.

Curriculum Vitae [1]

Professor Mathai Varghese FAA

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[1] updated July 2011

1. Personal Details:

Name:	**Professor Mathai Varghese FAA**
Position:	ARC Australian Professorial Fellow (full Professor, Level E)
Address:	School of Mathematical Sciences, University of Adelaide, Adelaide 5005
Telephone (work):	+61 8 8303 4173
Facsimile (work):	+61 8 8303 3696
E-mail:	mathai.varghese@adelaide.edu.au
URL:	http://www.maths.adelaide.edu.au/mathai.varghese
Citizenship:	Australian citizen
Memberships:	Australian Mathematical Society

2. Academic Qualifications:

1986	Doctor of Philosophy, Ph.D. Pure Mathematics,	Massachusetts Institute of Technology, Cambridge, Mass. 02139, USA. **Thesis Supervisor**: Prof. D. G. Quillen.
1981	Bachelor of Arts, B.A. Pure Mathematics	Illinois Institute of Technology, Chicago, Illinois 60616, USA. **Minors**: Physics, Computer Science, Psychology.

3. Academic Appointments:

Jan. 2009 -	Director	Institute for Geometry and its Applications
Oct. 2007 - Oct. 2013	Adjunct Professor	Australian National University, Canberra
Jan. 2007 - Dec. 2011	ARC Australian Professorial Fellow (Level E)	University of Adelaide, Adelaide
Dec. 2006 -	Professor (Level E)	University of Adelaide, Adelaide
Jan. 2006 - Feb. 2006 July 2006 - Nov. 2006	ARC Senior Research Fellow (Level E)	University of Adelaide
Mar. 2006 - June 2006	Senior Research Fellow	Erwin Schrödinger Institute, Vienna
Aug. 2001 - Dec. 2005	ARC Senior Research Fellow Associate Professor/Reader (Level D)	University of Adelaide, Adelaide,
Aug. 2000 - July 2001	Clay Senior Research Scholar/ Visiting Scientist,	Clay Mathematics Institute, Massachusetts Institute of Technology
Oct. 1994 - July 2000	ARC Australian Research Fellow (Level B)	University of Adelaide, Adelaide
Jan. 1989 - Sept. 1994	ARC Senior Research Associate (Level B) ARC Research Associate (Level A)	University of Adelaide, Adelaide
July 1986 - Dec. 1987	L.E. Dickson Instructor	University of Chicago, Chicago.

1981	Academic Achievement Award	Illinois Institute of Technology, Chicago, USA.
2000	Fellow, Australian Mathematical Society	`http://www.austms.org.au/Fellows`
2000	Medal, Australian Mathematical Society	`http://www.austms.org.au/AMSInfo/medal.html`

The Australian Mathematical Society Medal is awarded to Australian mathematicians under the age of 40 years for distinguished research in the mathematical sciences done mainly in Australia. The research citation for the medal reads: *"Mathai Varghese is a major contributor in the field of geometric analysis. He is justly famous for several seminal articles. Many of his results involve the geometry of manifolds, familiar examples of which are again curves and surfaces. However, mathematicians are not restricted to three dimensions, and much of Varghese's work is in spaces of higher dimension, and sometimes even in infinitely many dimensions. Varghese has proved a number of important results related to classifying manifolds with different geometric structures on them. His work finds applications in physics, in particular to string theory and the pursuit of what physicists like to call the 'Theory Of Everything'."*

A lay-person's account of the medal-winning work was featured in a prominent article by Jane Richardson in the front page of the Higher Education Supplement of "THE AUSTRALIAN" on July 5, 2000. My research was also featured as a significant contribution by an ARC Australian Research Fellow in the 1999-2000 ARC Annual Report (page 52), `http://www.arc.gov.au/pdf/00_05.pdf`.

2011	Fellow, Australian Academy of Science, FAA	`http://www.science.org.au/fellows/`

Election to the Fellowship recognises a career that has significantly advanced the world's store of scientific knowledge. It is the the highest academic accolade available to scientists and scholars in Australia. The research citation for the induction as a Fellow reads:- *"Mathai Varghese is a key researcher in the field of geometric analysis. He is famous for several seminal articles that contribute to several fields of mathematics and in particular the interactions between mathematics and mathematical physics. Mathai's mathematical theories include: the Mathai-Quillen formalism in topological field theories; L^2-invariants for covering spaces; the hyperbolic space and noncommutative geometry model of the fractional quantum Hall effect; projective Atiyah-Singer index theory; and, twisted K-theory and T-duality in String Theory."*

2011	Finalist, 2011 South Australian Scientist of the Year	`http://www.scienceawards.sa.gov.au/`

This highly-coveted South Australian award is the top of the Science Excellence Awards, which are South Australia's premier recognition and reward for outstanding scientific endeavour, including its application in industry and the advancement of science and mathematics education. It is given to a scientist for excellence in a field of science or technology, who has made a major contribution of national and international standing in their field of research. The prize money to the value of $20,000 is part of the award for the eventual winner, to be announced on 3rd November 2011.

