



THE INSTITUTE FOR ADVANCED STUDY
at
LA TROBE UNIVERSITY, BUNDOORA



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THE INSTITUTE

The overall aim of the Institute for Advanced Study [IAS] at La Trobe University is to enhance further the reputation and standing of the University as a major research institution – a place to which student and staff of the highest calibre are drawn.

To achieve this, the IAS brings to La Trobe University outstanding scholars who are leaders in their discipline and at the cutting edge of research. By encouraging productive interactions between these scholars, staff, and post graduate students, the climate for research is strengthened, as is the profile of the university as a major institution dedicated to the advancement of learning and research. Support for post graduate students is also offered in other ways, including through the Showcasing the Future series.

DIRECTOR'S REPORT 2003

It is a pleasure to present the Institute for Advanced Study's [IAS] annual report for 2004.

Major activities for the year 2004 are listed below.



The central hub of the IAS, the administration building, was formally opened by the Vice Chancellor, Professor Michael Osborne, on May 3¹.

IAS Fellows and IAS Distinguished Fellows

The following Fellows spent time at the Institute during 2004:

Professor Robin Williams	<i>Research Professor and former Vice Chancellor, University of Wales, Swansea, UK.</i>
Professor James Walvin	<i>Professor of History, University of York UK</i>
Professor Michael Fortescue	<i>Professor of General Linguistics, University of Copenhagen, Denmark</i>
Professor Carol Smart	<i>Director, Centre for Research on Family, Kinship & Childhood. University of Leeds, UK</i>
Professor Marcia Ory	<i>Professor, Social and Behavioral Health, The Texas A&M University System Health Science Center, USA</i>
Professor Demeter Krupka	<i>Professor in Mathematics, Palacky University, Olomouc, Czech Republic, and former Vice-dean and rector of the Silesian University in Opava, Czech Republic</i>
Professor Olga Krupkova	<i>Professor in Mathematical Physics, Faculty of Science, Palacky University, Olomouc, Czech Republic</i>
Professor Maurizio Paoletti	<i>Professor of Biology, University of Padova, Italy</i>

¹ The financial assistance of Fergusson's Winery in supporting this function is gratefully acknowledged.

Professor Miroslav Haviar

Professor of Mathematics, M Bel University, Ruzova, Slovak Republic

Professor Mark Lester

Professor of Solar Terrestrial Physics, Department of Physics and Astronomy, University of Leicester, United Kingdom

Mr Martin Woollacott

Fellowship continues 2005

In addition to working on their own research, these scholars interacted productively with staff and higher degree students from the university.

Reports submitted by IAS Fellows are appended to this report (see Appendix A). Publications produced by Fellows in 2004 are listed in Appendix B.

Seminars by IAS Fellows' and Distinguished Fellows' held in the IAS

Summaries

PROFESSOR ROBIN WILLIAMS

"The World of the Ultra Small: Nanotechnology at the Boundaries of the Physical and Biological Sciences."

Developments in computing and communications over the past few decades have transformed the way we live. The current silicon microchips that make all this possible are enormously complex with individual components less than 100nm in size [1nm = one billionth of a metre]. However, engineers are now reaching the limits of conventional technology and scientists are exploring novel methods of making electronic devices with dimensions close to the atomic scale, where the use of scanning tunnelling microscopes and radiation from synchrotron light sources may offer interesting possibilities.

This talk will review some of the developments, including thoughts on opportunities generated through biological processes, for example by making devices involving DNA.

PROFESSOR JAMES WALVIN

"Crimes and Misdemeanours. Slavery and the Public Mind."

The story of African slavery in the Americas has become familiar to a wide public, largely through TV, movies and best selling novels. It is also an historical episode which continues to provoke powerful contemporary feelings. But what is so special about this story? Is it worse, more painful, than a number of other historical experiences of collective suffering? And why should we remember it as a special, distinctive historical phenomenon? The seminar will deal with these and other contemporary responses to the story of black slavery across the Americas.

PROFESSOR MICHAEL FORTESCUE

"How Recent is Polysynthesis in the Arctic?"

