Mandyam Veerambudi <u>Srinivasan</u>

Queensland Brain Institute
Building 79
The University of Queensland
St. Lucia, QLD 4072
Australia
Date of birth: 15 September 1948
Citizenship: Australian

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Current position

University of Queensland Senior Professorial Research Fellow
Emeritus Professor of Visual and Sensory Neuroscience and Electrical Engineering
Queensland Brain Institute
and
School of Information Technology and Electrical Engineering
University of Queensland

Research Interests

I am interested in understanding the principles of visual processing and navigation in small animals, such as insects and birds, that possess relatively simple nervous systems but nevertheless display a rich behavioural repertoire. My research seeks to elucidate principles of visual flight control and navigation, as well as to explore the limits of the "cognitive" capacities of small brains.

Insights into the visual guidance of flight in insects and birds are providing simple, novel solutions to problems in machine vision and artificial intelligence. Thus, another focus of my research is the design of biologically-inspired algorithms for 'seeing' machines, and the development of autonomously navigating robots.

Academic qualifications

1994: D.Sc. in Neuroethology, Australian National University.

1977: Ph.D. in Engineering and Applied Science, Yale University, New Haven, Connecticut, U.S.A.
    Thesis: *Movement perception by the visual system of the fly*

1972: M.Phil. in Engineering and Applied Science, Yale University, New Haven Connecticut, U.S.A.

1970: Masters' degree in Applied Electronics & Servomechanisms (High Distinction),
    Indian Institute of Science, Bangalore, India

1968: Bachelors' degree in Electrical Engineering (First Class), Bangalore University, India

Awards and Distinctions

2017: Election to Fellowship of the German National Academy of Sciences, Leopoldina

2015: Portrait, National Portrait Gallery of Australia

2015: Election to Council, Australian Academy of Science

2104: Harold Spencer-Jones Gold Medal of the Royal Institute of Navigation, London.

2014: Election to Fellowship of the Royal Institute of Navigation, U.K. (FRIN)

2014: Inaugural Queensland Science Champion Award

2014: Australian Research Council Distinguished Outstanding Researcher Award (DORA)
    (2014-2016)

2013: University of Queensland Senior Professorial Research Fellowship
    (2013-2015)

2012: Membership of the Order of Australia (AM)

2011: Featured in *Interviews with Australian Scientists*, Australian Academy of Science\
    (http://www.sciencearchive.org.au/scientists/interviews/s/mvs.html)

2009: Distinguished Alumni Award, Indian Institute of Science

2008: Rank Prize in Optoelectronics (U.K.)

2008: Queensland Smart State Premier's Fellowship, 2008-2012

2006: Prime Minister's Science Prize (Australia)
    (This is Australia's top award for scientific achievement: one is awarded each year)

2006: Election to the World Academy of Sciences (FTWAS)

2006: 2006 Royal Society of New Zealand Distinguished Visitor

2003:   Australian Centenary Medal

2002:   Doctor honoris causa (Dr.h.c.), University of Zürich

2001:   Australasian Science Prize

2001:   Inaugural Australian Federation Fellowship award of the Australian Research Council

2001:   Election to the Fellowship of the Royal Society of London (FRS).

1996-97: Daimler-Benz Fellow, Institute of Advanced Studies (Wissenschaftskolleg), Berlin.

1995:   Election to the Fellowship of the Australian Academy of Science (FAA).

1995:   CEA Technologies Prize (together with Javaan Chahl, Martin Nagle and Peter Sobey) for the invention of a Panoramic Video Imaging System, judged the most promising innovation.

1994:   D.Sc. in Neuroethology, Australian National University.

1973:   Marshall, M.Phil. Degree Ceremony, Yale University.

1970:   Khambatti Memorial Award for top graduate student in Electrical Engineering,
        Indian Institute of Science, Bangalore.

1967:   First rank (out of ca. 500 students), Fourth Year Electrical Engineering, Bangalore University.

Previous Appointments

2013-2014, 2017-2019: University of Queensland Senior Professorial Research Fellow
2014-2017:   Vice Chancellor's Senior Professorial Research Fellowship, University of Queensland
2014-2016:   ARC Distinguished Outstanding Researcher

2008-2012:   Queensland Smart State Premier's Fellow

2002-2006:   Inaugural Federation Fellow, Australian Research Council

2002-2006:   Distinguished Professor of Visual Science, Research School of Biological Sciences,
                Australian National University

1994 - 2002:   Professor of Visual Science, Research School of Biological Sciences,
                Australian National University

1994-96,
2000-2006:   Director, Centre for Visual Science, Australian National University

1992-93:   Senior Fellow, Visual Sciences, Research School of Biological Sciences,
                Australian National University, Canberra, Australia

1985-91:   Fellow, Visual Sciences, Research School of Biological Sciences, Australian   National
                University, Canberra, Australia

1982-85:   Assistant Professor of Biophysics, Department of Neurobiology, University of Zürich,
                Switzerland.

1978-82:   Research Fellow, Departments of Neurobiology and Applied Mathematics, Australian
                National University, Canberra, Australia

1977-78:   Research Scientist, Department of Ophthalmology and Visual Science, Yale University
                School of Medicine, New Haven, Connecticut, U.S.A.

Editorial Activities

Editorial Board membership (past and present): *Vision Research, Journal of Comparative Physiology (A), Journal of Insect Physiology, Australian Journal of Intelligent Information Processing Systems,*

PLOS Biology, IEEE Transactions on Pattern Analysis and Machine Intelligence, Advances in Artificial Neural Systems

Over the past 10 years, articles were refereed for the following journals:

Nature, Science, Current Biology, PLOS Biology, PLOS One, Proceedings of the Royal Society (B), Proceedings of the National Academy of Science, Behavioral and Brain Sciences, Journal of Comparative Physiology A, Visual Neuroscience, Naturwissenschaften, Journal of Experimental Biology, PLoSOne, Journal of Guidance, Control and Dynamics, Animal Behaviour, Autonomous Roots, Physiology & Behavior, Ethology, Journal of Insect Physiology, Canadian Journal of Zoology, Apidologie, Neural Computation, Neural Networks, Journal of Neuroscience, Computational Neuroscience, IEEE Transactions on Pattern Analysis and Machine Intelligence, Australian Journal of Intelligent Information Processing Systems, Nature Scientific Reports.

Teaching experience*

Year/ Semester	Course Code & Name	Total formal classroom contact hours per semester.	Class size and percentage contribution
2015	Biol 3239 (Invertebrate Neuroethology)	1 hr	Class size: 20 students Guest lecture
2015	Neur 7004 (Systems Neuroscience)	3 hrs	Class size: 12 students (Team teaching as one of 10 lecturers) + assignment grading
2014	Neur 7004 (Systems Neuroscience)	3 hrs	Class size: 12 students (Team teaching as one of 10 lecturers) + assignment grading
2014	Neur 7004 (Systems Neuroscience)	3 hrs	Class size: 12 students (Team teaching as one of 10 lecturers) + assignment grading
2012	Biol 3239 (Invertebrate Neuroethology)	1 hr	Class size: 20 students Guest lecture
2012	Neur 7004 (Systems Neuroscience)	3 hrs	Class size: 12 students (Team teaching as one of 10 lecturers) + assignment grading
2011	Biol 3239 (Invertebrate Neuroethology)	1 hr	Class size: 20 students Guest lecture
2011	METR4202 Advanced Control	2 hrs	Class size: 30 students Guest lecture
2010	Neur7004 (Systems Neuroscience)	3 hrs	Class size: 7 students (Team teaching as one of 12

			lecturers) + assignment grading
2010	METR4202 Advanced Control	2 hrs	Class size: 30 students Guest lecture
2010	Second Queensland Brain Institute Short Course in Computational Neuroscience	1.50 hrs	Class size: 21 students Team teaching with 8 lecturers: My contribution was about 5%.
2009	One-week course on *Animal Navigation* conducted by the University of Queensland and the AustralianNational University	3 hrs total	I was one of the lecturers, contributing 15% of the total course instruction. **(Note: This was teaching was purely voluntary; my contract did not require it)**
2008	Engg 7300 *Biorobotics (Advanced Topics in Engineering I)* **(**This is a new course, introduced for the first time this semester)	10	Class size: 1 student. Nature of course: Reading/Discussion/Essay writing. Course is taught by a team of 3 staff. I contribute 33% as a lecturer.
2002-2006	One-week course on *Animal Navigation* conducted by the Centre for Visual Sciences, Australian National University	6 hrs each year	I was one of the lecturers, contributing 25% of the total course instruction. **(Note: This was teaching was purely voluntary; my contract did not require it)**
2003-2006	Undergraduate course, *Current Research in Animal Physiology,* Dept. of Botany and Zoology, Australian National University (lectures and laboratory sessions)	26 hrs each year	I was one of the lecturers, contributing 25% of the total course instruction. **(Note: This was teaching was purely voluntary; my contract did not require it)**
August 1999, 2000, 2001	*Invited lecturer, course on* Methods in Computational Neuroscience*, Marine Biological Laboratory, Woods Hole, Massachusetts, USA*	18 hrs per year	I was one of the lecturers, contributing 10% of the total course instruction.
1982-1985	*Graduate-level course on* Biological Cybernetics	28 hrs per semester	100%. I was the course designer, co-ordinator, organizer and lecturer.

			Lecturing was in the German language
1982-1985	*Graduate-level course on* Laboratory Computers and Biological Applications	28 hrs per semester	100%. I was the course designer, co-ordinator, organizer and lecturer. Lecturing was in the German language

* Faculty at the Australian National University's Institute of Advanced Science, and at the Queensland Brain Institute, University of Queensland do not have a formal obligation to teach. They engage in research full-time, as in Germany's Max-Planck Institutes. I teach part-time on a voluntary basis because (a) I enjoy it, and (b) it offers an opportunity to attract Ph.D. students.

Student awards:

Allen Cheung: Australian National University Crawford Medal for the best University Ph.D. thesis in the Sciences, 2008

Gavin Taylor, Ph.D. student, University of Queensland: Best student presentation award, ACEVS annual meeting, 26-28 March 2011.

Nicola Holmes, Honours student, University of Queensland: IEEE Student Prize for the Best Final Year Thesis in All Fields of Electrical Engineering and Information Technology in Queensland, 2011.

Samuel Baker, Ph.D. student, University of Queensland: Best student presentation award, ACEVS annual meeting, 24-27 February 2012.

Gavin Taylor, Ph.D. student, University of Queensland: Best student paper award, Queensland Brain Institute, 2013. Publication: Taylor GJ, Luu T, Ball D & Srinivasan MV (2013): Vision and air flow combine to streamline flying honeybees. *Scientific Reports* 3: 2614. DOI: 10.1038/srep02614

Reuben Strydom, Ph.D. student, University of Queensland: Best student paper award: R. Strydom, S. Thurrowgood and M.V. Srinivasan (2014) Visual Odometry: Autonomous UAV Navigation using Optic Flow and Stereo. *Proceedings, Australasian Conference on Robotics and Automation (ACRA 2014),* Melbourne, 2-4 December 2014, paper 133.

Haibo Wang, Ph.D. student, University of Queensland: Best paper award: H. Wang, H. Kurniawati, S. Singh and M.V. Srinivasan (in press) In-silico Behavior Discovery System: An Application of Planning in Ethology. *Proceedings, 25th International Conference on Automated Planning and Scheduling*, Jerusalem, Israel, June 7-11, 2015.

Dasun Gunasinghe, Ph.D. student, University of Queensland: Best student paper award: D. Gunasinghe, R. Strydom, M.V. Srinivasan (2016) A mid-air collision warning system: Vision-based estimation of collision threats for aircraft. *Proceedings, Australasian Conference on Robotics and Automation*, 5-7 December, Brisbane, Australia, Paper 111 S1.

Reuben Strydom, Ph.D. student, University of Queensland: "Rising Star" award: R. Strydom, S. Thurrowgood, A. Denuelle and M.V. Srinivasan (2016) TCM: A vision-based algorithm for

distinguishing between stationary and moving objects irrespective of depth contrast from a UAS. *International Journal of Advanced Robotic Systems*, DOI: 10.5772/62846.

Kiaran Lawson: Ph.D. student, University of Queensland: Best student paper award: K.K.K. Lawson and M.V. Srinivasan (2018) A robust dual-axis virtual reality platform for closed-loop insect flight analysis. *Proceedings, IEEE International Conference on Robotics and Biomimetics (ROBIO 2018)*, Kuala Lumpur, Malaysia, 12-15 December 2018.

Representative publications

From a total of 254 peer-reviewed research publications, including 13 in *Nature* and *Science*, 59 review articles/book chapters, 4 edited books, 3 patents. 18526 total citations; h index = 77. (September 2021: https://scholar.google.com/citations?user=GQhGyMoAAAAJ&hl=en)

Srinivasan M.V., Laughlin S.B. and Dubs A. (1982) Predictive coding: a fresh view of inhibition in the retina. *Proc. R. Soc. Lond. B* 216, 427-459

Lehrer M., Srinivasan M.V., Zhang S.W. and Horridge G.A. (1988) Motion cues provide the bee's visual world with a third dimension. *Nature (Lond.)* 332, 356-357.