5. Research Funding Summary:

At the University of Adelaide, I have successfully applied both alone and with others, for 8 Australian Research Council (ARC) Discovery Project grants and ARC Large Grants and 7 ARC Small Grants (1996-current), totalling well over a million dollars. The list of my recent ARC Discovery Project grants are:

(1) *Supersymmetric quantum field theory, topology and duality* (jointly with P. Bouwknegt, 2011-2013)
(2) *Geometric Dualities in String Theory and Conformal Field Theory in the context of the Langlands Program* (jointly with P. Bouwknegt, 2008 – 2010)
(3) *Global aspects of dualities in string theory in the presence of background fluxes* (jointly with P. Bouwknegt, 2005 – 2007)
(4) *Twisted K-theory and its Application to String Theory and Conformal Field Theory*, (jointly with P. Bouwknegt, 2002 – 2004)
(5) *New approaches to index theory*, (2001 – 2004)

I have also been awarded the following ARC fellowships and international fellowships:

(1) ARC Australian Professorial Fellowship (2007-2011);
(2) Senior Research Fellowship at the Erwin Schrödinger Institute in Vienna, Austria (2006, for a semester);
(3) ARC Senior Research Fellowship (2001-2006);
(4) Clay Research Fellowship (from the Clay Mathematics Institute) and Visiting Scientist at the Massachusetts Institute of Technology, Cambridge, USA (for a year, 2000–2001);
(5) ARC Australian Research Fellowship (1994-1999).

I have been appointed *visiting professor* for 3 months in 2011, at the CNRS, Université Paul Verlaine-Metz, Metz, France.

6. Editorship:

• 2010, **Guest Editor** for two special volumes, *Journal of the Australian Mathematical Society*, Cambridge University Press, Cambridge, UK. (ERA Journal Ranking = B)
The special volumes are the proceedings of the MPIM conference, Geometry and Quantum Field Theory, June 20-26, 2010, to mark the occasion of Alan Carey's 60th birthday.

• 2008-2016, **Editor** in charge of "Global analysis, noncommutative geometry, and the mathematics of string theory" *Proceedings of the American Mathematical Society*, Providence, Rhode Island, USA. (ERA Journal Ranking = A)

7. Postgraduate Research Students Supervised:

Ph.D. students supervised:

• 1994 - 1997   Dr. Luke Schubert.
Ph.D. Thesis title: *Spectral properties of the Laplacian on p-forms on the Heisenberg group*, (**Ph.D.** awarded 1997) University of Adelaide, (jointly with Alan Carey).
Australian Postgraduate Award. Currently working at DSpace Pty Ltd, Mawson Lakes, SA.

- 1999 - 2002   Dr. Stuart Yates.
  Ph.D. Thesis title: *Properties and applications of the vector Harper operator*,
  (**Ph.D.** awarded 2002) University of Adelaide. Australian Postgraduate Award.
  Completed a 1 year postdoctoral fellowship at the Max Planck Institute, Bonn, Germany.
  Completed a 2 year JSPS postdoctoral fellowship at Meiji University in Tokyo, Japan.
  Currently Chief Scientist, Archimedes Consulting, Adelaide.

- 2005 - 2009   Dr. Rongmin Lu,
  Ph.D. Thesis title: *Regularized Equivariant Euler Classes and Gamma Functions*,
  (**Ph.D.** awarded 2009) University of Adelaide.
  Junior Research Fellowship, Erwin Schrödinger Institute, Vienna, Mar.-April '09, June-Nov. '10.

- 2006 - 2009   Dr. Raymond Vozzo,
  Ph.D. Thesis title: *Loop groups, Higgs fields and generalized String classes*,
  (**Ph.D.** awarded 2009) University of Adelaide (jointly with Michael Murray).
  Australian Postgraduate Award, currently an ARC Research Associate at Adelaide.

- 2005 - 2009   Dr. David Roberts,
  Ph.D. Thesis title: *Homotopy bigroupoids and 2-covering spaces*,
  (**Ph.D.** awarded 2010) University of Adelaide (jointly with Michael Murray and J. Stasheff).
  Australian Postgraduate Award.