In his book "Language Relations across Bering Strait" (1998), Professor Fortescue argued for the origin of Eskimo-Aleut languages in a "mesh" of interrelated languages in south central Siberia during the Mesolithic. Speakers of the proto-language would have followed a riverine and then coastal "spread zone" into the New World that others had followed before and still others would follow later. One possible reflex of these movements is seen in the cline leading from the moderately synthetic, dependent-marking languages of Siberia today to the polysynthetic, head-marking languages of Northwest America via double-marking Eskimo-Aleut. This typological cline is unique in its broad areal distribution, and the reasons why all language families that have expanded into this direction seem to have developed along a one-way trajectory towards greater head-marking synthesis will be discussed in the presentation. The role of contact phenomena and the distinction between new and old polysynthesis will be drawn into the picture.

PROFESSOR CAROL SMART

"The Changing Textures of Post-Divorce Family Life."

In the talk I focus on how mothers, fathers, children and wider kin are adapting to changes incurred in family life by high rates of divorce or separation. I shall draw out a number of themes from a series of linked studies in which we have interviewed parents, children and grandparents. I shall propose that we are witnessing the emergence of a new kind of cultural 'etiquette' associated with divorce and separation. This suggests that the way in which people think about 'how to divorce' and 'how to live family life after divorce'

are becoming matters for reflection as divorce becomes a fact of life that touches almost all families in some way. Our research suggests that not everyone subscribes to this new etiquette, but it is clear that there is a 'cultural turn' against old ways of doing divorce. I shall map these changes by looking at a range of different dynamics in families facing change.

PROFESSOR MARCIA ORY

"Nature and Consequences of Ageist Stereotypes and Strategies for Combating such Stereotypic Behaviors."

The nature and consequences of ageist stereotypes, and strategies for combating such stereotypic behaviours, are discussed. Ageism is still very much a part of the cultural landscape, with recent research documenting stereotypes in many different venues and associated health hazards. The audience will be invited to explore their own stereotypes through pictorial representations of popular terms. Considerations in designing effective health promotion programs will be emphasized. Examples of successful programs and strategies will be highlighted, with particular attention to lessons learned in the Active for Life program.

PROFESSOR DEMETER KRUPKA

"Global Variational Theory: topics in Algebra, Analysis, Geometry and Topology."

The topic of the global variational theory as a modern, interdisciplinary area is to study properties of variational functionals on topologically nontrivial underlying spaces, smooth manifolds. Typical problems are (in geometry and analysis) the problem of geodesics, the minimal submanifold problem, the local and global inverse problem of the calculus of variations, and (in theoretical physics, field theory and general relativity) the structure of higher order mechanics, variational principles on manifolds, symmetries of variational functionals and differential equations related with them, and conservation laws. The aim of the seminar talk is (a) to introduce basic notions of the higher order variational calculus on fibred manifolds, and (b) to discuss selected open research problems in different areas of mathematics and mathematical physics which influence further developments of the global variational theory.

PROFESSOR OLGA KRUPKOVA

"The Geometry of Variational Equations."

Differential equations for mappings between differentiable manifolds can be represented as invariant (geometric) objects on manifolds with an appropriate structure (jet bundles). Within this framework, geometric properties of differential equations, such as compatibility, equivalence, symmetries, transformations, integrability, reducibility, etc., can be investigated by methods of global analysis and differential geometry. Related geometric structures can be used to study local or global solutions, or to find integration methods.

The seminar talk focused on variational equations, arising as equations for extremals of variational functionals on fibred manifolds. Selected topics and methods appearing in the geometric theory of variational equations will be presented, including some questions recently studied in collaboration with the Mathematics Department at La Trobe University. The problem of existence of a Lagrangian to a given system of differential equations (inverse problem of the calculus of variations), and related topics will also be discussed.

PROFESSOR MAURITZO PAOLETTI

"Food Biodiversity and Sustainability"

Two or more times per day we eat something that comes from a plant or an animal. We are not always able to name a species we put in our mouth that arrives later in our stomach. In most cases we cannot track the link between what we eat and the kind of landscape associated with its production. Hunter gatherers and horticulturalists have a knowledge of each of their key plant or animal species, sometimes they know the links of their food and the environment.