Srinivasan M.V., Lehrer M., Kirchner W.H. and Zhang S.W. (1991) Range perception through apparent image speed in freely-flying honeybees. *Visual. Neuroscience* 6, 519-535.

Srinivasan M.V., Zhang S.W. and Rolfe B. (1993) Pattern vision in insects: "cortical" processing? *Nature (Lond.)* 362, 539-540. (This paper was accompanied by a *News and Views* article)

Zhang S.W. and Srinivasan M.V. (1994) Prior experience enhances pattern discrimination in insect vision. *Nature (Lond.)* 368, 330-332. (This paper attracted a short article in *New Scientist*)

M.V. Srinivasan (1994): An image-interpolation technique for the computation of optic flow and egomotion. *Biol. Cybernetics* 71, 401-416.

Zhang S.W., Srinivasan M.V. and Collett T.S. (1995) Convergent processing in honeybee vision: Multiple channels for the recognition of shape. *Proc. Nat. Acad. Sci. U.S.A.* 92, 3029-3031.

Srinivasan, M.V., Zhang, S.W., Lehrer, M. and Collett, T.S. (1996) Honeybee navigation en route to the goal: visual flight control and odometry. *J. Exp. Biol*. 199, 237-244

Srinivasan M.V., Zhang S.W. and Bidwell N. (1997) Visually mediated odometry in honeybees. *J. Exp. Biol.* 200, 2513-2522. (This paper attracted an article in *New Scientist*)

J.S. Chahl and M.V. Srinivasan (1997) Reflective surfaces for panoramic imaging. *Applied Optics* 36, 8275-8285.

Srinivasan M.V., Zhang S.W. and Zhu H. (1998) Honeybees link sights to smells. *Nature (Lond.)* 396, 637-638. (This paper attracted an article in *New Scientist*)

Srinivasan M.V., Chahl J.S., Weber K.S., Venkatesh S., Nagle M.G. and Zhang S.W. (1999): Robot navigation inspired by principles of insect vision. *Robotics and Autonomous Systems* 26, 203-216.

Srinivasan M.V., Zhang S.W., Altwein M. and Tautz J. (2000) Honeybee navigation: nature and calibration of the 'odometer'. *Science* 287, 851 – 853. (With cover illustration and accompanying *Perspectives* article)

Srinivasan M.V., Zhang S.W., Chahl J.S., Barth E., and Venkatesh S. (2000) How honeybees make grazing landings on flat surfaces. *Biological Cybernetics* 83, 171-183. (This paper attracted an article in *New Scientist*)

H. Esch, S.W. Zhang, M.V. Srinivasan and J. Tautz (2001) Honeybee dances communicate distances measured by optic flow. *Nature* 411, 581-583. (With cover illustration).

M. Giurfa, S.W. Zhang, A. Jenett, R. Menzel and M.V. Srinivasan (2001) The concepts of "sameness" and "difference" in an insect. *Nature* 410, 930-933.

Barrows G.L., Chahl J.S. and Srinivasan M.V. (2003) Biomimetic visual sensing and flight control. The Aeronautical Journal, London : The Royal Aeronautical Society, vol. 107, No. 1069, pp. 159-168. (This paper was awarded the Royal Aeronautical Society's Simms Prize for the best paper of the year).

Srinivasan M.V. (2002) Visual Flight Control and Navigation in Honeybees, and Applications to Robotics. In: *Neurotechnology for Biomimetic Robots*, J. Ayers, J.L. Davis and A. Rudolph (eds.), MIT Press, pp 593 – 610.

Reinhard, J., Srinivasan, M.V. and Zhang, S.W. (2004) Scent-triggered navigation in honeybees. *Nature (Lond.)* 427, 411.

M.V. Srinivasan., S.W. Zhang, J S Chahl, G Stange and M Garratt (2004*)* An overview of insect inspired guidance for application in ground and airborne platforms. *Proc Inst Mech Engnrs Part G: J Aerospace Engineering 218, 375-388.*

S.W. Zhang, F. Bock, A. Si, J. Tautz and M.V. Srinivasan (2005) Visual working memory in decision making by honeybees. *Proceedings of the National Academy of Science* 102, 5250-5255. (This paper was selected by the Faculty of 1000).

M.V. Srinivasan, S. Thurrowgood and D. Soccol (2009) From flying insects to autonomously navigating robots. *IEEE Robotics and Automation Magazine*, Special Issue on Cognitive Robotics. *16*(3): 59-71.

P. Bhagavatula, C. Claudianos, M. Ibbotson and M. Srinivasan (2009) Edge detection in landing budgerigars (*Melopsittacus undulatus*). *PLoS ONE* 4(10): e7301.

M.V. Srinivasan (2009) Honeybees as a model for vision, perception and 'cognition'. *Annual Review of Entomology 55*, 267–284

C. Evangelista, P. Kraft, M. Dacke, J. Reinhard and M.V. Srinivasan (2010) The moment before touchdown: Landing manoeuvres of the honeybee *Apis mellifera*. *Journal of Experimental Biology* 213, 262-270.

P. Bhagavatula, C. Claudianos, M. Ibbotson and M. Srinivasan (2011) Optic flow cues guide flight in birds. *Current Biology* 21, 1794-1799.

E. Baird, N. Boeddeker, M.R. Ibbotson and MV. Srinivasan (2013) A universal strategy for visually guided landing. *PNAS* 110*,* 18686-91.

G.J. Taylor, T. Luu, D. Ball and M.V. Srinivasan (2013) Vision and air flow combine to streamline flying honeybees. *Scientific Reports* 3: 2614. DOI: 10.1038/srep02614.

C. Evangelista, P. Kraft, M. Dacke, T. Labhart and M.V. Srinivasan (2014) Honeybee navigation: critically examining the role of the polarization compass. *Philosophical Transactions of the Royal Society B* 369: 20130037.

P. S. Bhagavatula, C. Claudianos, M.R. Ibbotson and M.V. Srinivasan (2014) Behavioral lateralization and optimal route choice in flying budgerigars. *PLOS Computational Biology.* 10(3): e1003473. doi:10.1371/journal.pcbi.1003473 (Featured research paper)

J. Groening, D. Venini, M.V. Srinivasan (2017) In search of evidence for the experience of pain in honeybees: A self-administration study. *Scientific Reports* 7:45825 | DOI: 10.1038/srep45825 (*This paper was selected by the Faculty of 1000*).

From Living Eyes to Seeing Machines, M.V. Srinivasan and S. Venkatesh (eds), Oxford University Press, U.K. (1997).

Flying Insects and Robots, D. Floreano, J-C. Zufferey, M.V. Srinivasan and C. Ellington (eds.), Springer-Verlag, Berlin, Heidelberg, 2009. ISBN: 978-3-540-89392-9. 316 pages.

Frontiers in Sensing: *From Biology to Engineering*. F.G. Barth, J.G.C. Humphrey and M.V. Srinivasan (eds), Springer-Verlag Vienna/New York (2012), 438 pages. ISBN 978-3-211-99748-2.

The Visual Neurosciences. J.S. Werner and L.M. Chalupa (Editors), M. Burns, J. Geng, M. Goldman, J. Handa, A. Ishida, G.R. Mangun, K, McAllister, B. Olshausen, G. Recanzone, M.V. Srinivasan, W.M. Usrey, M. Webster, D. Whitney (Associate Editors), MIT Press (2013), 2000 pages. ISBN 9780262019163.

M.V. Srinivasan (2020) Vision, perception, navigation and 'cognition' in honeybees and applications to aerial robotics. *Biochemical and Biophysical Research Communications*. https://doi.org/10.1016/j.bbrc.2020.09.052

Graduate student supervision

A. Dubs: *Spatial integration of signals in the retina and lamina of the fly.*
Ph.D. thesis, Australian National University, 1982.

E.J. Warrant: *The arthropod superposition eye.*
Ph.D. thesis, Australian National University, 1989.

A.C. James: *White noise studies in the fly lamina.*
Ph.D. thesis, Australian National University, 1990.

Z.F. Jin: *Computational studies of visual motion processing.*
Ph.D. thesis, Australian National University, 1991.

Q.J. Sun: *Descending motion-detecting neurons in the ventral nerve cord of the butterfly.*
Ph.D. thesis, Australian National University, 1991

R. Dubois: *Direction selective neurons in the medulla of the butterfly.*
Ph.D. thesis, Australian National University, 1993

M. Holmqvist: *Visually evoked escape of flies: a behavioural and electrophysiological analysis.* Ph.D. thesis, Australian National University, 1993

E.C. Yang: *Processing of spectral information in the dragonfly lamina.*
Ph.D. thesis, Australian National University, 1994

M. Nagle: *Artificial Vision and the Mobile Blind*
Ph.D. thesis, Australian National University , 1995

J.S. Chahl: *Stratagems for mobile robot navigation using panoramic vision.*
Ph.D. thesis, Australian National University , 1996

A. Giger: *Honeybee vision: analysis of pattern orientation.*
Ph.D. thesis, Australian National University, 1996

T. Vladusich: *Navigation strategies of the honeybee*
Ph.D. thesis, Australian National University, 2003

J. Gong: Direct *perception of time to contact: Temporal and visuo-spatial constraints.*
Ph.D. thesis, Australian National University, 2003

A. Si: *Learning and navigation in honeybees*
Ph.D. thesis, Australian National University, 2004

A. Bell: *The underwater piano: A resonance theory of cochlear mechanics.*

Ph.D. thesis, Australian National University, 2005

N. Carey: *Models of insect visual guidance and motion camouflage.*
Ph.D. thesis, Australian National University, 2007

E. Baird: *Visual flight control in the honeybee*
Ph.D. thesis, Australian National University, 2008

A. Cheung: *Theory and neural network models of animal navigation*
Ph.D. thesis, Australian National University, 2008. (Awarded Crawford Medal for the best University thesis in the Sciences)

M. Garratt: *Biologically inspired vision and control for an autonomous flying helicopter*
Ph.D. thesis, Australian National University, 2008.

P. Cinar: *Lateralization of function in the honeybee*
Ph.D. thesis, Australian National University, 2008.

P. Bhagavatula: *Visual orientation and navigation in birds*
Ph.D. thesis, Australian National University, 2011
(conducted largely at the University of Queensland)

R. Moore: A vision system for autonomous aircraft guidance (Ph.D. thesis, University of Queensland, 2012)

N. Nourani: Topological Mapping and Localization for car-like vehicles using vision. Ph.D. thesis, University of Queensland, 2012.

G. Taylor: Unravelling the sensory control of behaviour in honeybees using virtual reality paradigms. Ph.D. thesis, University of Queensland, 2015.

A. Denuelle: Bio-inspired visual homing strategies for autonomous aerial navigation. Ph.D. thesis, University of Queensland, 2015.

R. Strydom: Bio-inspired strategies for autonomous aerial navigation, guidance and interception Ph.D. thesis, University of Queensland, 2017.

D. Karmaker: Mid-air collision cvoidance in Budgerigars and potential applications to UAV guidance. Ph.D. thesis, University of Queensland, 2019.

K. Lawson: Virtual reality investigation of insect flight. Experimental analysis of complex insect flight behaviours inside virtual reality for potential applications in robotics. Ph.D. thesis, University of Queensland, 2021.

D. Gunasinghe: Conflict warning and avoidance in dual aircraft scenarios. Ph.D. thesis, University of Queensland, 2021.

M. Yadav: Mid-air collision avoidance in honeybees (ongoing Ph.D. project).

Supervision of Postdoctoral Fellows

Dr. Miriam Lehrer, Honeybee visual behavior, 1982-85.

Dr. Richard Guy, Insect visual electrophysiology, 1988-89.

Dr. Michael Ibbotson, Insect visual electrophysiology, 1989-90.

Dr. Daniel Osorio, Insect visual electrophysiology and computational vision, 1987-91.

Dr. Peter Sobey, Machine vision, 1990-93.

Dr. Martin Nagle, Machine vision, 1995-96.

Dr. Javaan Chahl, Robotics, 1997-99

Dr. Judith Reinhard, Olfactory signals in honeybee navigation, 2003-

Dr. Charles Claudianos, Molecular substrates of learning and memory in invertebrates, 2005-

Dr. David Guez, Neuropharmacological substrates of learning in honeybees, 2002-2005

Dr. Marie Dacke, Mental processes in honeybees, 2005-

Dr. Wolfgang Stuerzl, Imaging systems for machine vision, 2004-

Dr. Andy Barron, Honeybee behaviour, 2004-2005.

Dr. Shunpeng Wang, Optical imaging of brain activity in honeybees, 2003- (shared supervision)

Dr. Norbert Boeddeker, Insect vision for flight, 2006- (shared supervision).