- 2006 - 2009   Dr. Richard Green,
  Ph.D. Thesis title: *A Fourier-Mukai transform for invariant differential characters*,
  (**Ph.D.** awarded 2011) University of Adelaide (jointly with Michael Murray).
  Australian Postgraduate Award, Junior Research Fellowship, Erwin Schrödinger Institute, Vienna,

- 2007 - 2011   Dr James Wallbridge,
  Ph.D. Thesis title: *Higher Tannaka duality*,
  (**Ph.D.** awarded 2011) University of Adelaide and Universite Paul Sabatier (jointly with Michael Murray and Bertand Toen)
  Divisional Scholarship, University of Adelaide.

M.Sc. students supervised:

- 1994 - 1998   Mr. Stuart Yates.
  M.Sc. Thesis title: *Discrete Morse theory and L^2 homology*,
  (**M.Sc. (research)** awarded March 1998) University of Adelaide.

- 2004   Mr. Rongmin Lu,
  M. Sc. Thesis title: *K-theory and a twisted analogue*,
  (**M.Sc.** awarded 2004) University of Adelaide.

- 2006   Mr. David Baraglia,
  M.Sc. Thesis title: *Generalized Geometry*
  (**M.Sc. (research)** awarded 2006) University of Adelaide. (secondary supervisor)

B.Sc. (Honours) students supervised:

- 2003   Mr Ben Dolman,
  B. Sc. (Honours) Thesis title: *Towards the cyclic cohomology of surface group algebras*,

(**B.Sc. (Honours)** awarded 2003) University of Adelaide.
Wazim Hasan and Amir Hasan Abdi Prize-winner 2003, University medal winner 2004.

- 2004   Mr Tyson Ritter,
  B. Sc. (Honours) Thesis title: *The Atiyah-Singer index theorem for Dirac type operators,*
  (**B.Sc. (Honours)** awarded 2004) University of Adelaide.
  Wazim Hasan and Amir Hasan Abdi Prize-winner 2004, University medal winner 2004.

- 2005   Mr. Richard Green,
  B. Sc. (Honours) Thesis title: *Introduction to equivariant cohomology*
  (**B.Sc. (Honours)** awarded 2005) University of Adelaide.

- 2010   Mr Michael McInerney,
  B. Sc. (Honours) Thesis title: *Tannaka-Krein duality*
  (**B.Sc. (Honours)** awarded 2010) University of Adelaide.(jointly with M. Murray)

- 2011   Mr. Adrian Fernandez Tojo, ,
  B. Sc. (Honours) Thesis title: *Birkhoff Decomposition Applied to Holomorphic Bundles*
  (**B.Sc. (Honours)** awarded 2011) University of Adelaide.

Currently co-supervising the following postgraduate students:

- Mr Joshua Garretson, Ph. D. (at ANU, jointly with P. Bouwknegt)
- Mr Ryan Mickler, M.Sc. (research).

8. POSTDOCTORAL (SENIOR) RESEARCH ASSOCIATES MENTORED ON MY ARC GRANTS:

2002	Dr. Stuart Yates	ARC Research Associate (part time)
2003-2004	Dr. Avijit Mukherjee	ARC Senior Research Associate;
2003-2005	Dr. Hisham Sati	ARC Research Associate
2007 (April-August)	Dr. Partha Sarathi Chakraborty	DEET Endeavour India Executive Awardee
2008-2009	Dr. Partha Sarathi Chakraborty	ARC Senior Research Associate
2009 (Nov, 3 months)	Dr. Stuart Yates	ARC Research Associate (part time)
2010-2012	Dr. Snigdhayan Mahanta	ARC Research Associate IGA postdoctoral fellow
2011-2012	Dr. Pedram Hekmati	ARC Research Associate IGA postdoctoral fellow

9. COLLABORATIONS (CURRENT):

- Institute Professor Isadore M. Singer, Massachussetts Institute of Technology, MA, USA;
- Simons Professor Richard B. Melrose, Massachussetts Institute of Technology, MA, USA;
- Ruth M. Davis Professor Jonathan Rosenberg, University of Maryland, Maryland, USA;

- Billmeir Fellow Dr. Keith Hannnabuss, Balliol College, Oxford University, UK;
- Chengkong Scholar Professor Weiping Zhang, Chern Institute of Mathematics, Nankai, China;
- Professor Peter Bouwknegt, Dept of Mathematics & Dept of Physics, ANU;
- A/Professor Siye Wu, Department of Math., Hong Kong U., HK and U. Colorado, Boulder, USA.

10. REFEREEING OF PAPERS SUBMITTED TO JOURNALS:

I referee articles for almost all the major international mathematical journals, including the following:
J. of Func. Anal., J. High Energy Phys, Commun. in Anal. Geom., J. AustMS, Bull. AustMS, Commun. in Math. Phys., Adv. Math., Trans. AMS, Proc. AMS, J. Phys. A: Mathematical and Theoretical, Proc. LMS., Rev. Math. Phys., Math. Annalen, Annals of Math.(2), J. Amer. Math. Soc., Duke Math. J., J. Diff. Geom., Commun. Math. Phys.

