

**Dr Marie R. G. Attard**  
**FUNCTIONAL ECOLOGIST AND EVOLUTIONARY BIOLOGIST**

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**PROFESSIONAL SUMMARY**

My research focuses on the relationship between form and function of hard tissues – primarily avian eggshells, vertebrate skulls and limbs using comparative biomechanics, material testing, microscopy and shape analysis. I publish and present on a range of topics from speech capabilities of Neanderthals, diet and predatory behaviour of extinct vertebrates to functional adaptations of avian eggs to survive extreme breeding conditions. I have co-supervised students and have taught and mentored students in zoology, biomechanics and evolutionary biology.

**EDUCATION**

- 2013 **Ph.D. in Biological Sciences.** University of New South Wales.
- 2008 **B. Sci. (Honours) in Biological Sciences; 1<sup>st</sup> Class.** Macquarie University.
- 2007 **B. Sci. (Advanced Science) in Biological Sciences;** University of Western Sydney. Environmental Science (major); Microbiology (major); Biochemistry and Molecular Biology (sub-major).

**PROFESSIONAL APPOINTMENTS**

- 2019-present **Postdoctoral Associate,** Dr Stephen Portugal Lab, Department of Biological Sciences, Royal Holloway University of London and School of Engineering and Innovation, Open University.
- 2016-18 **Postdoctoral Associate,** Tim R Birkhead Lab, Department of Animal and Plant Sciences, University of Sheffield.
- 2014-16 **Research Assistant,** The Function, Evolution and Anatomy Research (FEAR) Lab, Department of Zoology, University of New England.
- 2014/15 **Postdoctoral Associate,** The Function, Evolution and Anatomy Research (FEAR) Lab, Department of Zoology, University of New England.
- 2014 **Unit coordinator,** Principles of Zoology (ZOOL100), University of New England.
- 2009/10 **Demonstrator,** Animal Behaviour (BIOS3011), University of New South Wales.
- 2009 **Research Assistant,** School of Biological, Earth and Environmental Sciences, University of New South Wales.
- 2008 **Educational Officer,** Sydney Aquarium and Wildlife Park, Sydney.
- 2006/07 **Research Assistant,** School of Computing and Mathematics, University of Western Sydney.

**AWARDS AND HONORS**

- 2013 **Postgraduate Writing and Skills Transfer Award** (AU\$6,000), Evolution and Ecology Research Centre, University of New South Wales.
- 2012 **Postgraduate Research Competition Winner** (AU\$5,000), University of New South Wales.
- 2012 **Wiley-Blackwell Student prize** (AU\$300). Outstanding spoken presentation, Ecological Society of Australia conference.
- 2010 **Postgraduate Forum Award. Outstanding spoken presentation,** University of New South Wales.
- 2009-12 **Academic Postgraduate Award** (AU\$20,427 per annum), University of New South Wales.
- 2005-07 **Academic Excellence Scholarship** (AU\$5,000), University of Western Sydney.
- 2005-07 **University Dean's Medal,** University of Western Sydney.

**GRANTS**

- 2013 **£300 INTECOL** Student Travel Grant.
- 2012 **AU\$1,000 E&ERC** Postgraduate Research Start-Up Grant, University of New South Wales.
- 2012 **AU\$200** Ecological Society of Australia.
- 2011 **AU\$3,300** Postgraduate Research Student Support Scheme, University of New South Wales.

- 2011 AU\$1,000 Society for Marine Mammalogy Travel Grant.  
2008 AU\$500 Golden Key International Honours Society Scholarship.

### PUBLISHED MANUSCRIPTS

Impact factors and SCImago are from year of publication, or if that is unavailable, from the latest released. The SCImago subject categories of the journals are stated in brackets for the top quartile of the journal.

