Financial Engineering & Economic Agent Models, 5th International Conference on Computational Intelligence in Economics and Finance, 8-11 October, 2006, Taiwan.
7. Rajan, B., Rajasingh, I, Manuel, P., Miller, M., Cordial labeling of butterfly networks and mesh of trees, *Proceedings of AWOCA 2006* (J. Ryan, Dafik (eds.)), pp.198-207.
8. Rajasingh, I, Rajan, B., Manuel, P., Miller, M., Super edge-magic total labeling of spiked fans, hyper X-trees, dew drops and prisms, *Proceedings of AWOCA 2006* (J. Ryan, Dafik, eds.), pp.208-215.

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Research Reports : 2006

- 2006/01 Optimization solvers and problem formulations for solving data clustering problems, Julien Ugon, January 2006
- 2006/02 Constrained Nonlinear and Semismooth Equations and Global Optimization, Musa Mammadov, Liquin Qi and Fusheng Bai, January 2006
- 2006/03 Coverage in WLAN: Optimization Model and Algorithm, S. Kouhbor, J. Ugon, M. Mammadov, A. Rubinov and A. Kruger, February 2006
- 2006/04 Coverage in WLAN with Minimum Number of Access Points, S. Kouhbor, J. Ugon, A. Rubinov, A. Kruger and M. Mammadov, February 2006
- 2006/05 Nonsmooth Optimization for the Placement of Access Points to Enhance Security in WLAN, S. Kouhbor, J. Ugon, M. Mammadov, A. Rubinov and A. Kruger, February 2006
- 2006/06 Methods for global optimization of nonsmooth functions with applications, A M Rubinov, April 2006
- 2006/07 Abstract Convexity and Augmented Lagrangians, Regina Sandra Burachik and Alex Rubinov, April 2006
- 2006/08 Necessary Global Optimality Conditions for Quadratic Optimization Problems, A. M. Rubinov and Z. Y. Wu, April 2006
- 2006/09 Optimality conditions in global optimization and their applications, A. M. Rubinov and Z. Y. Wu, April 2006
- 2006/10 Best Approximation in a Class of Normed Spaces with Star-Shaped Cones, H. Mohebi, A. M. Rubinov and H. Sadeghi, April 2006
- 2006/11 Non-convex Quadratic Minimization Problems with Quadratic Constraints: Global Optimality Conditions, V. Jeyakumar, A. M. Rubinov and Z. Y. Wu. April 2006
- 2006/12 Subdifferentials of convex-along-rays functions, A. M. Rubinov and E.V. Sharikov, April 2006
- 2006/13 On the use of Abstract Convexity in set valued analysis, Regina Sandra Burachik and Alex Rubinov, April 2006
- 2006/14 Sufficient Global Optimality Conditions for Weakly Convex Minimization Problems, Z Y Wu, April 2006
- 2006/15 Lyusternik theorem and regularity of collections of sets, Andrei V. Dmitruk and Alexander Ya. Kruger, September 2006



All ITMS staff members and postgraduate students are encouraged to contribute to the next edition of the CIAO Newsletter

Examples of newsletter items are: projects in progress, papers accepted, research in process, publications, grants, seminars, visitors to ITMS, visits, scholarships, reports from school research groups / centres, events, conferences, new discoveries, and general items of interest

All items should be sent to Elizabeth Matuschka (e.matuschka@staff.ballarat.edu.au) by Thu 30 November 2006

Director of CIAO: Associate Professor John Yearwood
Deputy Director of CIAO: Professor Mirka Miller

Founding Director of CIAO:
Professor Alex Rubinov (1940-2006)