

Qualifications and Experience

June 2015 - Present	Japan Society for Promotion of Science (JSPS) Research Grant – Chiba University – Graduate School of Engineering - Bio-inspired flight control systems
March 2014 – Present	Vice Chancellors Research Fellow – RMIT University – School of Aerospace Mechanical and Manufacturing Engineering, Bio-Inspired Sensory Systems
2012 – 2014	Post-Doctoral Fellow – Harvard University -Department of Organismic and Evolutionary Biology - Combes Lab, Flight Biomechanics
2011 – 2012	Post-Doctoral Fellow - University of Tuebingen , Germany. I studied turbulence structures present within the Atmospheric Boundary Layer relevant to small-scale flight (birds, insects and MAVs).
2008 – 2011:	Doctor of Philosophy (Aerospace Engineering, RMIT University). Title: Influence of Turbulence on a Flat Plate Airfoil at Reynolds Numbers Relevant to MAVs. Supervisors: Prof.Simon Watkins & Dr.JonWatmuff Thesis Link: http://researchbank.rmit.edu.au/view/rmit:11534
2004 – 2007:	Bachelors of Aerospace Engineering , RMIT University, First Class Honors graduate
2003 – 2004:	Private Pilot License at Orient Flight School, India.

Fellowships and Awards

- 2015 – Humboldt Fellowship (120k\$)
- 2015 – Zhejiang University Research Visit Award
- 2015/2016 - Japan Society for Promotion of Science Fellowship (60k\$)
- 2014 - RMIT University Vice Chancellors Research Fellowship (350k\$)
- 2014 - Young Scientist Exchange Program (Department of Industry – Australia)

2014 - Journal of Experimental Biology Travel Fellowship

2013 - Harvard University Post-Doctoral Travel Award

Research Grants

- **Hugh Rogers Research Grant 2015-2016.** Title: Flight mechanics of mosquitoes. **\$10,000AUD**
- **National Geographic Research Grant for Scientific Exploration 2015-2016.** Title: What's the buzz in Australia: Mechanics of buzz pollination in native Australian bees. – **\$30,000AUD**
- **RMIT University Internal Research Grant 2014-2016.** Title: Wing kinematics during rapid response in flying insects – **\$100,000AUD**
- **Deutsche Forschungsgemeinschaft (Germany) 2014 - 2016** Title: Influence of Freestream Turbulence on the Flow Structure over Airfoils at Low Reynolds Numbers – **\$120,000 AUD**

Invited Reviews

- 1) Shyy, W., Kang, C.K., Chirarattananon, P., **Ravi, S.** and Liu, H. “Dynamics and Control of Bio-Inspired Flapping-Wing Flight Systems”, **Proceedings of the Royal Society A** (in preparation – Dec 2015 issue)
- 2) Liu, H., Tanaka, H., **Ravi, S.**, and Kolomenskiy, D. “Biomechanics and biomimetics in bio-inspired flight system”, **The Royal Society, Philosophical Transactions B** (in preparation – Jan 2016 issue)

Journal Papers

- 1) **Ravi, S.**, Mountcastle, A., and Combes, S.A, “Nectar vs. pollen loading affects the trade-off between flight stability and maneuverability in bumblebees”, **PNAS** 112 (33), 10527-10532 ^Co-First Authors (2015)
- 2) Crall, J., **Ravi, S.**, and Combes, S., “Bigger but not always better: Functional consequences of size on manoeuvrability”, **Journal of Experimental Biology**, 218 (17), 2728-2737 (2015)
- 3) **Ravi, S.**, Crall, J. D., Gagliardi, S., McNeilly, L., Biewener, A. A. and Combes, S. A. (2015). Hummingbird flight stability and control in freestream turbulent winds. **Journal of Experimental Biology**, 218 (9), 1444-1452 (2015)
- 4) Dyer, A., **Ravi, S.** and Garcia, J., “Flying in complex environments: can insects bind multiple sensory perceptions and what could be the lessons for machine vision?” **Journal of Software Engineering and Applications**, 7, 406-412 (2014)