Dr. Peter Kraft, Honeybee vision and navigation, 2007-2009

Dr. Nikolai Liebsch, Visual guidance in flying insects, 2009-

Dr. Ingo Schiffner, Visual guidance in birds, 2011- 2016

Supervision of Research Officers /Assistants

Dr. Shaowu Zhang, Honeybee visual behavior, 1990 – 2001

Dr. Martin Hofmann, Computational vision and software support, 1996 – 2000

Ms. Hong Zhu, Honeybee visual behavior, 1998 –

Ms. Ljerka Marcelja, Insect visual electrophysiology, 1995-96

Mr. Paul Helliwell, Beekeeping and maintenance, 2000-

Mr. Richard Lamont, Machine vision, 2002-2006

Mr. Dean Soccol, Mechatronics, 2005 -

Mr. Saul Thurrowgood, Computational vision and software support, 2005 –

Ms. Carla Evangelista, Honeybee visual behaviour, 2007-2009

Ms. Eliza Middleton, Honeybee visual behaviour, 2009-2010

Ms. Laura McLeod, Honeybee behaviour, 2011-

Dr. Julia Groening, Honeybee behaviour, 2011-

Mr. Daniel Bland, Aircraft avionics, 2009-2011

Mr. Michael Knight, Aircraft avionics, 2011-

Administrative experience

Acting Head, Dept. Neurobiology, RSBS, ANU, 3-23 March, 2-28 May 1986.

Acting Head, Visual Sciences, RSBS, ANU, 31 Aug - 2 Oct 1987, 16-27 Jan 1988, 1-10 May 1989, 24 Sep-4 Oct 1990, 18 Mar- 26 May 1991.

Attended Project Management Course, Institute of Administration, University of New South Wales, 1-3 March 1989.

Convener, ANU RSBS Faculty Board Computer Committee, 1990, 1991.

Treasurer, Colour Society of Australia, Canberra Division, 1989-91.

Local Chair, 3rd Australian Conference on Neural Networks, Canberra, 3-5 February 1992.

Co-organiser, Robertson Symposium on "Sensory Stratagems", Canberra, 7-11 February 1993.

Co-organiser, IEEE Workshop on Spatial and Temporal Interaction, Singapore, 8 November 1994.

Group Leader, Visual Sciences, October 1991 – October 1996

Acting Director, Research School of Biological Sciences, ANU, 10 August - 10 Sept 1994

Executive Director, Centre for Visual Science, Australian National University, 1994-96, and 2000-

Co-organiser, Centre for Visual Science Summer School on Animal Navigation, 2002 - 2006

Chair, Organising Committee, Sir Mark Oliphant International Conference on *Insect Sensors and Robotics,* Brisbane, 23-26 August 2004.

Theme Leader, ARC Centre for Excellence in Vision Science, Australian National University, 2005-2013.

Cluster Director, CSIRO Cluster Flagship on *Learning Principles of Olfactory Pattern Recognition,* 2006 – 2009

Co-organizer, *International Conference on Flying Insects and Robots*, Monte Verita, Ascona, Switzerland, August 12-17, 2007.

Co-organizer, *Ninth Australasian Conference on Robotics and Automation,* Brisbane, 10-12 December 2007.

Co-organizer, *International Conference on Sensors and Sensing in Biology and Engineering*, Cetraro, Italy, 12-16 October 2008.

Member, Program Committee, *Australasian Conference on Robotics and Automation (ACRA)*, 2011, 2013, 2014, 2015, 2016, 2017, 2018.

Conference Chair, *Seventh SPIE International Symposium on Multispectral Image Processing and Pattern Recognition*, 4-6 November 2011, Guilin, China

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Service on Committees

Member, Faculty Board, RSBS, ANU, 4 Feb-15 July 1986.

Member, Neuroscience Graduate program, ANU, 1998-1999

Member, IEEE Steering Committee for Biological Cybernetics, 1990-91.

Member, Australian Commonwealth Department of Technology and Commerce Science and Technology Mission to India, 17-29 April 1991.

Member, RSBS Futures Committee, 1992.

Member, Board of the Institute of Advanced Studies, ANU, 1/1/93 - 31/8/94

Member, Promotions Committee, Board of the Institute of Advanced Studies, ANU, 1994, 1998, 1999.

Member, Advisory Board, International Society of Neuroethology, 2002 - 2004

Member, Australian Research Council Biosciences and Biotechnology Expert Advisory Committee, 2003.

Member, Review Panel, Centre of Excellence for Research in Computational Intelligence and Applications, University of Birmingham, 13-17 September 2004.

Member, Prime Minister's Science, Engineering and Innovation Council (PMSEIC), 2006-2007.

Deputy Chair, PMSEIC Working Group on *Water for our Cities*, April-June 2007

Member, Advisory Board, ARC Network for Intelligent Signal Sensors and Information Processing, 2006- 2010

Member, Sectional Committee on Applied Physical and Engineering Sciences, Australian Academy of Science, 2008-2010.

Member, Scientific Advisory Board, Centre for the Mind, University of Sydney, 2009-2011.

Member, Australian Research Council Panel for Evaluating Excellence of Research in Australia, 2010.

Member, Research Evaluation Committee, National ICT Australia Ltd. (NICTA), 2011-

Member, Review Panel, Computer Vision Group, National ICT Australia Ltd. (NICTA), 2012, 2014

Member, Selection Committee, Prime Minister's Science Prize, 2013-2014.

Member, Program Committee, Australasian Conference on Robotics and Automation (ACRA), 2012, 2013, 2014, 2015, 2016,2017).

Member, Scientific Advisory Board, Cold Spring Harbor Asia Conferences, 2013-

Member, Advisory Board, ARC Centre of Excellence in Robotic Vision, 2014-2017.

Member, Sectional Committee on Corresponding Membership and Special Elections, Australian Academy of Science, 2015.

Elected Council Member, Australian Academy of Science, 2015-2017.

Travel for research / teaching

1 Feb - 3 Mar 1980: Visiting Fellow, Institute of Zoology, University of Zurich, Switzerland

20 Aug -19 Sep 1987: Visiting Fellow, Institute of Biophysics, Academia Sinica, Beijing, PR China

19 Aug -23 Sep 1988: Visiting Fellow, Institute of Zoology, University of Zurich, Switzerland

15-20 September 1991: Visiting Fellow, Max-Planck Institute for Biological Cybernetics, Tuebingen, Germany

17 August-6 September 1992: Visiting Fellow, Centre for Ecological Sciences, Indian Institute of Science, Bangalore.

18 April - 1 May 1994: Visiting Fellow, Institute of Zoology, University of Zurich, Switzerland.

October 1996 – July 1997: Invited Daimler-Benz Fellow, Institute of Advanced Study (Wissenschaftskolleg), Berlin, Germany.

August 1999: Invited lecturer, Course on "Methods in Computational Neuroscience", Marine Biological Laboratory, Woods Hole, Massachusetts, USA.

August 2000: Invited lecturer, Course on "Methods in Computational Neuroscience", Marine Biological Laboratory, Woods Hole, Massachusetts, USA.

July 2001: Collaborative research on honeybee navigation at the University of Wuerzburg, Germany.

August 2001: Invited lecturer, Course on "Methods in Computational Neuroscience", Marine Biological Laboratory, Woods Hole, Massachusetts, USA.

July 2010: Invited lecturer, Annual Neuromorphic Engineering Workshop, Telluride, Colorado, USA

January 2015: Invited lecturer, International Neuroscience Doctoral Program workshop on Social Insect Behaviour, Lisbon, Portugal.

Extracurricular collaborations

2008: Collaboration with artist Dr. Trish Adams to produce Host, a work at the art-science interface, at the University of Queensland Art Museum. My laboratory facilitated the conception and production of the work, which involved high-speed cinematography of flying insects. https://mod.org.au/exhibits/birds-and-bees/
2018: Collaboration with artist Dr. Sam Leach to produce an interactive public exhibition, organised by the University of South Australia, highlighting our laboratory's research on bees and birds. I helped design the interactive aspects of the exhibition. https://mod.org.au/exhibits/birds-and-bees/
2019: Collaboration with artist and academic Prof. Anne Noble to produce an installation Conversatio: A cabinet of wonder, highlighting the beauty, behaviour and lifestyle of honeybees, at the Gallery of Modern Art, Brisbane, in conjunction with the Ninth Asia Pacific Triennial of Contemporary Art (APT9). I assisted in the design and installation of the live exhibit, based on an observation beehive. https://blog.qagoma.qld.gov.au/apt9-conversatio-a-cabinet-of-wonder-is-a-living-photograph/

Research grants* (all figures in AU$)

M.V. Srinivasan: One three-year DF/RF position for research on Electrophysiology of Visual Information Processing funded by the Centre for Information Sciences, ANU. $ 120 K (1989-92).

G.A. Horridge and M.V. Srinivasan: Generic Research and Development Grant, No. GIRD 16009, for the development of seeing-eye devices based on principles of insect vision, funded by the Department of Industry, Technology & Commerce, Three three-year PDF/RF positions + equipment. $ 110 K per year for 3 years (1989-92).

M.V. Srinivasan: ANU/Fujitsu collaborative research grant on application of animal vision to machine vision. Two PDF/RF positions + equipment. $ 150 K per year for 5 years (1989-94).

M.V. Srinivasan: Australia/India Collaborative Research Grant on Biologically-inspired Machine Vision, funded by the Department of Industry, Technology and Commerce. $30K over 2 years (1991-92).

M.V. Srinivasan: Australia/Switzerland Collaborative Research Grant on insect visual behaviour, funded by the Department of Industry, Technology and Commerce. $13K over 2 years (1993-95).

M.V. Srinivasan: One 3-year 50% PDF/RF position for research on Scene Analysis and Segmentation by Animals and Computers, funded by the Centre for Information Sciences, ANU $ 25 K per year for 3 years (1994-96).

S. Venkatesh (Curtin University, Perth) and M.V. Srinivasan: ARC Research Grant for research on Biologically Based Spatial Vision. $ 40 K per year for 3 years (1994-96).

M.V. Srinivasan: ANU Major Equipment Grant for purchase of Magnetic and Optical Stimulators, $ 98 K (1995).

M.V. Srinivasan, J. Zeil, S.W. Zhang and J. Chahl: Neuroethological robotics (International Human Frontier Science Program Grant, $ 165,000 for 1997-99).

J. Zeil, J. Zanker, M.V. Srinivasan: Visual ecology (RSBS Strategic Development Award, $ 80 K per year, in perpetuity; 1998 -).

J. Zeil, M. Ball, M.V. Srinivasan: ANU Major Equipment Grant for purchase of Imaging Spectrometer, $280K, 1998).

M.V. Srinivasan: NASA Neurotechnology Program Grant ($ 33.5 K for the purchase of a high-speed video camera; 1999)

M.V. Srinivasan, J.S. Chahl, J. Zeil: Insect based vision study for guidance of flying platforms. DSTO research grant ($ 300 K for 1997-1999)

M.V. Srinivasan, J.S. Chahl: Automated visual target detection. DSTO research grant ($ 40 K, 1999)

M.V. Srinivasan: Insect vision and navigation. Research grant, Controlled Biological Systems Program, DARPA (U.S. Defence Advanced Research Projects Agency) ($ 1.1 M for 1999-2002)

J.S. Chahl, G. Stange, M.V. Srinivasan, M. Hoffman: Biomimetic mechanisms for flight stabilization and navigation, modeled on insect sensory systems. Controlled Biological Systems Program, DARPA (U.S. Defence Advanced Research Projects Agency) ($ 0.9 M for 2000-2002)

M.V. Srinivasan, J.S. Chahl, G. Stange. M. Garratt: Insect vision based seekers and controllers for guided weapons. U.S. Naval Air Warfare Center ($ 1.35 M for 2001-4)

M.V. Srinivasan: Biorobotics. Institute Planning Grant, Australian National University. ($ 200 K per year, in perpetuity, 2000 -)

M.V. Srinivasan, S.W. Zhang, J. Zeil, J.S. Chahl: Honeybee navigation: Low-level and cognitive mechanisms. ARC Discovery Grant ($ 210 K, 2002-2004).

M.V. Srinivasan, S.W. Zhang: Collaborative research grant, Australian-German Joint Research Co-operation Scheme. ($ 15.6 K, 2001-2003).

M.V. Srinivasan, M. Whitten: Insect Sensory Systems Inspiring Robotic Applications. Sir Mark Oliphant Conference Fund, 2003 ($ 65,150).

M.V. Srinivasan, C. Brack, J.S. Chahl, T. Cooke. Panotree: A panoramic imaging instrument for rapid, inexpensive, contact-free measurement of tree diameters. ACT Knowledge Fund Grant, 2003 ($ 48,500).

M.V. Srinivasan, M. Ibbotson, U. Schroeter: Neural mechanisms underlying visual control of flight in honeybees. ARC Linkage-International Fellowship, 2004 ($ 71,822).

S.W. Zhang, M.V. Srinivasan, K. Sato: Higher cognitive functions emerging from a small brain. ARC Discovery Grant ($ 585K, 2004-2006).

M.V. Srinivasan, J. Zeil, S.W. Zhang, J. Chahl and G. Stange: Control of Insect Flight: Regulation of Flight Speed and Height above the Ground. US Air Force Research Grant ($ 375 K, 2002-2004).

M.V. Srinivasan. Inaugural ARC Federation Fellowship award, $1.25M, 2002–2006

R. Jarvis, R. Kotagiri, S. Venkatesh and M.V. Srinivasan. Perceptive and Intelligent Machines. ARC Centre Grant, 2003–2007, $5.625M (Srinivasan component: $ 446,470).

