



Sarah Loughran

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Career Summary

As detailed throughout my CV, I have extensive experience in non-ionising radiation and health research. I am currently the inaugural director of the EME Program at Australia's primary authority for radiation protection (ARPANSA), and the immediate past director of Australia's Centre for Research Excellence in this field (ACEBR). I am a member of the Scientific Expert Group at ICNIRP, a key contributor to several chapters of the WHO EHC Monograph on RF EMF, and a member of the WHO RF EMF Task Group. My background and various roles show a strong commitment to engage in, and lead, high quality research, as well as extensive experience in research translation within the scientific community, government, industry, and the wider community on the topic of non-ionising radiation and health.

Educational and Academic Qualifications

- 2019 - Associate Professor** – *University of Wollongong*
- 2004-2007 PhD** (July 2007) – The effects of mobile phone electromagnetic fields on human sleep and melatonin. *Brain Sciences Institute, Swinburne University of Technology and the Australian Centre for Radiofrequency Bioeffects Research (ACRBR), Melbourne, Australia*
- 2003-2004 Honours** (Psychophysiology). *Swinburne University of Technology, Melbourne, Australia*
- 2000-2002 Bachelor of Science** (Double Major: Physiology and Psychology). *Deakin University, Geelong, Australia*

Employment and Work Experience

- 2020 - Australian Radiation Protection and Nuclear Safety Agency (ARPANSA): Director Radiation Research and Advice**
Leading, coordinating and managing ARPANSA's non-ionising radiation activities under the EME Program, including planning, developing and delivering science and research programs in the field of non-ionising radiation protection, identifying research needs, translating research results for Government and the wider community, and engaging with international bodies and experts to influence outcomes, build new knowledge and influence international health standards.
- 2013 - 2020 University of Wollongong/Australian Centre for Electromagnetic Bioeffects Research (ACEBR): Research Fellow and Lecturer**
Research, project management, and supervision of PhD, Clinical Masters, and Honours students in a variety of non-ionising radiation, sleep, and cognitive neuroscience projects; Director of ACEBR (NHMRC Centre of Research Excellence) and Chair of Science and Wireless Community Forum since 2018



- 2008 - 2012 University of Zürich: Postdoctoral Research Fellow**
Investigating the effects of mobile phone emissions on the sleep and waking EEG and cognition, and collaborating on other projects, including exploration of sleep-wake behaviour in vegetative/minimally conscious state patients and stability of brain activity in children
- 2007 - 2008 Phocus Services Basel: Project Coordinator & Medical/Science Writer**
Project management and medical writing for pharmaceutical industry across a number of different therapeutic areas
- 2007 - 2007 Australian Centre for Radiofrequency Bioeffects Research (ACRBR): Postdoctoral Researcher**
Involved in various studies on the effects of mobile phone emissions on sleep, the EEG, cognition, and other physiological variables

Journal Publications

Loughran SP, Wood AW, Barton JM, Croft RJ, Thompson B, Stough C. The effect of electromagnetic fields emitted by mobile phones on human sleep. *Neuroreport*, 16: 1973-1976 (2005).

Wood AW, **Loughran SP**, Stough C. Does early evening exposure to mobile phone radiation affect subsequent melatonin production? *Int J Radiat Biol*, 82: 69-76 (2006).

Loughran SP, McKenzie RJ, Anderson V, McIntosh RL, Croft RJ. Comment on Dosimetric evaluation and comparison of different RF exposure apparatuses used in human volunteer studies. *Bioelectromagnetics*, 29(3): 242-243 (2008).

Croft RJ, Leung S, McKenzie RJ, **Loughran SP**, Iskra S, Hamblin DL, Cooper NR. Effects of 2G and 3G mobile phones on human alpha rhythms: Resting EEG in adolescents, young adults, and the elderly. *Bioelectromagnetics*, 31(6): 434-444 (2010).

Loughran SP, McKenzie RJ, Jackson ML, Howard ME, Croft RJ. Individual differences in the effects of mobile phone exposure on human sleep: Rethinking the problem. *Bioelectromagnetics*, 33(1): 86-93 (2012).

Schmid MR, **Loughran SP**, Regel SJ, Murbach M, Bratic Grunauer A, Rusterholz T, Bersagliere A, Kuster N, Achermann P. Sleep EEG alterations: Effects of different pulse-modulated radio frequency electromagnetic fields. *J Sleep Res* 21(1): 50-58 (2012).

Schmid MR, Murbach M, Lustenberger C, Maire M, Kuster N, Achermann P, **Loughran SP**. Sleep EEG alterations: effects of pulsed magnetic fields versus pulse-modulated radio frequency electromagnetic fields. *J Sleep Res* 21(6): 620-9 (2012).

Loughran SP, Benz DC, Murbach M, Schmid MR, Kuster N, Achermann P. No increased sensitivity in brain activity of adolescents exposed to mobile phone-like emissions. *Clin Neurophysiol* 124(7): 1303-8 (2013).

Benz DC, Tarokh L, Achermann P, **Loughran SP**†. Regional differences in trait-like characteristics of the waking EEG in early adolescence. *BMC Neurosci* 14(117) (2013).