Sustainable development needs to reconsider how and where and how the food (species) is produced, what are the links between the species we consume and other species surrounding it in the food web.

Improving our knowledge about biodiversity and adopting biodiversity tools to monitor our environment including the rural one seems a good step towards improved sustainability.

PROFESSOR MIROSLAV HAVIAR

“Order-polynomial Completeness of Lattices and Related Problems.”

A lattice L is called **order-polynomially complete (OPC)** if every finitary function on L preserving the order of L is a polynomial function of L . OPC lattices were studied in the 1970s by D. Schweigert, R. Wille, M. Kindermann and D. Dorninger, later on by many others like H. Kaiser, N. Sauer, I. Rival, N. Zaguia, M. Erne, E.T. Schmidt, M. Goldstern, S. Shelah, M. Ploscica and the speaker. In the 1970s it was already shown that a finite lattice is OPC if and only if it is tolerance-free.

There had been a **long-standing conjecture** saying that **there is no infinite OPC lattice**. Kaiser and Sauer (1993) proved that an OPC lattice must be bounded and cannot be countably infinite. Ploscica and the speaker (1998) showed that the cardinality of an infinite OPC lattice (if exists) must be at least the first strong limit cardinal. Their method, which will be presented, was later employed by Goldstern and Shelah who first proved that the existence of an infinite OPC lattice implies the existence of an inaccessible cardinal (which cannot be proven from the usual ZF axioms) and then showed that there is no infinite OPC lattice after all.

PROFESSOR MARK LESTER

“The Aurora – Nature’s Lightshow.”

The aurora has been a source of mystery for millennia. Flickering arcs and curtains of light in the northern and southern polar regions, a diffuse red glow in the sky over Europe and Asia, and the dynamic disturbed auroras which can be observed all the way from the polar regions to Melbourne have all made their mark on humankind. The Space Age, however, has seen the biggest scientific development in our understanding of this wonderful, natural lightshow. Satellites make *in situ* measurements of the particles and fields that surround our planet and that are responsible for the aurora. Ground based instruments, such as radars, can remotely sense the large scale electrodynamics of the system in both northern and southern hemispheres. In this presentation we outline the background to the physical mechanisms that cause the aurora. We also discuss recent advances made in our understanding and conclude with a case study of how the dynamic aurora can be caused.

Evaluation and feedback

From an embryonic beginning in 2000, the IAS Fellowship scheme has increased steadily. Fellows’ feedback has been obtained since the inception of the scheme. With the passage of time, it is critical to examine the longer term benefits of the scheme from the University’s perspective. Nominators’ feedback was sought in 2003 and reported in the Annual Report for that year.

To reflect the lead time needed for some initiatives to come to fruition, nominators’ feedback is sought on a two-yearly cycle. The timing of minimum-length visits, i.e., those of two months, and links with the regional campuses require particular scrutiny.

Showcasing the Future series

Three different events took place. These were:

- *Forum on Education. (May 2004)* The Australian Science and Mathematics School (ASMS)
- *“3rd Symposium of the Melbourne Protein Group” (July 2004)* Department of Biochemistry
- *“Malaria in Melbourne 2004”. (October 2004)*

It is noteworthy that each of these events attracted support beyond that offered by the IAS. Selected and abbreviated reflections on these events are included in Appendix C.

The Research Centre for Linguistic Typology [RCLT]

Highlights of the RCLT activities for 2004 - summarised by Professor Alexandra Aikhenvald.

The past year has again been attended by success, in terms of the excellence of Research Fellows, Visiting Fellows and Doctoral Students, both the quality and the quantity of the publications we produce, and the continuing grants and fellow-ships we attract. The International Workshops we host produce seminal

volumes that are acknowledged as substantial contributions to the field. RCLT provides an intellectual milieu which engenders productive research of the highest order.