M.V. Srinivasan. Awards from US DARPA, US Air Force and US Office of Naval Research to organise an International Conference on Insect Sensors and Robotics, Brisbane, 23-26 August 2004, $40,000.

M.V. Srinivasan, M. Ibbotson and J.S. Chahl. Biologically inspired strategies, algorithms and hardware for visual guidance of autonomous helicopters. U.S. Army Research Office Grant, ($575K, 2003-2007).

M.V. Srinivasan and M. Ibbotson. How do bees orchestrate smooth landings? ARC Discovery Grant ($ 290K, 2006-2008).

M.V. Srinivasan. Visually guided terrain following and landing in UAVs: Reflective surfaces for the measurement of optical flow. U.S. Office of Naval Research Grant ($165 K, 2005-2006).

S. Venkatesh, G.A. West, M.V. Srinivasan, T. Tan, M.M. Lazarescu. Surveillance Systems for the Transport Industry. ARC Linkage Grant ($747K, 2005-2008).

M.A. Garratt, A. Lambert, D. Fraser, M.V. Srinivasan. Rapid prototyping of vision sensors for micro-UAV flight control and surveillance. University of NSW Strategic Research Initiative. ($75 K, 2005).

T. Lamb, M.V. Srinivasan, J. Stone (theme leaders), and 13 other CIs: ARC Centre of Excellence in Vision Science ($ 11M, 2006 – 2010).

M.V. Srinivasan. Target Tracking and Interception by Aggressive Honeybees. US Air Force Office of Scientific Research Grant. ($225K, 2007-2009)

M.V. Srinivasan, J. Reinhard, C. Claudianos. Principles of Olfactory Processing in Insects. CSIRO Flagship Cluster Grant ($875K, 2006 – 2008)

J. Wiles et al.: Navigating through real and conceptual spaces. ARC/NHMRC Thinking Systems Programme, 2006-2010, $100K per year (Srinivasan component).

M.V. Srinivasan: Queensland Smart State Premier's Fellowship. 2008-2012, $1.25M.

M.V. Srinivasan, M.R. Ibbotson, J.S. Chahl: Visual guidance of autonomous helicopters. US Army Research Office Continuation Grant DAAD 19-03-1-0359. $192,913.60, 2008-2009.

E. Scott, T. Burne, B. Key, R. Parton, C. White, D. Eyles, J. Marshall, M.V. Srinivasan, U. Siebeck, S. Temple: University of Queensland Major Equipment Grant, "Zebrafish Behavioural Suite". $240,000, 2010.

T. Lamb, M.V. Srinivasan, J. Stone (theme leaders), and 13 other CIs: ARC Centre of Excellence in Vision Science continuation grant ($ 4.8 M, 2010 – 2013).

M.V. Srinivasan: Visual guidance of flight in birds. ARC Discovery Grant ($500K, 2011-2013).

M.V. Srinivasan: Assessment and development of bio inspired guidance, navigation and control (GNC) sensors, algorithms and solutions for unmanned aircraft. Research Agreement, Boeing Defence Australia, $65K, Dec 2011 – Dec 2012.

M.V. Srinivasan: Assessment and development of bio inspired guidance, navigation and control (GNC) sensors, algorithms and solutions for unmanned aircraft. Research Agreement, Boeing Defence Australia, $140K, Jan 2013 – Dec 2015.

D. Altshuler (University of British Columbia), D. Lentink (Stanford University) and M.V. Srinivasan (University of Queensland): Visual control of flight modes and transitions in birds. Research Grant, Human Frontiers in Science Program ($1.05M, 2013-2015).

M.V. Srinivasan (University of Queensland), T. Perez (Queensland University of Technology), and B. Williams (Boeing Research and Technology Australia): Strategies for mid-air collision avoidance in aircraft: lessons from bird flight. ARC Linkage Grant ($ 1.07M, 2014-2016).

M.V. Srinivasan (University of Queensland) and T. Perez (Queensland University of Technology): Biologically-inspired detection, pursuit and interception of moving objects by unmanned aircraft systems. ARC Discovery Grant ($ 430 K, 2014-2016).

M.V. Srinivasan: Perception of pain in simple nervous systems. ARC Discovery Grant + Distinguished Outstanding Researcher Award ($ 1.04M, 2014-2016).

M.V. Srinivasan: From flying animals to airborne machines and back. Vice Chancellor's Senior Professorial Research Fellowship, University of Queensland, ($ 675K, 2014-2019).

* Unlike other Australian Universities, the Australian National University's Institute for Advanced Study is supported by federal block funding. Therefore Faculty at the Institute were not eligible, until (2001), to apply for support from conventional Australian research funding bodies such as the Australian Research Council.

Full-length refereed publications

[A]: Papers on vision and visual processing, guidance and navigation
[B]: Papers on learning, memory and higher brain function
[C]: Papers on machine vision and robotics

1. [A]M.V. Srinivasan and B.L. Deekshatulu (1971) Development of an eye-movement stimulator and monitor. *Indian J. Pure and Appl. Physics* 9, 253-260.

2. [A]M.V. Srinivasan, M.A.L. Thathachar and B.L. Deekshatulu (1975) A probabilistic hypothesis for the prediction of visual fixations. *IEEE Transactions on Systems, Man and Cybernetics*, SMC-5, 4, 431-437.

3. [A]M.V. Srinivasan and G.D. Bernard (1975) The effect of motion on visual acuity of the compound eye: a theoretical analysis. *Vision Res.*15, 515-525.

4. [A]M.V. Srinivasan and G.D. Bernard (1976) A proposed mechanism for multiplication of neural signals. *Biol. Cybernetics* 21, 227-236.

5. [A]M.V. Srinivasan and G.D. Bernard (1977) The pursuit response of the housefly and its interaction with the optomotor response. *J. Comp. Physiol.* 115, 101-117.

6. [A]M.V. Srinivasan and G.D. Bernard (1977) The fly can discriminate movement at signal/noise ratios as low as one-eighth. *Vision Res.* 17, 609-616.

7. [A]M.V. Srinivasan (1977) A visually-evoked roll response in the housefly: open-loop and closed-loop studies. *J. Comp. Physiol.* 119, 1-14.

8. [A]A.W. Snyder and M.V. Srinivasan (1979) Human psychophysics: Functional interpretation for contrast sensitivity versus spatial frequency curve. *Biol. Cybernetics* 32, 9-17.

9. [A]M.V. Srinivasan and D.R. Dvorak (1979) The waterfall illusion in an insect visual system. *Vision Res.* 19, 1435-1437.

10. [A]M.V. Srinivasan and G.D. Bernard (1980) A technique for estimating the contribution of photomechanical responses to visual adaptation. *Vision Res.* 20, 511-521.

11. [A]D. Dvorak, M.V. Srinivasan and A.S. French (1980) The contrast sensitivity of fly movement-detecting neurons. *Vision Res.* 20, 397-407.

12. [A]M.V. Srinivasan and D. Dvorak (1980) Spatial processing of visual information in the movement-detecting pathway of the fly. *J. Comp. Physiol.* 140, 1-23.

13. [A]A. Dubs, S.B. Laughlin and M.V. Srinivasan (1981) Single photon signals in fly photoreceptors and first order interneurones at behavioural threshold. *J. Physiol.* 317, 317-334.

14. [A]R. Wehner and M.V. Srinivasan (1981) Searching behaviour of desert ants, Genus Cataglyphis. *J. Comp. Physiol.* 142, 315-338.

15. [A]M.V. Srinivasan, S.B. Laughlin and A. Dubs (1982) Predictive coding: a fresh view of inhibition in the retina. *Proc. R. Soc. Lond. B* 216, 427-459.

16. [A]M.V. Srinivasan (1983) The impulse response of a movement-detecting neuron and its interpretation. *Vision Res.* 23, 659-663.

17. [A]M.V. Srinivasan and M. Lehrer (1984) Temporal acuity of honeybee vision: behavioural studies using moving stimuli. *J. Comp. Physiol.* 155, 297-312.

18. [A]M.V. Srinivasan and M. Lehrer (1984) Temporal acuity of honeybee vision: behavioural studies using flickering stimuli. *Physiol. Entomol.* 9, 447-457.

19. [A]M.V. Srinivasan and M. Lehrer (1985) Temporal resolution of colour vision in the honeybee. *J. Comp. Physiol. A* 157, 579-586.

20. [A]M.V. Srinivasan (1985) Shouldn't directional movement detection necessarily be "colour-blind"? *Vision Res. 25*, 997-1000.

21. [A]M.V. Srinivasan and M. Lehrer (1985) Temporal aspects of honeybee vision. *Proceedings, IEEE Conference on Systems, Man and Cybernetics, Tucson, Arizona*, pp. 850-853.

22. [A]M. Lehrer, R. Wehner and M.V. Srinivasan (1985) Visual scanning behaviour in honeybees. *J. Comp. Physiol. A* 157, 405-415.

23. [A]M.V. Srinivasan, M. Lehrer and R. Wehner (1987) Bees perceive illusory colours induced by movement. *Vision Res.* 27, 1285-1289.

24. [A]D. Osorio, A.W. Snyder and M.V. Srinivasan (1987) Bi-partitioning and boundary detection in natural scenes. *Spatial Vision* 2, 191-198.

25. [A]M. Lehrer, M.V. Srinivasan, S.W. Zhang and G.A. Horridge (1988) Motion cues provide the bee's visual world with a third dimension. *Nature. (Lond.)* 332, 356-357.

26. [A]M.V. Srinivasan, M. Lehrer, W. Kirchner, S.W. Zhang and G.A. Horridge (1988) How honeybees use motion cues to estimate range and discriminate objects. *Proceedings, IEEE Conference on Systems, Man and Cybernetics, Beijing and Shenyang.*

27. [A]M.V. Srinivasan and M. Lehrer (1988) Spatial acuity of honeybee vision, and its spectral properties. *J. Comp. Physiol. A* 162, 159-172.

28. [A]R.G. Guy and M.V. Srinivasan (1988) Integrative properties of second-order visual neurons: A study of large monopolar cells in the dronefly Eristalis. *J. Comp. Physiol. A* 162, 317-331.

29. [A]M.V. Srinivasan (1988) Visual motion processing in the invertebrate context. *Proceedings of the Australian Physiological and Pharmacological Society* 19, 15-24.

30. [A]W. Kirchner and M.V. Srinivasan (1989) Freely-flying honeybees use image motion to estimate object distance. *Naturwissenschaften* 76, 281-282.

31. [A]M.V. Srinivasan, M. Lehrer, S.W. Zhang and G.A. Horridge (1989) How honeybees measure their distance from objects of unknown size. *J. Comp. Physiol. A* 165, 605-613.

32. [A]P. Coombe, M.V. Srinivasan and R. Guy (1989) Are the large monopolar cells of the insect lamina on the optomotor pathway? *J. Comp. Physiol. A* 166, 23-35.

33. [A]R.B. Pinter, D. Osorio and M.V. Srinivasan (1989) Matched filter theory applied to responses of fly lamina cells predicts loss of edge-preference on lowering luminance. *Proceedings, Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Seattle*, 244-255.

34. [A]M. Lehrer, M.V. Srinivasan and S.W. Zhang (1990) Visual edge detection in the honeybee, and its chromatic properties. *Proc. R. Soc. Lond. B*. 238, 321-330.

35 [A]M.V. Srinivasan, M. Lehrer and G.A. Horridge (1990) Visual figure- ground discrimination in the honeybee: the role of motion parallax at boundaries. *Proc. R. Soc. Lond. B*. 238, 331-350.

36. [A]M.V. Srinivasan and R. Guy (1990) Spectral properties of movement perception in the dronefly Eristalis. *J. Comp. Physiol. A*. 166, 287-295.

37. [A]D. Osorio, M.V. Srinivasan and R.B. Pinter (1990) What causes edge fixation in walking flies? *J. Exp. Biol*. 149, 281-292.

38. [A]M.V. Srinivasan, R.B. Pinter and D. Osorio (1990) Matched filtering in the visual system of the fly: large monopolar cells in the lamina are optimized to detect moving edges and blobs. *Proc. R. Soc. Lond*. B. 240, 279-293.

39. [A]S.W. Zhang, X. Wang, Z. Liu and M.V. Srinivasan (1990) Visual tracking of moving targets by freely-flying honeybees. *Vis. Neurosci*. 4, 379-386.

40. [C]M.V. Srinivasan (1990) Generalized gradient schemes for the measurement of two-dimensional image motion. *Biol. Cybernetics* 63, 421-431.

41. [C]S. Jin and M.V. Srinivasan (1990) A neural gradient scheme for measurement of image velocity. *Vis. Neurosci*. 5, 261-271.

42. [A]R.B. Pinter, D. Osorio and M.V. Srinivasan (1990) Shift of edge-taxis to scototaxis depends on mean luminance and is predicted by a matched-filter theory on the responses of fly lamina LMC cells. *Vis. Neurosci*. 4, 579-584.

43. [B]J.H. van Hateren, M.V. Srinivasan and P.B. Wait (1990) Pattern recognition in bees: orientation discrimination. *J. Comp. Physiol*. A 167, 649-654.