1. **Attard MRG** and Portugal S (In Press) Climate variability and mode of development influence gas exchange across avian eggshells. *Proceedings of Royal Society B*. Impact factor: 4.3, SCImago: 2.3, Q1 (Multidisciplinary)
2. **Attard MRG**, Lewis A, Wroe S, Hughs C and Rogers R (In review - manuscript ID: ECS20-0706). A tool to tell time: Tasmanian devil vibrissae provide fine-scale temporal information about individual diet and habitat. *Ecosphere*.
3. Birkhead T, Russell D, Garbout A, **Attard MRG**, Thompson J and Jackson D (2020) New insights from old eggs – the shape and thickness of Great Auk *Pinguinus impennis* eggs. *Ibis* 162(4):1345-1354. Impact factor: 1.8, SCImago: 0.9, Q1 (Animal Science and Zoology; Ecology, Evolution, Behaviour and Systematics).
4. Tsang LR, Sansalone G, Wilson LAB, **Attard MRG**, Ledogar J and Wroe S (2019). Raptor talon shape and biomechanical performance are controlled by relative prey size but not by allometry. *Scientific Reports*. 9: 7076. DOI: <https://doi.org/10.1038/s41598-019-43654-0>. Impact factor: 3.9, SCImago: 1.3, Q1 (Multidisciplinary)
5. Birkhead TRB, **Attard MRG**, Pilastro A (2019) Subtle egg-membrane structures in birds' eggs. *Molecular Reproduction and Development*. Impact factor: 3.1. SCImago: 1.1, Q3 (Developmental Biology).
6. **Attard MRG**, Sherratt E, McDonald P, Gracia M and Wroe S (2018) A new, three-dimensional geometric morphometric approach to assess egg shape variation. *PeerJ*. 6: e5052. DOI: <https://doi.org/10.7717/peerj.5052>. Impact factor: 2.1. SCImago: 1.1, Q1 (Biological Sciences).
7. **Attard MRG**, Medina I, Langmore N, Sherratt E (2017) Egg shape mimicry in parasitic cuckoos, *Journal of Evolutionary Biology*. 7(2): e31704. DOI: 10.1111/jeb.13176. Impact factor: 2.5, SCImago: 1.6, Q1 (Ecology, Evolution, Behaviour and Systematics).
8. **Attard MRG**, Wilson LAB, Worthy TH, Scofield P, Johnston P, Parr WCH and Wroe S (2016) Moa diet fits the bill: virtual reconstruction incorporating mummified remains and prediction of biomechanical performance in avian giants. *Proceedings of Royal Society B*. 283(1822). DOI: 10.1098/rspb.2015.2043. Impact factor: 4.8, SCImago: 3.4, Q1 (Multidisciplinary).
9. **Attard MRG**, Parr W, Archer M, Hand S, Rogers TL and Wroe S (2014) Virtual reconstruction and prediction of diet of the Australian mid Cenozoic thylacinid, *Nimbacinus dicksoni* (Thylacinidae, Marsupialia). *PLOS ONE*. 9 (4),e93088. <https://doi.org/10.1371/journal.pone.0093088.g005>. Impact factor 4.2, SCImago: 1.6, Q1 (Multidisciplinary).
10. D'Anastasio R, Wroe S, Tuniz C, Arensburge B, Mancini L, Cesana DT, Dreossi D, Ravichandiran M, **Attard MRG**, Parr W, Agur A. (2013) Micro-Biomechanics of the Kebara 2 Hyoid and Its Implications for Speech in Neanderthals. *PLOS ONE*. DOI: 10.1371/journal.pone.0082261. Impact factor: 4.5. SCImago: 1.8, Q1 (Multidisciplinary).
11. **Attard MRG**, Chamoli U, Ferrara T, Rogers TL, Wroe S (2011) Skull mechanics and implications for feeding behaviour in a large marsupial carnivore guild: the thylacine, Tasmanian devil and spotted-tailed quoll. *Journal of Zoology*, 285 (4); 292-300. <https://doi.org/10.1111/j.1469-7998.2011.00844.x>. Impact factor: 1.3. SCImago: 1.1, Q1 (Ecology, Evolution, Behaviour and Systematics).
12. **Attard MRG**, Pitcher BJ, Charrier I, Ahonen H, Harcourt RG (2010) Vocal discrimination in mate guarding male Australian sea lions: Familiarity Breeds Contempt, *Ethology*, 116; 1-9. Impact factor: 2.0. SCImago: 0.5, Q2 (Multidisciplinary).

### RELEVANT PUBLICATIONS IN PREPARATION

1. **Attard MRG**, Portugal SJ (In Prep) Global diversity and adaptations of avian eggshell thickness. *Nature Communications*.
2. **Attard MRG**, Bowen J, Corado R, Hall LS, Dorey RA, Portugal SJ (In Prep) How wet is that egg?

Ecological drivers of eggshell wettability in birds. *Journal of Royal Society Interface*.

3. van Heteren A, Wroe S, Tsang LR, Mitchell R, Ross P, Ledogar JA, **Attard MRG**, Sustaita D, Clausen P, Scofield P, Sansalone G (In Prep) New Zealand's extinct giant raptor (*Harpagornis moorei*) killed like an eagle, ate like a condor. *Proceedings of Royal Society B*.
4. **Attard MRG**, Holland C, Wroe S, Clausen P, Birkhead TR (In Prep) Life on the edge: Evolution of pyriform eggs to resist breakage among cliff-breeding seabirds. *Journal of Evolutionary Biology*.
5. **Attard MRG**, Holland C, Birkhead TR (In Prep) Diversity in avian egg shape is dictated by egg-membrane material properties. *Ibis*.