Staff and students undertook original fieldwork on previously undocumented languages from Peru, Bolivia, Brazil, Papua New Guinea, Vanuatu, Malaysia, India, the Philippines and Aboriginal Australia. During the year twelve books and over seventy academic papers were published, based on work done by scholars while members of RCLT, with a further five books and eighty papers in press.

The Vice-Chancellor and President of La Trobe University, Professor Michael Osborne, has instituted an annual event. Each year, a leading world linguist will at a special ceremony be awarded the degree of Doctor of Letters (*honoris causa*) after which they will deliver a public lecture. Professor Bernard Comrie, Director of the Max Planck Institute for Evolutionary Anthropology in Leipzig and Research Professor at the University of California at Santa Barbara, a leading expert on linguistic typology and historical and comparative linguistics, having published seminal works on many topics, was the second recipient of this honour. On 15 September 2004, Professor Comrie was presented with the Honorary Degree and delivered a most well-received public lecture entitled 'Languages, Genes, and Prehistory'.

Antoine Guillaume, member of RCLT since 2000, completed his PhD thesis 'A grammar of Cavineña, an Amazonian language of Northern Bolivia'. It was unanimously approved by the academic referees who praised this piece of work for its depth of argumentation and wealth of data. Since March 2004, Antoine Guillaume has been an ELDP post-doctoral fellow at the Dynamique du Language Laboratory (CNRS) in Lyon (France) working on the documentation of Reyesano, another Tacana language from Bolivian Amazonia.

Professor Aikhenvald, together with Professor Dixon, was awarded a three-year Discovery Grant from the Australian Research Council to work on language contact phenomena and their impact on grammars, in Amazonia and in Australia.

Further highlights of the year included the publication of Professor Dixon's seminal grammar *The Jarawara language of southern Amazonia*, Oxford University Press in 2004 (636; xxiii), and of Professor Aikhenvald's substantial monograph *Evidentiality* (Oxford University Press, 452, xxvii), in addition to the volume *Adjective classes: a cross-linguistic typology*, edited by Dixon and Aikhenvald (*Explorations in Linguistic Typology*, vol. 2), resulting from our 2003 International Workshop. In addition, Aikhenvald has edited a special issue *Nominal classification of Sprachtypologie und Universalienforschung* (57, 3/4, 329 pp) featuring eight papers on various typological properties of noun categorization in the languages of South-East Asia, Siberia and the Americas.

IAS Administration Building

A short monograph summarising the genesis of the IAS and previous use of the site now known as the Institute for Advanced Study was published in 2004².

During 2004 air conditioning was installed in the large seminar hall and the larger meeting room. These additions are reflected in a further increase in the use of the IAS meeting facilities by groups within the University as well as outside bodies.

Seminars & Workshops given in 2004

107 Seminars/Workshops/Meetings were held in the IAS during 2004. For the majority, the IAS facilities were used on a fee recovery basis.

La Trobe House

La Trobe House, located next to the IAS administration building, contains five fully furnished, high quality apartments. They are used extensively: by visiting IAS Fellows and, when available, by other visitors to the university. Accommodation in the apartments as part of the IAS Fellows entitlement is regarded by Fellows as an attractive feature of the scheme.

² The financial assistance of Urban Pacific and its parent company Macquarie Bank for the printing of this booklet is gratefully acknowledged.

Other developments

Subject to space availability, the IAS facilities are also being utilized by staff and doctoral students for well defined and short term projects and special research meetings and seminars. Once again several postgraduate students were given office space in the IAS for a limited period to complete the final draft of their thesis. Several visitors to the University were also given access to an office in the IAS for a short period.

Nomination form

A copy of the nomination form for IAS Fellows and IAS Distinguished Fellows is attached to this report (see Appendix D). The form can be downloaded from the IAS Website.

A final comment

All of the IAS Fellows have commented gratefully on the support and help provided by the Executive Officer, Julia Anderson. I, too, want to express my thanks to Julia for her unfailing support, flexibility in carrying out an ever increasing range of tasks, and attention to the myriad of details needed to ensure the smooth functioning of activities in the IAS.

Gilah Leder (Director)