44. [C]M.V. Srinivasan and P. Sobey (1991) A generalized gradient scheme for the measurement of optical flow. *Proceedings, Second Australian Conference on Neural Networks, Sydney*, 4-6 Feb., pp 107 - 110.

45. [A]M.V. Srinivasan, M. Lehrer, W.H. Kirchner and S.W. Zhang (1991) Range perception through apparent image speed in freely-flying honeybees. *Vis. Neurosci*. 6, 519-535.

46. [C]G. Stange, M.V. Srinivasan and J. Dalczynski (1991) A rangefinder based on intensity gradient measurement. *Applied Optics* 30, 1695-1700.

47. [A]D. Osorio and M.V. Srinivasan (1991) Camouflage by edge enhancement in animal coloration patterns and its implications for visual mechanisms. *Proc. R. Soc. Lond. B* 244, 81-85.

48. [C]P. Sobey and M.V. Srinivasan (1991) Measurement of optical flow using a generalized gradient scheme. *J. Opt. Soc. Am*. 8, 1488-1498.

49. [C]M.V. Srinivasan and P. Sobey (1991) Biologically-inspired schemes for the detection of motion boundaries. Proceedings of Workshop "Computer Vision - From Cognitive Science to Industrial Automation", *12th International Joint Conference on Artificial Intelligence*, Sydney, 25-29 August 1991.

50. [A]M. Holmqvist and M.V. Srinivasan (1991) A visually evoked escape response in the housefly. *J. Comp. Physiol. A* 169, 451-459.

51. [A]R.B. Pinter, D. Osorio and M.V. Srinivasan (1992) Adaptive matched filtering in peripheral nervous system. *Proceedings, International Joint Conference on Neural Networks*, Seattle, Vol II, 633-637.

52. [C]M.V. Srinivasan and P. Sobey (1992) Neural networks for the detection of motion boundaries. *Proceedings, Third Australian Conference on Neural Networks*, Canberra, 3-5 February 1992, pp 4-7.

53. [C]S.W. Zhang, M. Nagle and M.V. Srinivasan (1992) Pattern recognition by using a compound eye-like hybrid system. *Proceedings, Third Australian Conference on Neural Networks*, Canberra, 3-5 February 1992, pp 223-226.

54. [B]S.W. Zhang, M.V. Srinivasan and G.A. Horridge (1992) Pattern recognition in honeybees: local and global analysis. *Proc. R. Soc. Lond. B*. 248, 55-61.

55. [A]M. Lehrer and M.V. Srinivasan (1992) Freely flying bees discriminate between stationary and moving objects: performance and possible mechanisms. *J. Comp. Physiol. A*. 171, 457-467.

56. [C]P. Sobey, S. Sasaki, M. Nagle, T. Toriu, M.V. Srinivasan (1992) A hardware system for computing image velocity in real time. *Proceedings SPIE*, Boston, 1823, 334 - 341.

57. [B]S.W. Zhang and M.V. Srinivasan (1993) Parallel information processing in the visual system of insects. *Japanese Journal of Physiology*, 43, Suppl.1, S247-S258.

58. [A]M. Lehrer, M. Wunderli and M.V. Srinivasan (1993) Perception of heterochromatic flicker by honeybees: a behavioural study. *J. Comp. Physiol. A*. 172, 1-6.

59. [A]M.V. Srinivasan, S.W. Zhang and B. Rolfe (1993) Is pattern vision in insects mediated by 'cortical' processing? *Nature, (Lond.)* 362, 539-540. (This paper was accompanied by a *News & Views* article)

60. [A]M.V. Srinivasan, Z.F. Jin, G. Stange, and M.R. Ibbotson (1993) 'Vector white noise': a technique for mapping the motion receptive fields of direction-selective visual neurons. *Biol. Cybernetics* 68, 199-207.

61. [A]M.V. Srinivasan, S.W. Zhang and K. Chandrashekara (1993) Evidence for two distinct movement-detecting mechanisms in insect vision. *Naturwissenschaften* 80, 38-41.

62. [C]J.S. Chahl and M.V. Srinivasan (1993) Neural networks to compute global pattern rotation and dilation. *Proceedings, Fourth Australian Conference on Neural Networks*, 154-156.

63. [A]M. Lehrer and M.V. Srinivasan (1993) Object detection by honeybees: why do bees land on edges? *J. Comp. Physiol. A* 173, 23-32.

64. [C]P.J. Sobey, M.G. Nagle, G. Stange, S. Sasaki, M. Shiohara, H. Egawa and M.V. Srinivasan (1993) Artificial vision research in the Centre for Visual Science. *Proc. Image & Vision Computing Conference, New Zealand,* 43-50.

65. [C]M.G. Nagle, M.V. Srinivasan and P. Sobey (1993) Robust depth extraction for mobile robots. *Proc. SPIE, Boston* , Vol. 2056, 207-218.

66. [C]M.V. Srinivasan (1993) An image-interpolation technique for the computation of 2-D motion. *Proceedings, Australian and New Zealand Conference on Intelligent Information Processing Systems,* Perth, 1-3 December, pp. 367-371, 1993.

67. [C]J.S. Chahl and M.V. Srinivasan (1993) Visual computation of egomotion using an image-interpolation technique. *Proceedings, Australian and New Zealand Conference on Intelligent Information Processing Systems,* Perth, 1-3 December, pp. 372-376, 1993.

68. [A]M. Lehrer and M.V. Srinivasan (1994) Active vision in honeybees: task-oriented suppression of an innate behaviour. *Vision Res*. 34, 511-516.

69. [B]M. V. Srinivasan, S.W. Zhang and K. Witney (1994) Visual discrimination of pattern orientation by honeybees: Performance and implications for 'cortical' processing. *Phil. Trans. R. Soc. Lond. B*. 343, 199-210.

70. [C]M. Shiohara, H. Egawa, S. Sasaki, M. Nagle, P.J. Sobey and M.V. Srinivasan (1993) Real-time optical flow processor ISHTAR. *Proceedings of the Asian Conference on Computer Vision*, Osaka, Japan, pp. 790-793.

71. [C]M.G. Nagle, M.V. Srinivasan and P.J. Sobey (1994) High resolution CCDs and their use in mobility devices. *Proceedings, International Mobility Conference,* Melbourne, 1-3 Feb. 1994. pp. 330-334.

72. [C]M.V. Srinivasan (1994) Generalised gradients versus image interpolation: A critical evaluation of two schemes for measurement of image motion. *Australian Journal of Intelligent Information Processing Systems* 1, 41-50.

73. S.W. Zhang and M.V. Srinivasan (1994) Prior experience enhances pattern discrimination in insect vision. *Nature (Lond.)* 368, 330-332. (This paper attracted a short article in *New Scientist*)

74. [C]M.V. Srinivasan (1994) An image-interpolation technique for the computation of optic flow and egomotion. *Biol. Cybernetics* 71, 401-416.

75. [C]P.J. Sobey, M.G. Nagle, Y.V. Venkatesh and M.V. Srinivasan (1994) Measurement of complex optical flow using an augmented, generalised-gradient scheme. *J. Opt. Soc. Am. A* 11, 2787-2798.

76. [C]M.V. Srinivasan (1994) Capturing complex optic flow through image interpolation. *Proceedings, IMACS International Symposium on Signal Processing, Robotics and Neural Networks*. Villeneuve d'Ascq, France, pp. 620-623.

77. [A,C]M.V. Srinivasan, S.W. Zhang, M. Lehrer and T.S. Collett (1994) "Tunnel vision" in bees, and possible applications to robot navigation. *Proceedings, Workshop on Spatial and Temporal Interaction: Representation and Reasoning*, at the *Third International Conference on Automation, Robotics and Computer Vision, Singapore,* 8-11 November 1994. pp. 56-74.

78. [B]S.W. Zhang and M.V. Srinivasan (1994) Pattern recognition in honeybees: analysis of orientation. *Phil. Trans. R. Soc. Lond B* 346, 399-406.

79. [A]M.V. Srinivasan and M. Davey (1995) Strategies for active camouflage of motion. *Proc. R. Soc. Lond. B.* 259, 19-25.

80. [B]S.W. Zhang, M.V. Srinivasan and T. Collett (1995) Convergent processing in honeybee vision: Multiple channels for the recognition of shape. *Proc. Nat. Acad. Sci.* 92, 3029-3031.

81. [B]A.Giger and M.V. Srinivasan (1995) Pattern recognition in honeybees: Eidetic imagery and orientation discrimination *J. Comp. Physiol. A* 176, 791-795.

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B4. [A]*The Visual Neurosciences*. J.S. Werner and L.M. Chalupa (Editors), M. Burns, J. Geng, M. Goldman, J. Handa, A. Ishida, G.R. Mangun, K, McAllister, B. Olshausen, G. Recanzone, M.V. Srinivasan, W.M. Usrey, M. Webster, D. Whitney (Associate Editors), MIT Press (2013), 2000 pages. ISBN 9780262019163.

Patents

P1. [C]J.S. Chahl, M. Nagle, M.V. Srinivasan and P. Sobey. A novel system for panoramic video surveillance. Australian Patent WO95/06303 (1997), U.S. Patent 5790181 (1998), European Patent 0715743 (2002).

P2. [C]J.S. Chahl and M.V. Srinivasan (1997) Imaging system. Australian Provisional Patent application PO3976/96, U.S. Patent 6429418 (2002).

P3. [C]J.S. Chahl and M.V. Srinivasan (1997) Range finding. Australian Provisional Patent application filed 19 August 1997.

P4. [C]M.V. Srinivasan, S. Thurrowgood and D. Soccol (2006) Optical detection system. Australian Provisional Patent application, priority date 21 September 2006.

P5. [C]M.V. Srinivasan, S. Thurrowgood and D. Soccol (2007) Optical detection system. International (PCT) Patent Application No PCT/AU2007/001406, priority date 21 September 2006

P6. [C]M.V. Srinivasan, S. Thurrowgood and D. Soccol (2007) Optical detection system-Australian Provisional Patent Application No. 2007906795, priority date 14 December 2007

Book Reviews

[C]M.V. Srinivasan (2005) Putting science into the engineering of robots. *International Journal of Advanced Robotics Systems* 2(4), 374.

[B]M.V. Srinivasan (2008) Commentary on M.R. Bennett and P.M.S. Hacker, *History of Cognitive Neuroscience*, Oxford University Press.

Conference abstracts
ca. 140 conference abstracts. Details can be provided on request.

Invited presentations and keynote/plenary lectures, 2000 -

2000

Pattern recognition and associative recall in honeybees. Invited presentation, workshop on "Recognition of visual patterns and landmarks by insects", Delmenhorst, Germany, 8-10 March 2000.

Insect Vision and Navigation. Invited presentation, Annual DARPA Workshop on Controlled Biological Systems, San Antonio, Texas, 10-14 May 2000.

From living insects to autonomous robots. Invited presentation, NASA/MBL Conference on Invertebrate Sensory Information Processing, Johnson Center of the National Academy of Sciences, Woods Hole, 15-17 April 2000.

From living insects to autonomous robots. Plenary lecture, Seventh International Symposium on Evolutionary Robotics (ER2000), Tokyo, Japan, 27-28 April 2000.

Small brains, smart minds. Invited presentation, Symposium on Australia's Science Future, Australian Academy of Science, Canberra, 3-4 May 2000.

Visual control of bee navigation and homing. Invited presentation, Conference on Neurotechnology for Biomimetic Robots, Marine Science Center, Northeastern University, Nahant, Mass, 14-16 May 2000.

From living insects to seeing machines. Invited seminar, Physical Sciences Inc. (Andover, Mass) 19 May 2000.

Honeybee Vision, Navigation and "Cognition". Invited seminar, Caltech, 22 May 2000.

From living insects to autonomous robots. Invited seminar, Burgman College, Australian National University, 5 May 2000.

From living insects to autonomously navigating robots. Invited seminar, Research School of Physical Sciences and Engineering Colloquium, Australian National University, 15 June 2000.

Insect vision and navigation, and applications to robotics. Plenary lecture, Sixth International Conference on Simulation of Adaptive Behaviour, Paris, France, 11-16 September 2000.

Invited lecturer, Course on "Methods in Computational Neuroscience", Marine Biological Laboratory, Woods Hole, Massachusetts, 15-29 August 2000.

From flying bees to autonomous robots. Plenary lecture, NASA/DOD Second Biomorphic Explorers Workshop, Jet Propulsion Laboratory, Pasadena, California, 4-6 December 2000.

2001

Small Brains, Smart Minds: Honeybee Vision, Navigation and "Cognition". Plenary lecture, Annual Meeting of the Australian Neuroscience Society, Brisbane, 28-31 January 2001.

Perception and Learning in Honeybees. Workshop on Animal Cognition, McQuarie Centre for Cognitive Science, Sydney, 5 January 2001.

Small Brains, Smart Minds: Honeybee Vision, Navigation and "Cognition". Invited seminar, University of California, Davis, 5 February 2001.

From Flying Insects to UAVs. Invited lecture, UAV Australia Conference, Melbourne, 8-9 February 2001.

Insect Vision and Navigation. Invited presentation, DARPA Workshop on Controlled Biological Systems, Breckenridge, Colorado, 19 March 2001.