- 5) Wildmann, N., **Ravi, S.** and Bange, J., "Towards higher accuracy and better frequency response with standard multi-hole probes in turbulence measurement with Remotely Piloted Aircraft (RPA)" **Atmospheric Measurement Techniques**, 7 (4), 1027-1041 (2014)
- 6) **Ravi, S.**, Crall, J. and Combes, S. "Rolling with the flow: Bumblebees flying in unsteady wakes", **Journal of Experimental Biology**, Vol. 216, No. 22 (2013)
- 7) **Ravi, S.**, Watkins, S., Watmuff, J., and Fisher, A, "Transient Loads Occurring over a Thin Airfoil Subjected to Large-Scale Freestream Turbulence", **AIAA Journal**, Vol. 51, No. 6 (2013), pp. 1473-1485. DOI: 10.2514/1.J052142
- 8) **Ravi, S.**, Watkins, S., Watmuff, J., Petersen, P. and Marino, M. "Influence of Large-Scale Freestream Turbulence on the Performance of a Thin Airfoil", **AIAA Journal**, Vol. 50, No. 11 (2012), pp. 2448-2459. DOI: 10.2514/1.J051640
- 9) **Ravi, S.**, Watkins, S., Watmuff, J., Massey, K., Petersen, P., Marino, M. and Ravi, A., "The flow over a thin airfoil subjected to elevated levels of freestream turbulence at low Reynolds numbers", **Experiments in Fluids** DOI 10.1007/s00348-012-1316-2 (2012)
- 10) **Ravi, S.**, Petersen, P., Watkins, S., Marino, M. and Watmuff, J., "The Aerodynamic Performance and Flow Structure over a Flat-Plate Airfoil in Smooth and Turbulent conditions at Low Reynolds Numbers", **Journal of Flow Visualization and Image Processing** Vol. 18, Pages 253–274 (2011)
- 11) S.Watkins, **S.Ravi**, & B.Loxton, "The Effect of Turbulence on the Aerodynamics of Low Reynolds Number Wings", **Engineering Letters**, 18:3, EL_18_3_09, (2009)

Journal Papers – under review

- 12) **Ravi, S.**, Garcia, J., Wang, C.H. and Dyer, A. G, "The Answer is Blowing in the Wind: Free Flying Honeybees Bind Visual and Mechano-sensory Inputs for Making Complex Foraging Decisions" **Proceedings of the Royal Society B** (In Review)*
- 13) Switzer, S., Hogendoorn, K., **Ravi, S.** and Combes, S.A., "Shakers and head bangers: Differences in sonication behavior between Australian *Amegilla murrayensis* (blue banded bees) and North American *Bombus impatiens* (bumblebees)", **PLOS One** (In Review)*
- 14) Fisher, A., **Ravi, S.**, Watkins, S., Watmuff, J. and Peterson, P. (2015). Transient Surface Pressures on a Low-Aspect-Ratio Wing Subjected to Large-Scale Freestream Turbulence. **Journal of Aircraft**. (in Review)
- 15) **Marino, M., Ravi, S., Watkins, S. & Massey, K.** (2015). The Influence of Turbulence on Unsteady Pressures on a Wing and Airfoil at Low Reynolds Numbers. **Journal of Fluids Engineering** (In Review)
- 16) Combes, S., **Ravi, S.**, Daniel, T. and Crall, J., "Abdominal flexion; a universal flight control strategy employed by volant insects" (Under Preparation)*

*Under preparation and under review manuscripts can be provided upon request but subject to co-authors' agreement.