## **PUBLISHED BOOK CHAPTERS AND FEATURE ARTICLES**

1. **Attard MRG** and Wroe S (Publication date: Dec 2021) Thylacine Prey Size in "History and Mystery of the Thylacine". Editor: Branden Holmes. *CSIRO Publishing*.
2. **Attard MRG** and Wroe S (2012) "The thylacine myth". *Australasian Science Magazine*. (6): 19- 22.
3. **Attard MRG** (2012) "Unveiling the mysteries of the Tasmanian Tiger". *The conversation*.

## **PUBLIC OUTREACH**

My research has been disseminated to the public through:

- **Interviews on radio and television** (e.g. ABC Science Show, Bush Telegraph, ABC News)
- **Feature articles** (e.g. BBC Nature, Science Illustrated, Science News, Australian Geographic)
- **Newspapers** (e.g. Sydney Morning Herald, Canberra Times).

A full list of media coverage is available at <http://www.marieattard.com>

## **RESEARCH EXPERIENCE**

### **Postdoctoral Research**

2019-Present **Stephen Portugal Lab**, Department of Biological Sciences, Royal Holloway University of London

- Lead researcher to explore adaptive function of avian eggs. Duties included collecting and analysing eggshell samples, lab work, publishing papers and presenting research findings.
- This project was conducted in collaboration with two universities (School of Engineering and Innovation, Open University and University of Surrey) and two museums (Natural History Museum, Tring and Western Foundation of Vertebrate Zoology, California).
- Analytical techniques: Phylogenetic Comparative Analysis, Water Vapour Conductance, Interferometry, Nanoindentation, Macroindentation, Drop Shape Analysis.
- Software: ArcGIS, R and software specific to each analytical technique.

2016-18 **Tim R Birkhead lab**, Department of Animal and Plant Sciences and **Natural Materials Group**, Department of Material Sciences and Engineering, University of Sheffield.

- Lead researcher to explore adaptive function of avian eggs. Duties including conducting and publishing studies, mentoring students, travelling to museums to measure and scan eggshells from living and extinct auk species.
- Analytical techniques: Scanning Electron Microscopy; Transmission Electron Microscopy; Stereo Microscopy; Rheometry; Tensile testing; 3D Finite Element Analysis; 2D and 3D shape analysis.
- Conceived and organised Resolving the Mysteries of the Avian Egg Conference (<https://eggconference.wixsite.com/home>)
- Software: Mimics, 3-Matic, Meshlab, Rhinoceros 3D, Strand7, Agisoft Photoscan, ArcGIS, R.

2014-15 **Function, Evolution and Anatomy Research (FEAR) lab**, Department of Zoology, University of New England.

- Led, published and presented studies to assess variation in avian egg shape and mentored and co-supervised PhD and honours students.
- Administration duties including writing grants, processing invoices, training students on software, managing large data sets, organising Function, Evolution and Anatomy conference.
- Software: Mimics, 3-Matic, Meshlab, Rhinoceros 3D, Blender, Strand7, PAST, R.

## Research Assistant

2014-16 **Function, Evolution and Anatomy Research (FEAR) lab**, Department of Zoology, University of New England.

- Lead investigator and collaborator in research projects involving Finite Element Analysis and Geometric Morphometrics, primarily to reconstruct the feeding ecology and predatory behaviour of living and extinct species.
- Lab manager duties including purchasing of equipment and software, organise museum loans, travel to museums to access specimens, teaching software, conducted CT scanning, organised Function, Evolution and Anatomy Research conference, created and maintained lab website.
- Software: Mimics, 3-Matic, Rhinoceros 3D, Blender, Strand7, R.

2009 **Mammal Lab**, University of New South Wales.

- Data preparation and statistical analysis of home range using satellite tracking data for Leopard Seal Ecology Project. Travelled to museums to collect historical tissues for stable isotope analysis.

2006/07 **School of Computing and Mathematics**, University of Western Sydney.

- Co-author of Almanac, a statistical reference guide for Self Storage Industries. Duties involved statistical analysis, interpretation and write-up of annual survey data.

## Postdoctoral Research and Studentships

2009-14 **PhD**, Evolution and Ecology Research Centre, University of New South Wales.

- Lead investigator to develop methods to monitor endangered Tasmanian devils and explore long-term change in marsupial carnivore diet and habitat use (paper currently in review).
- Analytical Techniques: Stable isotope ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) and 3D Finite Element Analysis.

2008 **Honours**, Department of Environment and Geography, Macquarie University.

- Conducted and published experiments demonstrating vocal recognition among Australian sea lions.

2006 **Research Studentship**, CSIRO Plant Industry Summer Student Program, Canberra.