11. REFEREEING OF GRANT AND FELLOWSHIP APPLICATIONS:

I assess research and fellowship proposals for the following funding bodies:-
- Australian Research Council;
- National Science Foundation (USA);
- Israel Binational Science Foundation (Israel);
- Austrian Science Fund (FWF).

12. SEMINARS ORGANIZED:

- I co-organize the Differential Geometry seminar (Institute for Geometry and its Applications)
`http://www.maths.adelaide.edu.au/groups/iga/dgwg.html`
- I organize and speak at the Mathematical String Theory journal club that meets weekly.
`http://www.maths.adelaide.edu.au/people/vmathai/stringsJC.html`

13. TEACHING EXPERIENCE:

- 1986-87, Have taught a year-long freshman courses in *Calculus* and also in *Advanced Calculus*, at the University of Chicago;
- 1990-2000, have taught Honours level courses at University of Adelaide in the following areas:
Differential Geometry (twice), *Algebraic Topology* (thrice), *Analysis on manifolds* (once);
- 2000: Have given a lecture series at Singers MIT research course.
- 2001, 2002, 2003: Taught 3rd year courses entitled *Integration and Analysis III* at University of Adelaide.
- 2004, 2005, 2007, 2008, 2010, 2011: Taught Honours (4th year) courses entitled *Distributions and Partial Differential Equations IV* at University of Adelaide.
- 2006: Taught a semester-long course of advanced graduate lectures (40) entitled *K-theory and Physics*, (7th March - 30th June, 2006), at the Erwin Schrödinger Institute, Vienna, Austria.
`http://www.esi.ac.at/activities/archive/K-TheorySS06.html`

14. Administration (recent):

2011, **Chair**, selection committee for the **Gavin Brown Prize** of the AustMS.
2011, Member of the appointments committee and search committee for a permanent (level E) professorial position, University of Adelaide.
2010-2011, Member of the selection committee for a permanent (level B) position, University of Adelaide.
2009 –, **Director**, Institute for Geometry and its Applications, University of Adelaide.
2010–, Member, Advisory committee, *Gazette of the Australian Mathematical Society*.
2009-2010, Member, appointments committee and search committee for a continuing (level E) professorial position, University of Adelaide.
2006 - 2009, **Vice-President** (in charge of Annual Conferences), Australian Mathematical Society (AustMS).
2006 - 2009, member, Steering Committee, AustMS.
2006 - 2009, ex-officio member, Council of the AustMS.
2007, Member, program committee for the AustMS annual conference, Latrobe University.
2008, **Convenor** of the Oz program committee for the 7th Australia - New Zealand Mathematics Convention, Christchurch, NZ.
2009, Member, program committee for the AustMS annual conference, UniSA.
2010, Member, program committee for the AustMS annual conference, UQ.
2009, **Chair**, selection committee for the **Mahler Lecturer** (Terrence Tao selected).
2008, Member, selection committee for a continuing (level B) lecturer position, University of Adelaide.
2008 - 2010, **Ozreader** for the ARC.
2007, Member, selection committee for the **Mahler Lecturer** (Mark Kisin selected).
2007, Member, selection committee for the **AustMS medal**.
2005, Member, selection committee for a continuing (level C) position, University of Adelaide.
2005 –, Member, Research Committee, School of Mathematical Sciences, University of Adelaide.
2001, **Intreader** for the ARC.

15. International conferences, workshops and mini-spring schools (co) organized:

Major conferences co-organized:-

• 2011; Have co-organized an international workshop funded by IGA and AMSI, *Group-valued moment maps with applications to mathematics and physics*, with principal speaker Eckhard Meinrenken (IGA Lecturer, U. Toronto, Canada), held at U. Adelaide, Conference Room 7.15, Level 7, Innova 21 building, 5-9 September 2011. `http://www.iga.adelaide.edu.au/workshops/WorkshopSept2011/`

• 2010; Have co-organized an international workshop funded by IGA and AMSI, *Dirac Operators in Geometry, Topology, Representation Theory, and Physics*, with principal speaker Dan Freed (IGA Lecturer, U. Texas at Austin), held at U. Adelaide, Conference Room 7.15, Level 7, Innova 21 building, 18-22 October 2010. `http://www.iga.adelaide.edu.au/workshops/WorkshopOct2010/index.html`