Insect Navigation and Robotic Applications. Invited seminar, NASA Ames Research Center, Moffet Field, California, 23 March 2001.

Vision, Navigation and "Cognition" in Honeybees. Anderson Stuart Seminar, University of Sydney, 30 March 2001.

Small brains, smart minds. New Fellows' Lectures, The Royal Society, London, 13 July 2001.

Visual orientation in insects. Plenary lecture, International Conference on Invertebrate Vision, Lund, Sweden, 7-12 August 2001.

Invited lecturer, Course on "Methods in Computational Neuroscience", Marine Biological Laboratory, Woods Hole, Massachusetts, 15-19 August 2001.

Navigation and perception in a miniature brain. Plenary lecture, Third International Conference on Cognitive Science, Beijing, 27-31 August 2001.

Small brains, smart minds: Insect vision, navigation and 'cognition'. Plenary lecture, International Conference on The Interface between Systems Brain Science and Neuroethology, Okazaki, Japan, 30 Oct – 1 Nov 2001.

From flying insects to autonomously navigating robots. Plenary lecture, International Conference on The Interface between Systems Brain Science and Neuroethology, Okazaki, Japan, 30 Oct – 1 Nov 2001.

Landing strategies in honeybees and UAVs. Invited presentation, Conference of the International Society of Robotics Research, Lorne, Australia, 9-12 Nov 2001.

Honeybee navigation and cognition. Invited lecture, Tamagawa University, Tokyo, Japan, 2 Nov. 2001.

2002

From insects to autonomous robots. Invited lecture, Fourth National Science Teacher's Summer School, Canberra, 16 Jan 2002.

Insect vision and navigation, and applications to machine vision. Banquet Lecture, Asian Conference on Computer Vision, Melbourne, 25 Jan 2002.

From flying insects to autonomous robots. Invited lecture, Second Summer Systems and Control Workshop, UNSW, Sydney, 22 Feb 2002.

Principles of insect vision and navigation, and applications to autonomous vehicles. Keynote lecture, International Conference on Information, Decision and Control, Adelaide, 10 – 12 Feb 2002.

From Living Insects to Autonomous Robots, Invited Seminar, University of Zurich, Switzerland, 30 April 2002.

Vision, Navigation and "Cognition" in Honeybees. Invited Seminar, Department of Botany and Zoology, Australian National University, 16 May 2002.

From Honeybees to UAVs. Researching with Scientists seminar, CSIRO Discovery Centre, 6 June 2002.

Small brains, smart minds: Honeybee vision, navigation and 'cognition'. Plenary lecture, Annual Conference of the Japan Society for Biochemistry and Physiology, August 4-7, 2002.

From living insects to autonomous flight. Plenary lecture, W. Grey Walter Workshop, Bristol, U.K., 13-16 August 2002.

Vision, Navigation and "Cognition" in Honeybees. Invited Lecture, Canberra Field Naturalists' Society, 5 September 2002.

Biomimetic UCAVs. Keynote Lecture, U.S. DARPA Biodynotics Workshop, Arlington, Oct 7, 2002.

Small Brains, Smart Minds: Insect Navigation and Robotic Applications. Plenary Lecture, Second Advanced Studies Institute Conference, Australian National University, Canberra, 21-25 October 2002.

Insect Navigation and Robotic Applications. The National Institutes Public Lecture Series, National Museum of Australia, 30 October 2002.

Flying Robots Inspired by Insect Vision. Invited presentation to the Prime Minister's Science, Engineering and Innovation Council (PMSEIC), Parliament House, 5 December 2002.

2003
Invited participant and lecturer, Workshop on "Functional Analysis of the Nervous System", Mathematical Biosciences Institute, Ohio State University, USA, 25-27 February 2003. Talk titles: (i) From Flying Insects to Autonomous Robots; (ii) Small Brains, Smart Minds: Vision, perception and 'cognition' in honeybees.

Novel applications of basic research: Flying robots inspired by insect vision and navigation. Invited lecture, High Flyers' Think Tank on Safeguarding Australia. Australian Academy of Science, Canberra, 4 April 2003.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees. Plenary Lecture, Annual Conference of the Australasian Society for the Study of Animal Behaviour, ANU, Canberra, 26 April 2003.

Honeybee vision, navigation and 'cognition': recent progress. Invited presentation, Gordon Conference on Neural Plasticity, Salve Regina College, Newport, Rhode Island, June 22-27, 2003.

Small Brains, Smart Minds: Insect Navigation and Robotic Applications. Plenary Lecture, Sixth International Conference on Information Fusion, Cairns, 8-11 July 2003.

Insect Navigation: From Perception to Action using Optic Flow. Plenary Lecture, Twelfth International Conference on Perception and Action, Gold Coast, 13-18 July 2003.

Insect vision and navigation, and applications to robotics. Invited seminar, U.S. Office of Naval Research, London: 26 August 2003.

Small Brains, Smart Minds: Insect Navigation and Robotic Applications. Keynote Lecture, Conference on "Towards Intelligent Mobile Robotics", Bristol, U.K., 28-29 August 2003.

Insect Vision and Navigation, and Technological Applications. 2003 Ian Constable Lecture, Lions Eye Institute, Perth, 10 September 2003.

Invited participant, Workshop on "Micro Aerial Vehicles: Unmet Technological Requirements", Garmisch Partenkirchen, Germany, 22-24 September 2003.

Invited to give a series of lectures at the Defence Science Organisation, Singapore, 5-7 November 2003.

Visual perception and 'cognition' in insects. Invited seminar, Brain Science Institute, University of Queensland, Brisbane, 19 November 2003.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees. Peter Bishop Plenary Lecture, Australasian Ophthalmic and Visual Sciences Meeting, Melbourne, 29-30 November, 2003.

2004

Visual control of insect flight. Invited lecture, National Summer Science Teachers' School, Australian National University, Canberra. 12 January 2004.

Lessons from the study of vision in simple natural systems. Invited lecture, Australian National University Ph.B. Student Workshop, Kioloa, NSW. 27 February 2004.

Honeybee behaviour and visual ecology. Invited seminar, School of Ecological Sciences, University of Queensland, Brisbane. 12 March 2004.

Principles of insect navigation. Invited presentation, 60th Institute of Navigation Conference, Dayton, Ohio, USA, 7 June 2004.

Insect vision and navigation and applications to robotics. Invited seminar, Eglin U.S. Air Force Base, Florida, USA. 15 June 2004.

Landing strategies in honeybees, and applications to UAVs. Invited seminar, Dept. of Aeronautical Engineering, U. Maryland. 18 June 2004.

Studying honeybee vision and navigation: Continuing a strong German tradition. Invited lecture, German Embassy, Canberra. 5 July 2004.

Small brains, smart minds: Insect vision, navigation and 'cognition'. Opening Keynote lecture, International Congress of Entomology, Brisbane, Australia. 15 August 2004.

Vision down under, up above, and to either side: Vision, navigation, perception, and 'cognition' in honeybees. Opening Keynote lecture, Vision Down Under Conference, Fraser Island, Australia, 5 September 2004.

Making a beeline for the food: Recent progress in understanding honeybee flight and navigation. Invited presentation, Gordon Conference on Sensory Coding and the Natural Environment, Oxford University, U.K., 8 September 2004.

Principles of visual information processing and computation in insects. Invited seminar, Dept. of Computer Science, U. Birmingham, U.K. 13 September 2004.

Parallel problem solving by honeybees Opening Keynote lecture, 8th International Conference on Parallel Problem Solving from Nature, Birmingham, U.K. 20 September 2004.

Learning by and from small brains. Stanhope Oration, Annual Conference of the Australian Science Teachers' Association, Canberra. 28 September: 2004.

Higher order brain functions in an invertebrate. Invited seminar, School of Psychology, University of Griffith, Brisbane. 8 October 2004.

Invited address, ARC Grants Announcement Ceremony. Parliament House, Canberra. 17 November 2004.

Vision and navigation in insects, and opportunities to study sensor interaction. Plenary lecture, International Conference on Intelligent Sensors, Sensor Networks and Information Processing, Melbourne, Australia, 16 December 2004.

2005
Small brains, smart minds: Vision, navigation and 'cognition' in honeybees, and applications to robotics. Invited Public lecture, National Brain Awareness Week, Canberra, 17 March 2005.

Small brains, smart minds: Vision, navigation and 'cognition' in honeybees, and applications to robotics. Invited presentation, Combined Academies Dinner, Australian Academy of Science, Canberra, 26 May 2005.

Small brains, smart minds: Vision, navigation and 'cognition' in honeybees. Control and Dynamical Systems Distinguished Lecture, University of Maryland, College Park, U.S.A. June 16, 2005.

Vision, navigation and 'cognition' in honeybees, and applications to robotics. Invited presentation, Winter School in Mathematics and Computational Biology, University of Queensland, Brisbane, July 15, 2005.

Insect vision and applications to the design of MAVs. Plenary lecture, Indo-US Workshop on Micro Air Vehicles, Bangalore, 1 August 2005.

From flying insects to autonomously navigating vehicles. Invited seminar, Jawaharlal Nehru Institute of Advanced Study, Bangalore, 5 August 2005.

Principles of vision, navigation and 'cognition' in honeybees. Plenary lecture, 13th Congress of the International Union for the Study of Social Insects, St. Petersburg, Russia, 23 August 2005.

From insect vision to robot navigation. Public lecture, Institute of Electrical and Electronic Engineers, Victorian Section, Melbourne, 6 September 2005.

Cognition in mini-brains. Invited presentation, Inaugural Brain Plasticity Symposium, Queensland Brain Institute, University of Queensland, Brisbane, 13 September 2005.

Visual guidance in insects and applications to MAVs. Invited presentation, First US-European Conference on Micro Air Vehicles, Elmau, Germany, 22 September 2005.

Small brains, smart computations. Plenary lecture, Brain IT Symposium, Kitakyushu, Japan, 9 October 2005.

Seeing on the move: Active vision in flying insects. Invited presentation, Rank Prize Symposium on Active Vision, Grasmere, U.K., 27 Oct 2005.

Bee brain: Implications for navigation, eusociality and robotics. Sixth Annual Theodore L. Hopkins Distinguished lecture, Kansas State University, 4 November 2005.

Insect-inspired robotics. Invited presentation, Annual Meeting, Entomological Society of America, 6 November 2005.

Insect-inspired sensors for autonomous visual guidance. Keynote lecture, Second International Conference on Intelligent Sensors, Sensor Networks and Information Processing, Melbourne, 6 December 2005.

Vision, Navigation and 'Cognition" in Honeybees. Plenary lecture, International Symposium of the Society for Optical Engineering (SPIE), Brisbane, 13 December 2005.

2006
Royal Society of New Zealand Distinguished Visitor lectures at a number of universities in New Zealand, 9-21 March 2006.

Much more than a honey machine. Plenary lecture, 8th Conference of the Australasian Apicultural Association, Perth, 21- 24 March 2006.

Emerging Frontiers in Computational Neuroscience. Opening Lecture, Inauguration of the University of Adelaide Computational Neuroscience Cluster, Adelaide, 19 May 2006.

Probing Perception in a Mini-Brain. Invited lecture, International Symposium on "From Stars to Brains: Pathways to Human Consciousness", Canberra, 20-21 June 2006.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees. Plenary lecture, 23rd International Conference on Machine Learning, Pittsburgh, 25-29 June 2006.

Visual guidance in insects and applications to optics, vision systems and autonomous flight. Invited lecture, Australian Centre for Precision Optics, Sydney, 14 July 2006.

Vision, navigation, perception, learning and memory in honeybees, and applications to robotics. Plenary lecture, International Congress of the International Union for the Study of Social Insects, Washington D.C., 30 July – 5 August 2006.

Insect olfaction, and prospects for E-noses. Invited lecture, CSIRO Food Futures Flagship Vision 06 Conference, Adelaide, 7-8 August 2006.

Computational behaviour in flying Insects. Invited lecture, Inaugural Queensland Brain Institute Workshop on Mathematical and Computational Neuroscience, Brisbane, 13-14 August 2006.

Acceptance lecture, Prime Minister's Science Prize. Parliament House, Canberra, 16 October 2006.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees, and applications to autonomous visual guidance. Azriel Rosenfeld Distinguished Seminar Series on Vision, University of Maryland, College Park, MD, 30 October 2006.

Visual guidance in flying insects and applications to robotics: Recent progress. Invited lecture, Insect Vision Workshop, Arizona Research laboratories, University of Arizona, Tucson, 2-3 November 2006.

More than a honey machine. Invited seminar, John Curtin School of Medical Research, Australian National University, 18 October 2006.

2007
Insect vision and navigation, and applications to robotics. Dinner Lecture, National Youth Science Forum, Canberra, 9 January 2007.

Sophisticated performance from simple brains. Invited seminar, Brain and Mind Forum, University of Melbourne, 22 March 2007.

Visual guidance in insects and applications to autonomous flight. Invited seminar, CSIRO, Pullenvale, 29 March 2007.

Vision and perception in simple nervous systems. Invited seminar, The Garvan Institute, Sydney, 1 May 2007.

Perception, learning and 'cognition' in honeybees. International Symposium on Development and Evolution of Higher Cognition in Animals, Australian Academy of Science, Canberra, 4 May 2007.