Verrender A, **Loughran SP**, Dalecki A, McKenzie R, Croft RJ. Pulse modulated radiofrequency exposure influences cognitive performance. *Int J Radiat Biol* 92:603-610 (2016).

Loughran, SP et al. Bioelectromagnetics research within an Australian context: The Australian Centre for Electromagnetic Bioeffects Research (ACEBR). *Int J Environ Res Public Health* 13 (2016).



Okely AD, Ghersi D, Hesketh KD, Santos R, **Loughran SP**, Cliff DP, Shilton T, Grant D, Jones RA, Stanley RM, Sherring J, Hinkley T, Trost SG, McHugh C, Eckermann S, Thorpe K, Waters K, Olds TS, Mackey T, Livingstone R, Christian H, Carr H, Verrender A, Pereira JR, Zhang Z, Downing KL, Tremblay MS. A collaborative approach to adopting/adapting guidelines - The Australian 24-Hour Movement Guidelines for the early years (Birth to 5 years): an integration of physical activity, sedentary behavior, and sleep. *BMC Public Health* 17(suppl 5) (2017).

Sagar S, Adem SM, Struchen B, **Loughran SP**, Brunjes ME, Arangua L, Dalvie MA, Croft RJ, Jerrett M, Moskowitz JM, Kuo T, Rössli M. Comparison of radiofrequency electromagnetic field exposure levels in different everyday microenvironments in an International context. *Environment International* 114:297-306 (2018).

Dalecki A, **Loughran SP**, Verrender A, Burdon CA, Taylor NAS, Croft RJ. Report of an acute radio-frequency electromagnetic field exposure effect on the P1 and N1 visual event-related potentials in healthy adults. *Clinical Neurophysiology* 129(5):901-908 (2018).

Verrender A, **Loughran SP**, Anderson V, Hillert L, Rubin GJ, Oftedal G, Croft RJ. IEI-EMF provocation case studies: A novel approach to testing sensitive individuals. *Bioelectromagnetics* 39(2):132-143 (2018).

Verrender A, **Loughran SP**, Dalecki A, Freudenstein F, Croft RJ. Can explicit suggestions about the harmfulness of EMF exposure exacerbate a nocebo response in healthy controls? *Environmental Research* 166:409-417 (2018).

Macfarlane M, Rajapakse S, **Loughran SP**. What prevents patients sleeping on an acute medical ward? An actigraphy and qualitative sleep study. *Sleep Health* 5(6):666-669 (2019).

Evans I, Palmisano S, **Loughran SP**, Legros A, Croft RJ. Frequency-dependent and montage-based differences in phosphene perception thresholds via transcranial alternating current stimulation. *Bioelectromagnetics* 40(6):365-374 (2019).

Loughran, SP et al. Radiofrequency electromagnetic field exposure and the resting EEG: Exploring the thermal mechanism hypothesis. *Int J Environ Res Public Health* 16(9):1505-1516 (2019).

ICNIRP: Croft RJ, Feychting M, Green AC, Hirata A, d'Inzeo G, Jokela K, **Loughran SP**, Marino C, Miller S, Oftedal G, Okuno T, van Rongen E, Rössli M, Sienkiewicz Z, Tattersall J, Watanabe S. Guidelines for Limiting Exposure to Electromagnetic Fields (100 kHz to 300 GHz). *Health Physics* 118(5):483-524 (2020).

Freudenstein F, Croft RJ, Wiedemann P, Verrender A, Boehmert C, **Loughran SP**. Framing Effects in Risk Communication Messages – Hazard Identification vs. Risk Assessment. *Environmental Research* 190 (2020).

Dalecki A, **Loughran SP**, Verrender A, Croft RJ. The effect of electromagnetic field exposure on the waking electroencephalogram: Methodological influences. *Bioelectromagnetics* 42(4):317-328 (2021).

Freudenstein F, Croft RJ, **Loughran SP**, Zeleke BM, Wiedemann P. Effects of selective outcome reporting on risk perception. *Environmental Research* 196 (2021).

Karipidis K, Brzozek C, Bhatt C, **Loughran SP**, Wood A. What evidence exists on the impact of anthropogenic radiofrequency electromagnetic fields on animals and



plants in the environment? A systematic map protocol. *Environmental Evidence* 10 (1): 1-9 (2021).

Okely AD, Ghersi D, **Loughran SP**, et al. A collaborative approach to adopting/adapting guidelines. The Australian 24-hour movement guidelines for children (5-12 years) and young people (13-17 years): An integration of physical activity, sedentary behavior, and sleep. *International Journal of Behavioral Nutrition and Physical Activity* 19(1): 1-21 (2022).

Henderson S, Bhatt C, **Loughran S**. A survey of the radiofrequency electromagnetic energy environment in Melbourne, Australia. *Radiation Protection Dosimetry* 199(6): 519-526 (2023).

Freudenstein F, Boerner F, Croft RJ, Leung RWS, **Loughran SP**, Wiedemann PM. Effects of generalization descriptions on risk perception. *Environmental Research* 223: 115422 (2023).