• 2010; Have co-organized a conference entitled *Geometry and Quantum Field Theory* at *Max Planck Institute*, Bonn, to celebrate Alan Carey's sixtieth birthday, June 20-26. (€27,000/- funded by MPIM) The webpage for the conference is,
`http://www.mpim-bonn.mpg.de/Events/This+Year+and+Prospect/Geometry+and+Quantum+Field+Theory/`

• 2009; Have co-organized an IGA and AMSI funded Workshop on New Currents in Geometry in Australia, highlighting the work of early career researchers,16-18 November, University of Adelaide. ($ 12,000/- funded). The webpage for the workshop is,
`http://www.iga.adelaide.edu.au/WorkshopNov09.html`

• 2006   Have co-organized an AMSI funded ($23,500/-) and IGA funded ($16,000/-) international workshop entitled *Mathematics of String Theory 2006* held at ANU, Canberra July 13 - 23. The webpage for the workshop is, `http://tpsrv.anu.edu.au/Members/bouwknegt/MOST06`

• 2005   Have co-organized an AMSI funded ($26,500/-) international workshop entitled *Noncommutative geometry and Index theory* that was held at ANU, Canberra in July 22 - August 1. The webpage for the workshop is, `http://wwwmaths.anu.edu.au/events/ngit05/`

Other conferences and instructional schools co-organized:-

• 2009; Have co-organized an IGA Mini Winter School entitled *Geometry and Physics* held on July 20-23, at the University of Adelaide. [2]

• 2008; Have co-organized the *Geometry and Analysis special session* in the 7th Australia-New Zealand Mathematics Convention, University of Canterbury, Christchurch, New Zealand, December 8 -12. `http://www.math.canterbury.ac.nz/ANZMC2008/special-sessions/\#GeometryAnalysis`

• 2006; Have co-organized the *Differential Geometry special session* in the 50th AustMS annual meeting, Macquarie University, September 23-29. `http://www.maths.mq.edu.au/austms06/session05.html`

• 2006   Have organized an international IGA satellite workshop to the *Mathematics of String Theory 2006* workshop, held on July 27th, 2006 at the University of Adelaide.

• 2005   Have organized an international IGA workshop entitled *Geometry and Physics* in honour of Keith Hannabuss's 60th birthday, held on April 11 at the University of Adelaide, Australia.

• 2004   Have co-organized an IGA Mini Spring School entitled *Noncommutative Geometry and String Theory* held held on 13-15 at the University of Adelaide.

• 2004   Have co-organized an international IGA workshop entitled *Strings and Mathematics 2004* held on March 29-30 at the University of Adelaide.

• 2003   Have co-organized an international IGA workshop entitled *Strings and Mathematics 2003* held held on May 26-28 at the University of Adelaide.

• 2002 Have co-organized an international IGA workshop entitled *Noncommutative geometry and the fractional quantum Hall effect* held on August 5 and 6, 2002 at the University of Adelaide.

• 2002   Have co-organized an IGA Mini Spring School entitled *An Introduction to the mathematics of String Theory* held held on November 18-22, 2002 at the University of Adelaide.

• 2002   Have also co-organized an international IGA workshop entitled *Workshop on Noncommutative Geometry K-theory, and String Theory* held on January 7 and 8, 2002 at the University of Adelaide.

• 1999   Have co-organized a major international IGA workshop entitled *Fractional quantum Hall effect on the eve of the new millennium* held on August 16-20, 1999 at the National Institute for Theoretical Physics (NITP) at the University of Adelaide.

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[2]The IGA workshop webpages can be found at, `http://www.iga.adelaide.edu.au/workshops.html`

I have been an invited visitor to prestigious universities and research centres worldwide to give research seminars, colloquia as well as lecture series. I am usually invited to 4-6 international conferences annually, and often have been keynote and plenary speaker.

Selected recent invited addresses

- Plenary speaker at the Mathematical Institute (University of Oxford) *K-theory Day* in honour of the Fields medalist, Prof Daniel G. Quillen, at the occasion of his retirement, May 22, 2006;
- Plenary speaker, *Journal of Geometry and Physics congress*, SISSA International School for Advanced Studies, Trieste, Italy, June 24-28, 2006.
- Plenary speaker (3 talks) *21st Nishinomiya-Yukawa Memorial Symposium*, 11- 15 November, 2006, at Nishinomiya and Kyoto, Japan.
- Plenary speaker, *Geometry and Analysis on Manifolds* April 8-14, 2007, at the Chern Institute of Mathematics, Nankai University, Tianjin, China.
- Keynote speaker, special session in *Mathematical Physics* 51st Annual Meeting of the Australian Mathematical Society, 25-28 September 2007 at LaTrobe University, Melbourne.
- Keynote speaker, 21st Century, Center of Excellence (COE) Program on *Exploring New Science by Bridging Particle-Matter Hierarchy*, Tohoku University, Sendai, Japan, 13-15th Dec 2007.
- Plenary speaker, *Motives, Quantum Field Theory, and Pseudodifferential Operators*, Boston University, Boston, USA, June 2-13, 2008.
- Plenary speaker, *From Wave Propagation to K-theory: a Conference in Honour of the 60th Birthday of Richard Melrose*, Stanford University, October 25-26, 2008.
- Plenary speaker, *Noncommutative Geometric Methods in Global Analysis, a conference in honor of Henri Moscovici*, Hausdorff Center for Mathematics, Bonn, Germany, June 29-July 4, 2009.
- Keynote speaker, special session in *Noncommutative Geometry*, 54th Annual Meeting of the Australian Mathematical Society, at U. Queensland, Brisbane, 27 to 30 September 2010.