Invited Talks

1. University of Tokyo - September 2015
2. University of Bielefeld – Department of Neurobiology – July 2015
3. World Congress of Biomechanics - July 2014
4. Physics of Living Systems Seminar - Georgia Institute of Technology - January 2015
5. Department of Biology - Brown University - 2014
6. School of Biological Sciences - La Trobe University (Australia) - 2014
7. Defense Science and Technology Organization of Australia - 2014

Conference Papers

- 1) **Ravi, S.**, Garcia, J.E, Wang, C.H. and Dyer, A.G., “Multi modal sensory integration in honeybees” **Gordon Research Conference** July 2015, Barga Italy
- 2) **Ravi, S.**, Mountcastle, A., and Combes, S.A., “Influence of Payload on Bumblebee Flight Dynamics”, **Society of Integrative and Comparative Zoology Meeting**, West Palm Beach, January 2015
- 3) **Ravi, S.**, Crall, J. and Combes, S., “Dynamics of Hummingbirds Flying in Highly Turbulent Winds”, **Society of Integrative and Comparative Zoology Meeting**, Austin, January 2014
- 4) **Ravi, S.**, Mountcastle, A. and Combes, S.A., “How does nectar and pollen loads influence insect flight manoeuvrability and stability?”, **World Congress of Biomechanics**, Boston, July 2014
- 5) Watkins, S., Fisher, A., Mohamed, A., Marino, M., Thompson, M., Clothier, R. and **Ravi, S.**, “The Turbulent Flight Environment Close to the Ground and Its Effects on Fixed and Flapping Wings at Low Reynolds Number” **5th European Conference for Aeronautics and Space Sciences (EUCASS)**, At Munich, Germany
- 6) **Ravi, S.**, Crall, J. and Combes, S., “Dynamics of Hummingbirds Flying in Highly Turbulent Winds”, **Society of Integrative and Comparative Zoology Meeting**, Austin, January 2014
- 7) Gagliardi, S., **Ravi, S.** and Combes, S., “Hummingbird flight kinematics in a longitudinal vortex”, **Society of Integrative and Comparative Zoology Meeting**, Austin, January 2014
- 8) Crall, J., **Ravi, S.**, Mountcastle, A.M., and Combes, S., “Bigger but not always better: Tradeoffs between maneuverability and flight speed with body size in bumblebees” **Society of Integrative and Comparative Zoology Meeting**, Austin, January 2014
- 9) **S. Ravi**, J. Crall, & S. Combes; ‘On flight trajectories of bumblebees in the near-wake of idealized flowers’ **Society of Integrative and Comparative Zoology Meeting**, Los Angeles, January 2013
- 10) **S. Ravi**, S. Watkins & M. Marino; ‘The influence of turbulence intensity on the flow structure over a thin airfoil at low Reynolds numbers’ **ICAS Meeting**, Sept. 2012, Brisbane, Australia
- 11) M. Marino, **S. Ravi** & S. Watkins; ‘Optimum location of pressure measurements around a wing as a dynamic control input in smooth and turbulent conditions’ **ICAS Meeting**, Sept. 2012, Brisbane, Australia
- 12) **S. Ravi** & S. Watkins; ‘The Influence of Freestream Turbulence on the Transient Loads Experienced by an Airfoil at Low Reynolds Numbers’ **IMAV, July. 2012**, Braunschweig, Germany
- 13) **S. Ravi**, S. Watkins & M. Marino; ‘The Optimum Location of Pressure Taps over a Wing for Dynamic Control Inputs’ **IMAV, July. 2012**, Braunschweig, Germany