- Conducting genetic analysis of mutant rice and presenting research in a public forum.

## PROFESSIONAL PRESENTATIONS

2019 **Advances in Avian Reproduction: Nests, Eggs and Incubation Conference**, Oral presentation, "Life on the edge: Are pyriform eggs more resistant to breakage among cliff-breeding seabirds?" and poster, "Scratching beyond the surface: the evolution and functional role of avian eggshell structure and tomography", Lincoln.

2018 **Resolving the Mysteries of the Avian Egg Conference**, Oral Presentation "Egg shape mimicry in brood parasites", Sheffield.

2015 **Function, Evolution and Anatomy Conference**, Oral presentation. "Extinct Australian predator was fierce but no Tasmanian devil", Armidale

2014 **Society of Vertebrate Paleontology**, Oral presentation. "Virtual reconstruction and prey preference of Tasmanian tiger's ancient relative", Berlin.

2014 **4<sup>th</sup> International Palaeontological Congress**, Poster, "Moa diet fits the bill: clip and pluck feeding strategies of New Zealand's Extinct giant flightless birds", Mendoza.

2013 **International Association for Ecology conference**, Poster, "New insight from the old: Using stable isotopes to assess marsupial carnivore vulnerability to anthropogenic impacts", London.

2013 **Ecological Society of America conference**, Oral presentation, "The risks of being big - The ecological and evolutionary significance of the thylacine's body size and diet", Minneapolis.

2013 **Australian Mammal Society conference**, Oral presentation, "Tracking long-term diet and habitat shifts in the world's largest marsupial carnivores", Sydney.

2012 **Ecological Society of Australia conference**, Oral presentation, "The thylacine myth: stable isotopes and skull biomechanics reveal their 'actual' diet and extinction risk", Melbourne.

2012 **Using virtual reconstruction and computational biomechanics to study form and function in biology workshop**, guest speaker, Sydney.

- 2011 **19<sup>th</sup> Biennial Conference on the Biology of Marine Mammals**, Oral presentation, "Are you really what you eat: Influences of fasting on stable isotope ratios in male southern elephant seals", Tampa.

### **TEACHING EXPERIENCE**

- 2018 **Brilliant Club tutor**, Year 6 students. Castle Hall Academy
- Developed teaching material, delivered tutorials and provided feedback on assignment
- 2017/18 **Teaching Coordinator for Level 1 Sign Language**, Sheffield University Sign Language Society.
- Developed teaching material, deliver weekly classes, organised teaching roster, prepared students for exams.
- 2015 **Unit Coordinator for Principles of Zoology (ZOOL100)**, University of New England
- Developed teaching material, delivered lectures, set and marked assessments. Provided advice to students on unit related matters including withdrawal, extensions and assignments.
- 2012 **Demonstrator for Vertebrate Zoology (BIOS2061)**, University of New South Wales.
- Used interactive computer-based case studies to teach vertebrate evolution.
- 2009/10 **Demonstrator for Animal Behaviour (BIOS3011)**, University of New South Wales.
- Laboratory demonstrator and supervised student group projects.
- 2008 **Educational Officer**, Sydney Aquarium and Sydney Wildlife Park.
- Delivered public educational tours and handled invertebrates for public encounters.

### **FIELD AND LABORATORY EXPERIENCE (selected)**

- 2013 **Field assistant** for Greencollar consulting solutions, Sydney.
- Conducted intensive vegetation field surveys to estimate the biomass of project areas and determine the magnitude of CO<sub>2</sub> abatement.
- 2013 **Field assistant** for Cetacean Ecology Research, Maldives. Directed by CEBEL lab, Flinders University.
- Three-week expedition recording behaviour, collecting biopsy samples and photo-identification.
- 2010/12 **Field assistant** for Southwest Whale Ecology Study, Western Australia.
- Two month fieldwork theodolite tracking cetaceans, collecting biopsy samples and photo-identification.
- 2010 **Field assistant**, Murray Darling Basin. Directed by Australian Wetlands, Rivers and Landscapes Centre.
- One week frog abundance and distribution survey to assess response to river regulation.
- 2009 **Field and laboratory assistant** for Leopard seal Research Program, Primavera Station. Directed by University of New South Wales, Instituto Antártico Argentino and Taronga Conservation Society.
- Two month fieldwork involving satellite tag deployment, scat and biopsy sampling, body size measurements, processing blood samples and organising field equipment.
- 2008 **Field assistant** for Oyster Research, Sydney. Directed by Benthic Ecology Group, Macquarie University.
- Assisting in field experiments to assess recruitment in Sydney rock oysters and Pacific oysters.

### **JOURNAL REVIEWER**

I have been a reviewer for several journals, including Ecology and Evolution and Animal Behaviour.