Selected recent invited lecture series

- Invited lecture series entitled, *K-theory and Physics* (40 lectures) at the Erwin Schrodinger Institute (Vienna) 7th March-30th June, 2006.
  `http://www.esi.ac.at/activities/archive/K-TheorySS06.html`
- Keynote speaker (4 talks) *Workshop on index theory of singular spaces*, November 28th, 2006, Radboud U., Nijmegen, Holland.
- Plenary lecturer, lecture series of 5 lectures entitled, *Noncommutative geometry and the fractional quantum Hall effect* , International School and Conference of Noncommutative Geometry, Aug. 15-30, 2007, Chern Institute of Mathematics, Nankai University, Tianjin, China.
  `http://www.nim.nankai.edu.cn/activites/conferences/hy20070815/program.htm`
- Invited Lecture-series (3 lectures), *RIMS International Conference on Noncommutative Geometry and Physics*, RIMS, Kyoto University, Kyoto, Japan, November 8-12, 2010.
  Invited Lecture-series (3 lectures), Global Centre of Excellence (GCOE), Tohoku University, Sendai, Japan, November 13-20, 2010.

Selected recent visiting appointments

- Annually appointed Visiting Scholar at MIT for a month on average (since 2000).
- Visiting Professor, CNRS-Metz, Université Paul Verlaine, Metz, France, for a period of 3 months in 2011, mid June-mid July, October-November.

- Appointed research member at the Mathematical Sciences Research Institute (Berkeley) for a period of 2 weeks in October/November 2008.
- Appointed Mathematical Sciences Research Visitors Program visitor, ANU, Canberra, for 2 months in July/August 2007.

Other recent invitations

(1) Plenary speaker, *Twisted K-theory and Gerbes*, Clermont-Ferrand on March 24-25, 2006.
(2) Invited speaker, *Noncommutative Geometry* at BIRS, Banff (Canada), April 8-13, 2006.
(3) Invited speaker at the MFO, Oberwolfach conference entitled *Zeta Functions, Index and Twisted K-Theory; Interactions with Physics*, Germany, April 30 - May 6, 2006.
(4) Invited speaker at the Erwin Schrodinger Institute (Vienna) conference *Gerbes, Groupoids, and Quantum Field Theory*, May 9-13, 2006.
(5) ZMP colloquium speaker (DESY, U. Hamburg, Germany), June 1, 2006.
(6) Invited speaker at the workshop *Mathematics of String Theory 2006* held at ANU, Canberra July 13 - 23, 2006.
(7) Visiting Scholar, Department of Mathematics, MIT, Cambridge, MA, USA, Oct. 2nd - 30th, 2006.
(8) Invited seminar speaker, 20th November, 2006, U. Amsterdam, Holland.
(9) Colloquium speaker, 23rd November, 2006, U. Utrecht, Holland.
(10) Joint Mathematics-Physics Seminar speaker, November 24th, 2006, U. Utrecht, Holland.
(11) Invited speaker, *8th Pacific Rim Geometry Conference*, 11-15 December 2006, Murramarang Resort, South Durras, NSW.
(12) Keynote speaker, *Gus Lehrer's 60th birthday conference*, U. Sydney, July 9-13, 2007.
(13) Invited visitor and seminar speaker at University of Helsinki, Helsinki, Finland, 28-31st Oct 2007.
(14) Visiting scholar and seminar speaker at MIT, Cambridge, MA, USA, 1- 13th Nov 2007.
(15) Invited speaker, *Conference on Noncommutative Geometry*, Hausdorff Research Institute for Mathematics, Bonn, Germany, July 27 - August 02, 2008.
(16) Plenary speaker, *Algebras, Operators and Noncommutative Geometry*, ANU, Canberra, 1-5 December, 2008.
(17) Invited speaker, *7th Australia-New Zealand Mathematics Convention*, Christchurch, New Zealand, 8-12 December, 2008.
(18) Invited speaker, *NSF String Theory conference*, Fortworth, Texas, 17-21 May, 2009.
(19) Invited participant, *Perspectives in Geometry and Physics, a conference in celebration of Isadore Singer's $85^{t}h$ birthday*, Harvard University and MIT, Cambrdge, Massachusetts, 21-24 May, 2009.
(20) Invited speaker, *1st PRIMA Congress*, UNSW, Sydney, July 6-10, 2009.
(21) Invited speaker, special session in *Mathematical Physics*, 53rd Annual Meeting of the Australian Mathematical Society, 28 September - 1st October, 2009, at UniSA.
(22) Invited speaker, *Noncommutative Geometry and Loop Quantum Gravity: Loops, Algebras and Spectral Triples*, MFO, Oberwolfach, 7-13 February, 2010.
(23) Visiting scholar at MIT, Cambridge, MA, USA, 27 April-28th May, 2010.
(24) Invited speaker, *Geometry, Quantum Fields and Strings: Categorical Aspects*, MFO, Oberwolfach, 6-12 June, 2010.
(25) Invited speaker at Hitchin's Geometry seminar and also the Quantum Theory seminar, Oxford University, 12-20 June, 2010.
(26) Invited speaker, *ICM 2010 Satellite conference on operator algebras*, Institute of Mathematical Sciences, Chennai, August 9-13, 2010.
(27) Invited speaker, *Geometric Quantization in the Non-compact Setting*, MFO, Oberwolfach, February 13-19, 2011.
(28) Invited speaker, *Workshop on Geometry and Lie Groups*, Hong Kong U., Hong Kong, 25-26 March, 2011.
(29) Invited speaker, *Index Theory and Hopf Algebras*, Vanderbilt University, Nashville, USA, May 9-18, 2011.