The non-cognate bee. Invited presentation, International Symposium on Higher Cognition in Animals, Forum for European-Australian Science and Technology Cooperation (FEAST), Berrima, NSW, 6-8 May 2007.

How Do Insects Find Their Way? Invited Lecture, The Hut Environmental and Community Regeneration Association, Brisbane, QLD, 23 May 2007.

Visual computation in honeybees and applications to robotics. Invited presentation, Winter School in Computational Biology, University of Queensland, Brisbane, 28-29 June 2007.

How an Insect Sees the World. Invited lecture, Kenmore High School, QLD, 9 July 2007.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees, and applications to robotics. Plenary Lecture, IBRO World Congress of Neuroscience, Melbourne, 12-17 July 2007.

More than a honey machine. Plenary Lecture, *Annual Human Frontiers in Science Program Conference,* Brisbane, 18-20 July 2007.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees, and applications to robotics. Public Lecture, National Science Museum, Canberra, 3 August 2007.

Visual Guidance of Flight in Insects: An Introductory Review and Summary of Recent Progress. Plenary lecture, International Symposium on Flying Insects and Robots, Ascona, Switzerland, 12-17 August 2007.

Vision and Navigation in Honeybees. Invited seminar, School of Integrative Biology, University of Queensland, Brisbane, QLD, 24 August 2007.

Small Brains, Smart Minds: Vision, navigation and 'cognition' in honeybees, and applications to robotics. Public Lecture, *BrisScience*, Brisbane City Hall, 27 August 2007.

Bug-Eyed Science. Plenary Lecture, 12th International Commercialization of Micro and Nano Systems Conference, Melbourne, 2-5 September 2007.

Beyond the Honey: Spatial vision, navigation and 'cognition' in honeybees. Plenary lecture, International Conference on Spatial Information Theory, Melbourne, 19-23 September 2007. (I had accepted the invitation to give this lecture, but unfortunately could not attend the conference at the last moment due to a severe bout of the 'flu).

Visual Guidance for Airborne Vehicles. Invited Presentation, Australian JSF Advanced Technology and Innovation Conference, Melbourne, 10-11 July 2007.

Small Brains, Smart Minds: Vision, navigation, and 'cognition' in honeybees, and applications to robotics. University Public Lecture, Cornell University, Ithaca, N.Y., USA, 3 October 2007.

The honeybee as a model for the study of visual processing, learning and memory. Invited seminar, Division of Neurobiology and Behavior, Cornell University, Ithaca, N.Y., USA, 4 October 2007.

From Insects to Autonomous Aerial Vehicles. Invited seminar, College of Engineering, Cornell University, Ithaca, N.Y., USA, 4 October 2007.

From Flying Insects to Autonomous Aerial Vehicles. Invited seminar, Dept. of Mechanical Engineering, University of Melbourne, 30 October 2007.

From Bees to Robots. Invited seminar, Griffith University, 2 November 2007.

Biologically-Inspired Vision for Machines. Invited presentation, IEEE Annual General Meeting, QLD Chapter, 29 November 2007.

Is There Life Without GPS? Honeybee Navigation and Applications to Robotics. Invited Evening lecture, University of NSW, 3 December 2007.

Eighty Years of Adrian Horridge. Invited presentation, Festschrift for Prof. Adrian Horridge, Australian National University, Canberra, 4 December 2007.

Intelligent Sensing in Insects. Invited presentation, Annual Meeting of the ARC Network on Intelligent Sensors and Sensor Networks for Information Processing, 7 December 2007.

2008
Prize Acceptance lecture, U.K Rank Prize in Optoelectronics, London, 4 February 2008.

Biologically Inspired Vision for Robots. Invited seminar, Institute for Neuroinformatics, Swiss Federal Institute of Technology and University of Zürich, Switzerland. 7 February 2008.

Vision-Based Navigation and Control of Micro Aerial Vehicles. Invited presentation, MAV 08: First US-Asian Demonstration and Assessment of Micro Aerial Vehicle and Unmanned Ground Vehicle Technology, Agra, India, 10-15 March 2008.

Neuroethology and the Honeybee. Invited seminar, Centre for Ecological Sciences, Indian Institute of Science, Bangalore, India, 19 March 2008.

Probing Higher Functions in a Small Brain. Plenary Lecture, Conference of the Australasian Society for the Study of Animal Behaviour, Coffs Harbour, NSW, 28 March 2008.

Visualizing the World of a Honeybee. Invited lecture, The Fiona Hall Force of Nature Lecture Series, Museum of Contemporary Art, Sydney, NSW, 11 April 2008.

Brilliant Bee Brains. Hot Topic Talk, Australian Course in Advanced Neuroscience, Moreton Bay Research Station, QLD, 25 April 2008.

From Visual Guidance in Insects to Autonomous Aerial Vehicles. Plenary Lecture, American Control Conference, Seattle, Washington, USA, 11-13 June 2008.

Visually Guided Flight in Honeybees. Invited seminar, Dept. of Biology, University of Washington, Seattle, Washington, USA, 10 June 2008.

The Honeybee as a Model for Understanding Sensory Information Processing. Invited seminar, Howard Hughes Medical Institute, Janelia Farm Research Campus, Ashburn, Virgina, USA, 19 June 2008.

Vision, Navigation and Cognition in Social Insects. Plenary Lecture, 2008 Asia-Pacific Conference on Vision, Brisbane, Australia, 18 July 2008.

More Than a Honey Machine; Vision, Navigation and Cognitive Capacity in Honeybees. Plenary Lecture, 8th International Bee Congress, Ribeirao Preto, Brazil, 22-26 July 2008.

Honeybee Vision and Navigation. Invited lecture, Queensland Naturalist's club, 18 August 2008.

Sensible Sensing in Biology and Engineering: Visual guidance of insect flight, and applications to robotics. Opening Keynote Lecture, International Conference on Sensors and Sensing in Biology and Engineering, Cetraro, Italy, 12-16 October 2008.

Probing Cognitive Capacity in Honeybees. Invited lecture, Gatsby Workshop on Simpler Cognitive Systems, London, U.K., 24-26 November 2008.

Going with the flow: Visually guided flight and navigation in honeybees. Craik Lecture, Cambridge University, U.K, 27 November 2008.

2009
From Photoreceptors to Behaviour in Birds and Bees. Invited lecture, Symposium "From Photoreceptors to Behaviour", Australian Neuroscience Society, Canberra, 31 January 2009.

Biologically Inspired Vision for UAV Navigation. Invited lecture, International Conference on Unmanned Aerial Vehicles, Bangalore, India, 3-4 April 2009.

Small Brains, Smart Minds: Vision, navigation, and 'cognition' in honeybees, and applications to robotics. Invited Student's Choice seminar, Max Planck Institute for Cell Biology and Genetics, Dresden, Germany, 16 April 2009.

Small Brains, Smart Minds: Vision, navigation, and 'cognition' in honeybees. Invited lecture, University of the Third Age, Queensland Chapter, Brisbane, 23 April 2009.

Small Brains, Smart Minds: Vision, navigation, and cognitive capacity in honeybees. Invited Key Lecture, Munich Center for Neurosciences, University of Munich, Germany, 4 May 2009.

Critically Evaluating the Role of the Polarization Compass in Honeybee Navigation. Invited lecture, International Conference on Visual Processing in Insects, Howard Hughes Medical Institute, Janelia Farm Research Campus, Ashburn, Virginia, USA, 17-20 May 2009.

More than a Honey Machine: Vision, Navigation and Cognitive Capacity in Honeybees. Invited lecture, Annual General Meeting West Australian Apiculturists' Society, Perth, 3 June 2009.

Visual Guidance in Flying Insects and Applications to UAV Navigation. Invited seminar, Ecole Polytechnique Federale Lausanne, Switzerland, 15 June 2009.

The Mind: Mind over Matter? Invited Panel Discussant, Public Forum, Adelaide Festival of Ideas, 10 July 2009.

Big science, Big bucks, Big deal? Invited Panel Discussant, Public Forum, Adelaide Festival of Ideas, 11 July 2009.

Pushing the limits of a one-milligram brain. Invited Public Lecture, Adelaide Festival of Ideas, 12 July 2009.

Visual and Navigational Computation in Small Brains. Invited seminar, Department of Mathematics and Statistics, U. Melbourne, 18 August 2009.

Small Brains, Smart Minds: Vision, Navigation and 'Cognition' in Honeybees, and Applications to Robotics. Opening Lecture, BioHorizons e-conference, 900 first year biology students, University of Queensland, 22 August 2009.

Small Brains, Smart Minds: Vision, Navigation and 'Cognition' in Honeybees, and Applications to Robotics. Invited seminar, School of Pharmacy, University of Queensland, 9 September 2009.

Creative minds: The parallels between science and writing. Invited Panel Discussant, Public Forum, Brisbane Writers' Festival, 11 September 2009.

Hybrid Vigour. Plenary lecture, Live in Queensland Design in the World: Supernature: Design Inspired by Nature. Queensland University of Technology, Brisbane, 17 September 2009.

What Geoff Henry has taught us about the birds and the bees. Geoff Henry Symposium, Australian National University, 21 November 2009.

2010
Visual information processing in honeybee navigation. Invited presentation, Second International Workshop on Natural Environments, Tasks and Intelligence, University of Texas, Austin, 9-11 April 2010.

Visual guidance for autonomous flight. Australian Joint Strike Fighter Advanced Technology and Innovation Conference, 3-4 May 2010.

Navigating to a food source, and helping your sisters find it too. Key Lecture, Symposium On Sensory Aspects of Pollination, The Rank Prize Funds, Grasmere, U.K., 24-27 May 2010.

More than a honey machine: Vision, navigation and 'cognition' in honeybees and applications to robotics. Charles Roff Memorial Address, Annual Conference of the Queensland Beekeepers' Association, Ipswich, QLD, 17-18 June 2010.

Biological vision and animal navigation in the context of robotics. Invited presentation, Annual Neuromorphic Engineering Workshop, Telluride, Colorado, 10-17 July 2010.

Visual information processing in honeybee navigation and applications to robotics. Invited seminar, Dept. of Mathematics, University of Queensland, 30 August 2010.

Towards biologically inspired visual guidance for autonomous aerial vehicles. Invited Black Box Lecture, Australian Defense Science and Technology Organization, Melbourne, 27 September 2010.

Small brains, smart minds: Vision and navigation in honeybees, and applications to robotics. Invited seminar, Harvard Electrical Engineering Seminar Series, Harvard University, Boston, Mass., USA, 8 October 2010.

Visual information processing in honeybee navigation and applications to robotics. Keynote Lecture, Geelong Innovation Forum, Deakin University, Geelong, 1-2 November 2010.

Computational principles of visual guidance in birds and bees. Invited lecture, Fourth Australian Workshop in Computational Neuroscience, Queensland Brain Institute, University of Queensland, Brisbane, 4-5 November 2010.

Visual guidance, navigation and higher brain function in honeybees. Invited symposium presentation, Annual Meeting of the Entomological Society of America, San Diego, 12-15 December 2010. (Had to cancel attendance just prior to conference due to other work commitments).

2011
The world through the eyes of a bee: vision, navigation and "cognition" in honeybees, and application to robotics. Oration, Conference of the Academia Ophthalmologica Internationalis, Sydney, 20 March 2011.

Optic flow and odometry in nature. Invited symposium presentation, Workshop on Optic Flow, Sensors and Applications to Guidance, Navigation and Control. Eglin Air Force Base Research Laboratories, Florida, USA, 23-25 May 2011.

Rigidity and plasticity in honeybee vision, perception and navigation. Gordon Research Conference on Excitatory Synapses and Brain Function. Easton, Massachusetts, USA, 26 June 26 – 1 July 2011. (Had to cancel attendance just prior to conference due to other work commitments).

Vision, navigation and 'cognition' in honeybees, and applications to the guidance of autonomous aerial vehicles. Invited seminar, Queensland Institute of Molecular Biology, University of Queensland, 29 July 2011.

From Bees to 'Bots: Vision and Navigation in Honeybees, and Applications to Flying Machines. Closing plenary lecture, Student Conference, Australian Institute for Biotechnology and Nanotechnology, University of Queensland. 23 – 24 September 2011.

Visual processing in natural systems and applications to robotics. Plenary Lecture, Session on Biologically Inspired Robotics, International Conference on Robotics and Intelligent Systems (IROS), San Francisco, California, USA, 25-30 September 2011.

Vision and navigation in insects, and applications to flying machines. Invited lecture, Melbourne Brain Symposium, Melbourne, 5 October 2011.

Vision, pattern recognition and navigation in honeybees and applications to aircraft guidance. Plenary lecture, Seventh SPIE International Symposium on Multispectral Image Processing and Pattern Recognition, Guilin, China, 4-6 November, 2011.

Vision, orientation and navigation in honeybees and applications to robotics. Keynote lecture, Conference on Thinking Systems Frontiers: Intelligent Machines, Robots, Human-Computer Interaction and the Science-Arts Nexus. Powerhouse Museum, Sydney, 8-9 December 2011.