- 14) S. Watkins, **S. Ravi**, M. Thompson, M. Abdulrahim, M. Marino & C. White; 'Testing of MAVs in replicated atmospheric turbulence' 13th International Conference on **Wind Engineering**, Amsterdam, Netherlands (2011)
- 15) **S. Ravi**, S.Watkins & P.Petersen; 'Pressure Fluctuations over an Airfoil in Smooth and Turbulent Flow at Low Reynolds Numbers' 14th Australian International Aerospace Congress, March 2011, Melbourne, Australia
- 16) R.Carrese, H.Winarto, **S. Ravi**; 'Chordwise and Spanwise Ground Effects Acting on Wings of various Aspect and Taper Ratios', 13th Australian International Aerospace Congress, March 2009, Melbourne, Australia
- 17) B. Loxton, S. Watkins, **S. Ravi**, J. Watmuff; 'MAV Wings Under the Influence of Turbulence', 13th Australian International Aerospace Congress, March 2009, Melbourne, Australia
- 18) S.Watkins, **S. Ravi** & M.Marino, 'The Opportunities Afforded by Micro Air Vehicles and the Challenges they have to Overcome' The 2011 International **Conference of Mechanical Engineering**, 6-8th July 2011, London, United Kingdom.
- 19) S. Watkins, M. Abdulrahim, M. Marino & **S. Ravi**, 'Flight Testing of a Fixed Wing MAV in Turbulence with Open and Closed Loop Control', **IMAV 2010, Braunschweig, Germany**
- 20) **S. Ravi**, H.Winarto, R.Carrese, Z.Louli; 'Combined Chordwise and Spanwise Effects Acting on a Wing Near the Ground', International Joint Seminar of Engineering, August 2008, Jakarta.
- 21) S. Kang, H. Winarto, R. Carrese, **S. Ravi**, 'Longitudinal Stability Criterion for Wing in Ground Effect Crafts', 2008 **AIAA** Australian-Asia Regional Student Conference 17-18 November 2008, Melbourne, Australia

Media

My research has attracted widespread media attention. List of key news reports on my work.

- **BBC News article** on my research on bumblebee flight in unsteady flows. Link: <http://www.bbc.co.uk/news/science-environment-24149440>
 - Audio and video interview with **BBC News, BBC World Service radio and PNR News**. Files will be provided on request.
 - **New York Times**
<http://www.nytimes.com/video/science/100000002507447/sciencetake-flight-of-the-bumblebee.html>
http://www.nytimes.com/2015/03/16/science/tiny-masters-of-turbulent-air.html?_r=0
 - **ABC News**
<http://www.abc.net.au/science/articles/2015/08/04/4283851.htm>
- Others:**
- <http://www.popularmechanics.com/science/animals/a14517/how-hummingbirds-fly/>
 - <http://www.natureworldnews.com/articles/13405/20150313/turbulence-why-hummingbirds-dont-even-notice.htm>
 - <http://news.discovery.com/animals/insects/pollen-turns-bumble-bees-into-jumbo-jets-150804.htm>

- <http://www.npr.org/sections/thesalt/2015/08/03/427844248/heavy-loads-of-pollen-may-shift-flight-plans-of-the-bumblebee>
- <http://phys.org/news/2015-08-bumblebees-differently.html>
- <http://www.hngn.com/articles/115804/20150804/bumblebees-fly-differently-depending-load-theyre-carrying-scientists-report.htm>
- <http://www.themarketbusiness.com/2015-08-05-bumblebees-make-the-tradeoff-with-loads-pollen>
- Articles in **Mechanical Engineers Magazine, Sciences et Avenir and El Mercurio.**

Teaching Experience

- March 2014 – Present:
RMIT University, School of Aerospace Mechanical and Manufacturing Engineering
Lecturer for **Low Reynolds Number Aerodynamics**
Lecturer and Course Administrator for **Introduction to Biomechanics**
- September 2013 – March 2014:
Assisting with lecturing and running labs at the **Harvard University Extension School**
- September 2011 – July 2012:
Lecturer associated with a number of courses in Environmental Physics and Statistics within the Dept. of Environmental Physics, **University of Tuebingen**
- October 2007 – July 2011:
Part-Time Lecturer/Academic Tutor associated with a number of Engineering courses including; **Engineering Mechanics, Thermo fluids 1&2, Mechanics of Machines** and Dynamics, **Fundamentals Aerodynamics, Advanced Aerodynamics**, etc within School of Aero. Mech. Manu. & Auto Engineering, **RMIT University**