(30) Invited speaker, *Topology and Analysis in Interaction*, in Cortona, Italy, June 6-10, 2011.

(31) Invited speaker, *Noncommutative Geometry*, MFO, Oberwolfach, Germany, September 11-17, 2011

17. Twenty (20) career best publications in Mathematics and Mathematical Physics:

17.1. **Current list of ten best refereed publications in Mathematics.** :

(1) **V. Mathai** and D.G. Quillen,
Superconnections, Thom classes and equivariant differential forms,
Topology, **25** (1986) 85-110.
This publication has received recent publicity in the **Wikipedia encyclopedia**,
`http://en.wikipedia.org/wiki/Mathai_Varghese`
163 citations in ISI

(2) **V. Mathai**
L^2 Analytic torsion,
Journal of Functional Analysis, **107** (1992) 369-386.
27 citations in ISI

(3) **V. Mathai** and S. Wu,
Equivariant holomorphic Morse inequalities: a heat kernel proof,
Journal of Differential Geometry, **46** (1997) 78-98.

(4) A. Carey, M. Farber and **V. Mathai**,
Determinant Lines, Von Neumann algebras and L^2 torsion,
J. fur die Reine und Angewandte Mathematik (Crelle Journal),
484 (1997) 153-181.

(5) **V. Mathai**,
K-theory of twisted group C^*-algebras and positive scalar curvature,
Contemporary Mathematics, **231** (1999) 203-225.

(6) J. Dodziuk, P. Linnell, **V. Mathai**, T. Schick and S. Yates,
Approximating L^2-invariants and the Atiyah conjecture,
Communications on Pure and Applied Mathematics, **56**, no. 7, (2003), 839-873.
22 citations in ISI

(7) Y. Kordyukov, **V. Mathai** and M.A. Shubin,
Equivalence of spectral projections in semiclassical limit and a vanishing theorem for higher traces in K-theory,
J. fur die Reine und Angewandte Mathematik (Crelle Journal), **581** (2005), 193 - 236.

(8) **V. Mathai**, R.B. Melrose and I.M. Singer,
Fractional Analytic Index, & Equivariant and fractional index of projective elliptic operators,
Journal of Differential Geometry,
74 no. 2 (2006) 265-292; **78** no.3 (2008) 465-473.

(9) **V. Mathai** and D. Stevenson,
On a generalized Connes-Kostant-Hochschild-Rosenberg theorem.
Advances in Mathematics,
200 no. 2 (2006) 303-335.

(10) **V. Mathai** and W. Zhang,
Geometric quantization for proper actions,
Advances in Mathematics,
225 no. 3 (2010) 1224–1247.

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17.2. Current list of ten best refereed publications in Mathematical Physics:

(1) A. Carey, K. Hannabuss, **V. Mathai** and P. McCann,
Quantum Hall Effect on the hyperbolic plane,
Communications in Mathematical Physics, **190** No. 3 (1998) 629-673.
37 citations in ISI

(2) M. Marcolli and **V. Mathai**,
Twisted index theory on good orbifolds, II: fractional quantum numbers,
Communications in Mathematical Physics, **217** no.1 (2001) 55-87.