2012
Critically testing the role of the polarization compass in honeybee navigation. In Conference on "Towards a Common Framework to Study the Function of the Insect Central Complex", Howard Hughes Medical Research Centre, Janelia Farm Research Campus, USA, 15-18 April 2012. (Had to cancel attendance just prior to conference due to other work commitments).

Vision, Robotics and Bees. Tedx presentation, Sydney, 26 May 2012.
http://www.youtube.com/watch?v=TQeK3d83ybk

More than a Honey Machine. Invited lecture, Annual Conference of the South Australian Apiarists' Association, Clare, South Australia, 28-29 June 2012.

From Bees to Airborne Robots. Invited lecture, Annual Conference of the South Australian Apiarists' Association, Clare, South Australia, 28-29 June 2012.

Small Brains. Keynote lecture, Robotics: Science and Systems Conference, Sydney, 9-13 July 2012.

From Flying Insects to Autonomous Aerial Vehicles. Invited presentation, Workshop on Bio-inspired Robotics, Robotics: Science and Systems Conference, Sydney, 9-13 July 2012.

Multimodal Sensing for Flight Control and Navigation in Honeybees. Invited Symposium Presentation (SY28), Tenth International Congress of Neuroethology, University of Maryland College Park, MD, USA, 5-10 August 2012.

Small Brains, Smart Planes. Invited seminar, Dept. of Psychology, Queen's University, Kingston, Ontario, Canada, 3 August 2012.

Flow-field Visualization and Incorporating Unique Capabilities into UAS which are ideal for Take-off and Landing on Ships. Invited Presentation, Meeting of the Scientific Committee for Oceanographic Aircraft Research (SCOAR), University of Alaska, Fairbanks - International Arctic Research Center, Fairbanks, AK, USA, 14-15 August 2012.

Small Brains – Smart Minds. Invited lecture, Barcelona Cognition, Brain and Technology Summer School, Universitat Pompeu Fabra, Barcelona, Spain, 3-14 September 2012.

Inspiration from the Land of Mike in the Land of Oz. Invited presentation, Animal Vision Symposium, Applied Vision Association, University of Sussex, Falmer, Brighton, U.K., 10 September 2012.

From Bees to 'Bots: Vision and Navigation in Honeybees, and Applications to Flying Machines. Public Lecture, 2102 International Postgraduate Symposium in Biomedical Sciences, The School of Biomedical Sciences, University of Queensland, Brisbane, Australia, 24-26 September 2012.

Of Bees, Birds and Robots. Invited presentation, International Conference on Systems Neuroscience, Munich, Germany, 9-12 October 2012.

Vision and Navigation in Honeybees. Invited lecture, IBRO-UNESCO Inter-Regional School on Computational and Theoretical Neuroscience, Hyderabad, India, 5 – 20 December 2012.

Biologically Inspired Robotics. Invited lecture, IBRO-UNESCO Inter-Regional School on Computational and Theoretical Neuroscience, Hyderabad, India, 5 – 20 December 2012.

Small Brains, Smart Minds. Invited lecture, IBRO-UNESCO Inter-Regional School on Computational and Theoretical Neuroscience, Hyderabad, India, 5 – 20 December 2012.

Of Bees, Birds and Robots. Seminar, Centre for Neuroscience, Indian Institute of Science, Bangalore, India, 21 December 2012.

2013
Visual guidance of flight in bees and birds, and applications to robotics. Booz Allen lecture, Distinguished Colloquium Series in Electrical and Computer Engineering, University of Maryland, USA, 1 March 2013.

Vision in honeybees, and applications to guidance of aerial vehicles. Invited presentation, International Conference on Insect Vision: Cells, Computation and Behaviour, Howard Hughes Medical Research Institute, Janelia Farm, VA, USA, 3-6 March 2013.

Of bees, birds and flying machines. Plenary lecture, Workshop on Compound Eyes: From Biology to Technology, University of Tuebingen, Germany, 26-28 March 2013.

Vision and navigation in honeybees, and applications to robotics. Plenary lecture, BIONAV Conference, Royal Institute of Navigation, Royal Holloway College, London, U.K., 11-13 April 2013.

Honeybees: Vision, navigation, psychophysics and robotics. Invited seminar, Department of Psychology, University of Hong Kong, 2 July 2013.

Visual guidance of flight in honeybees and birds and applications to robotics. Plenary lecture, Ninth Asia-Pacific Conference on Vision (APCV2013), Suzhou, China, 5-8 July 2013.

Dull, Dirty and Dangerous: Advances in Drone Technology. Invited member, panel discussion, Concilium Symposium, Intercontinental Sanctuary Cove Resort, Gold Coast, Queensland, Australia, 22-24 August 2013.

Mind in a two-millimetre brain. Invited lecture, Leopoldina, German Academy of Sciences, Halle, Germany, 20-22 September 2013. (Had to cancel participation just prior to conference due to illness).

More than a Honey Machine: Vision and navigation in honeybees, and applications to robotics. Invited seminar, Entomological Society of Queensland, Brisbane, Australia, 8 October 2013.

From bees and birds to autonomous aerial vehicles. Keynote lecture, Eighth SPIE International Symposium on Multispectral image processing and pattern recognition, Wuhan, China, 26-27 October 2013. (Had to cancel participation just prior to conference due to illness).

2014
From bees to robots. Invited presentation, Cold Spring Harbor Meeting "Neuronal circuits: from structure to function", Cold Spring Harbor, USA, 2-5 April 2014. (Had to cancel participation just prior to conference due to illness).

More than a Honey Machine: Vision and navigation in honeybees, and applications to robotics. Keynote lecture, Annual Meeting of the Vision Sciences Society, St. Pete's Beach, Florida, USA, 14-21 May 2014.

Of Bees, Birds and Flying Machines. Public lecture, *BrisScience*, Brisbane, Australia, 23 June 2014.

More than a Honey Machine: Vision and Navigation in Honeybees, and Applications to Robotics. Invited seminar, Deakin University, Geelong, Australia, 27 June 2014.

Consciousness in insects. Invited presentation, Symposium on Panpsychism, Gold Coast, Australia, 21 July 2014.

Of Bees, Birds and Flying Machines. Plenary address, Living Machines Conference, Milan, Italy, 31 July 2014.

Vision and Navigation in Honeybees, and Applications to Robotics. Invited seminar, University of Trento, Trento, Italy, 4 August 2014.

Vision and Navigation in Bees and Birds, and Applications to Robotics. Invited seminar, John Curtin School of Medical Research, Australian National University, Canberra, Australia, 5 September 2014.

Small Brains, Smart Minds and Biologically Inspired Robotics. Invited seminar, National Institute of Astrophysics, Optics and Electronics, Puebla, Mexico, 30 October 2014.

From Bees to Flying Machines. Keynote lecture, Annual Meeting of the Mexican Society for Computer Science, Oxaca, Mexico, 3-5 November 2014.

Visual Guidance in Bees, Birds and Flying Machines. Plenary lecture, DSTO Symposium on Autonomous Systems in Complex Contexts, Melbourne, Australia, 1 December 2014.

2015
Learning, Memory and 'Cognition' in Honeybees. Invited presentation, International Workshop on Social Insect Behaviour, Lisbon, Portugal, 26-29 January 2015.

Going with the Flow: Visual Odometry in Bees and Flying Machines. Invited presentation, Symposium on Ecology, Sensory Processes, and Cognition, Macquarie University, Sydney, Australia, 7 February 2015.

Vision and Navigation in Honeybees, and Applications to Robotics. Plenary lecture, International Conference on Computational Photography, Houston, USA, 24-26 April 2015.

Honeybee Navigation: The Nature of the Odometer and the Compass. Invited lecture, Annual Convention of the Association for Psychological Science, New York, USA, 21-24 May 2015.

Of Bees, Birds, 'Bots, and Portraits. Public lecture, National Portrait Gallery, Canberra, Australia, 14 June 2015.

Visual Guidance in Birds and Bees, and Applications to Aerial Robotics. Keynote Address, *RoboVis* Conference, Adelaide, Australia, 26 June 2015.

Vision and Navigation in Bees and Birds, and Applications to Flying Machines. Plenary Lecture, International Ethological Conference, Cairns, Australia, 9-14 August 2015.

More than a Honey Machine: Vision and Navigation in Bees, and Applications to Autonomous Aerial Vehicles. Invited seminar, CNRS, Marseille, France, 25 September 2015.

Visual guidance of flight: Bees versus Birds. Invited presentation, Workshop on Moving the Senses: From Motion Sensing to Animals in Motion, University of Bielefeld, Germany, 30 September – 2 October 2015.

2016
Small brains, smart minds. Invited talk, Lyceum Club, Brisbane, Australia, 4 April 2016.

Visual guidance of flight: Bees versus Birds, and Applications to UAVs. Invited lecture, Annual Conference of the Society for Experimental Biology, Brighton, Sussex, U.K., 3-8 July 2016.

From Birds and Bees to 'Bots. Presentation at TEDx UQ, University of Queensland, Brisbane, Australia, 30 July 2016.

Small brains, smart minds: *Vision, navigation and 'cognition' in honeybees, and applications to aerial vehicles.* David Danks Leaders in Science Seminar, Murdoch Childrens Research Institute, Melbourne, Australia, 4 October 2016.

The World through the Prism of Science and Religion: Perspectives, Possibilities, and Promises. General Thimmayya Lecture, Bishop Cotton Boys' High School, Bangalore, 26 November 2016.

From Birds and Bees to 'Bots. Invited seminar, Indian Institute of Science, Bangalore, India, 29 November 2016.

2017
Visual guidance of flight in bees and birds. Plenary Lecture, Symposium on The Neural Basis of Active Sensing and Navigation, Howard Hughes Medical Institute, Janelia Research Campus, Ashburn, Virginia, USA, 26-29 March 2017.

From Bees to Drones. Talk and Panel Discussion, World of Drones Congress, Brisbane, Australia, 2 September 2017.

Bees, Birds and 'Bots. Invited speaker and panel discussant, Symposium on The Birds and the Bees, *Siteworks*, Bundanon, NSW, Australia, 23 September 2017.

Why birds don't crash into themselves when flying in flocks. Invited seminar, The Hut Environmental and Community Association, Brisbane, Australia, 27 September 2017.

Invited keynote speaker, *10th SPIE Conference on Multispectral Image Processing and Pattern Recognition*, Xiangyang, Hubei, China, 28-29 October 2017. (Could not participate due to unforeseen family circumstances).

Invited speaker, *Symposium on Studying Complex Behavior,* Weizmann Institute of Science, Rehovot, Israel, 13-15 December 2017. (Could not participate due to unforeseen family circumstances).

2018
From Birds and Bees to Flying Machines. Plenary Lecture, Annual Conference on Australia and New Zealand Industrial and Applied Mathematics (ANZIAM), Hobart, Australia 4-8 February 2018.

Facets of Vision: The Insect Compound Eye. Invited presentation, Symposium on Vision and Opticality: The Humanities and Neuroscience, University of Queensland, Brisbane, Australia, 17 March 2018.

Facets of vision, perception, learning and 'cognition' in a small brain. Invited presentation, Workshop on "Representing a Complex World: Perception, Inference, and Learning for Joint Semantic, Geometric, and Physical Understanding, IEEE International Conference on Robotics and Automation, Brisbane, Australia, 21 May 2018.

Some facets of collective behaviour in bees and birds. Invited presentation, Workshop on Swarms: From Biology to Robotics and Back, IEEE International Conference on Robotics and Automation, Brisbane, Australia, 25 May 2018.

A new perspective on the birds and the bees: Biologically inspired aerial robotics. Plenary lecture, IEEE International Conference on Robotics and Automation, Brisbane, Australia, 24 May 2018.

In conversation with Sam Leach and Mandyam Srinivasan. Panel Discussion at 'Birds and Bees' exhibition, MOD.IFY, University of South Australia, Adelaide, Australia, 4 July 2018.

From Bees and Birds to Flying Machines. Invited presentation, Winter School, University of the Third Age (U3A), Brisbane, Australia, 9 July 2018.

Birds, Bees and Flying Machines. Plenary lecture, International Congress of Neuroethology., Brisbane, 15-20 July 2018.

Artist Anne Noble in conversation with Professor Srini Srinivasan. Ninth Asia-Pacific Triennial of Contemporary Art, QAGOMA, Brisbane, Australia, 24 November 2018.

Small Brains, Smart minds: From Bees and Birds to UAVs. Invited public lecture,
SAGE Center for the Study of the Mind, University of California, Santa Barbara, USA, 6 December 2018.

2019
Visual guidance of flight in bees and birds and applications to aerial robotics. Invited presentation, Gordon Research Conference on Behavior, Evolution and Neurobiology, Mt. Snow, Vermont, USA, 27-28 July 2019 (did not attend due to family health reasons).

2020
Invited talk at Imperial College, London (cancelled due to COVID-related travel restrictions)

2021
Visual guidance of flight in bees and birds and applications to aircraft guidance. Annual Bioengineering Lecture, Imperial College, London, U.K., 26 May 2021 (delivered virtually).

Birds, bees and biologically inspired robotics. Invited Session Keynote Lecture, ALIFE 2021 Conference, 19-23 July 2021 (delivered virtually).

M.V. Srinivasan
6 August 2021