(3) P. Bouwknegt, A. Carey, **V. Mathai**, M. Murray and D. Stevenson,
Twisted K-theory and K-theory of bundle gerbes,
Communications in Mathematical Physics, **228**, no. 1, (2002) 17-49.
48 citations in ISI

(4) **V. Mathai** and D. Stevenson,
Chern character in twisted K-theory: equivariant and holomorphic cases,
Communications in Mathematical Physics, **236**, no. 1 (2003), 161-186.

(5) P. Bouwknegt, J. Evslin and **V. Mathai**,
Topology and H-flux of T-dual manifolds,
Physical Review Letters, **92**, 181601 (2004) [`arXiv:hep-th/0312052`].
23 citations in ISI

(6) P. Bouwknegt, J. Evslin and **V. Mathai**,
T-duality: Topology Change from H-flux,
Communications in Mathematical Physics, **249** no. 2 (2004) 383-415
56 citations in ISI

(7) **V. Mathai** and J. Rosenberg,
T-duality for torus bundles via noncommutative topology,
Communications in Mathematical Physics, **253** no.3 (2005) 705-721.
21 citations in ISI

(8) J. Dodziuk, **V. Mathai** and S. Yates,
Arithmetic properties of eigenvalues of generalized Harper operators on graphs,
Communications in Mathematical Physics, **262** no. 2 (2006) 269-297.

(9) P. Bouwknegt, K. Hannabuss and **V. Mathai**,
Nonassociative tori and applications to T-duality,
Communications in Mathematical Physics, **264** no. 1 (2006) 41-69.
29 citations in ISI

(10) J. Brodzki, **V. Mathai**, J. Rosenberg and R. Szabo,
D-Branes, RR-Fields and Duality on Noncommutative Manifolds,
Communications in Mathematical Physics, **277**, no.3 (2008) 643-706.

18. Institute for Geometry and its Applications (IGA)

A University-Designated Research Centre and the research arm of the Discipline of Pure Mathematics in the School of Mathematical Sciences at University of Adelaide, the Institute for Geometry and its Applications (IGA) `http://www.iga.adelaide.edu.au/`, was founded on the 7th of November 1996, in recognition of the strong group of researchers in geometry and its applications at Adelaide, with its inaugural director being Professor Michael Eastwood (Federation Fellow, MSI, ANU). The IGA organises symposia, workshops, instructional schools and regular seminars. The IGA also provides collaborative opportunities to promote research in geometry.

Since my appointment as Director of the Institute for Geometry and its Applications (IGA), I have helped the IGA secure the highly competitive ECMS faculty research funding ($130K in 2009-2010 and $108K in 2010-2011) for the first time ever. Using this funding, I have arranged a new initiative, the *IGA Lecturerships*, where prominent mathematicians with exceptional expository skills are invited to give lecture series on hot topics of research. These include,

• February 2009, Dr Partha Chakraborty, (Adelaide and MSI, Chennai) *An introduction to Kontsevich's deformation quantization of Poisson manifolds*,
• January 2010, Prof Frank Kutzschebauch (University of Berne, Switzerland) *Group Actions in Complex Analytic Geometry*,
• July 2010, Dr Mohammed Abouzaid (Clay Research Fellow, MIT) *An introduction to Mirror Symmetry and the Fukaya Category*,
• October 2010, Prof. Dan Freed (University of Texas at Austin) *Dirac Operators in Geometry, Topology, Representation Theory, and Physics*,
• September 2011, Prof Eckhard Meinrenken (University of Toronto, Canada), *Group-valued moment maps with applications to mathematics and physics*.
`www.iga.adelaide.edu.au/lectureseries.html`.

Another new IGA initiative, jointly with Prof Michael Murray, is the appointment of two new IGA postdoctoral fellows (Dr Pedram Hekmati and Dr Snigdhayan Mahanta) for a couple of years (2010-2012), partly funded by ECMS faculty research funding and partly funded by ARC DP grants of mine and Murray's.
`www.iga.adelaide.edu.au/igapostdocs.html`

• In 2010, the IGA has been recognized as being one of the University's Research Expertise and Strengths in the fundamental disciplines, `http://www.adelaide.edu.au/research/our/`.
• In the 2010 Excellence in Research for Australia (ERA) nationwide rankings, pure mathematics at Adelaide received an impressive score of 4 (out of 5), rating it above world standard,
`http://www.iga.adelaide.edu.au/Mathematics-ERA_s4.pdf`