Karipidis K, Brzozek C, Mate R, Bhatt CR, **Loughran S**, Wood AW. What evidence exists on the impact of anthropogenic radiofrequency electromagnetic fields on animals and plants in the environment: a systematic map. *Environmental Evidence* 12(1): 9 (2023).

Book Chapters

Verrinder A, **Loughran SP**, Dalecki A, Croft RJ: Editors Wood AW and Karipidis K. Perceived Hypersensitivity: Anecdotal vs Objective Evidence. In *Non Ionising Radiation Protection: Summary of Research and Policy Options* (2017).

Croft RJ, Curcio G, **Loughran SP**. Are there hidden dangers to mobile phones use? A psychobiological perspective. In *International Handbook of Psychobiology* (2018).

Wood AW and **Loughran SP**. Behavioral and Cognitive Effects of Electromagnetic Field Exposure. In *Biological and Medical Aspects of Electromagnetic Fields, Fourth Edition*, Great Britain, Taylor and Francis LTD (2018).

Invited Opinion Pieces

Loughran SP. Why screen time before bed is bad for children. *The Conversation*, September 2, 2015.

Loughran SP. Can you be allergic to your Wi-Fi?. *The Conversation*, September 7, 2015.

Loughran SP. Peut-on être allergique au wifi?. *The Conversation*, October 7, 2015.

Loughran SP. Banning under twos from screens has little basis in evidence. *The Conversation*, October 21, 2015.

Chapman S, Saunders D, Croft R, **Loughran SP**. Do Wi-Fi and mobile phones really cause cancer? Experts respond. *The Conversation*, February 17, 2016.

Loughran SP. David Gillespie's 'Teen Brain': a valid argument let down by selective science and over-the-top claims. *The Conversation*, May 1, 2019.

Loughran SP. There's no evidence 5G is going to harm our health, so let's stop worrying about it. *The Conversation*, August 2, 2019.

Loughran SP. What is the UV index? An expert explains what it means and how it is calculated. *The Conversation*, December 21, 2021.



**Invited
Presentations**

Loughran SP. Urban S. Are bananas really 'radioactive'? An expert clears up common misunderstandings about radiation. The Conversation, November 4, 2022.

Loughran SP. There's a serious ethical problem with some sunscreen testing methods – and you're probably not aware of it. The Conversation, December 2, 2022.

Loughran SP. Phone exposure effects on sleep physiology. Monte Verità workshop on EMF Health Risk Research, November 20-24, 2005, Switzerland.

Loughran SP. Summary and Update of the ACRBR Human Neurophysiology Research. FGF-Workshop: "Sleep Disorders, EEG Changes, Altered Cognitive Functions - Is There a Connection With the Exposure to Mobile Communication RF Fields?" November 7-9, 2007, Stuttgart, Germany.

Loughran SP. Individual differences in EMF provocation studies on sleep. NFP-57 Workshop: "Electromagnetic fields and the brain", October 6-7, 2008, Zürich, Switzerland.

Loughran SP. The influence of pulsed radiofrequency electromagnetic fields emitted by mobile phones on human brain physiology. Oxford University, December 1, 2009, Oxford, United Kingdom.

Loughran SP. RF EMF and brain physiology: Increasing evidence of effects on the waking and sleep EEG. Plenary topic in focus, Annual Meeting of the Bioelectromagnetics Society 2010, June 13-18, Seoul, South Korea.

Loughran SP. International Expert Workshop on RF Health Research Needs. Electric Power Research Institute, July 12-13, 2011, Palo Alto, California, USA.

Loughran SP. Radiofrequency Electromagnetic Fields and Brain Physiology: Effects on the EEG, Sleep, and Human Performance. German Aerospace Center (DLR), November 2, 2011, Cologne, Germany.

Loughran SP. Radiofrequency Electromagnetic Fields and Brain Physiology: Effects on the EEG, Sleep, and Human Performance. Howard Florey Institute, February 6, 2012, Melbourne, Australia.

Loughran SP. Radiofrequency Electromagnetic Fields & Brain Physiology: Effects on Sleep and the EEG. Woolcock Institute, March 5, 2013, Sydney, Australia.

Loughran SP. Exposure to Radiofrequency Electromagnetic Fields: Effects on Sleep and the EEG. Lawson Health Research Institute, July 22, 2014, London, Ontario, Canada.

Loughran SP. Possible Basis for RF Effects on Alpha Waves. BioEM2015, June 14-19, Asilomar, USA.

Loughran SP. VIII COURSE of the International School of Bioelectromagnetics "Alessandro Chiabrera": Electromagnetic Fields and the Nervous System: Biological Effects, Biophysical Mechanisms, Methods, and Medical Applications: 11-16 April, 2016, Erice, Italy.

Loughran SP. Sleepless in Bioelectromagnetics: Unravelling the Effects of Radiofrequency Electromagnetic Fields on the Brain. BioEM2016 Alessandro Chiabrera Young Scientist Award Presentation, June 5-10, Ghent, Belgium.

Loughran SP. Do Mobile Phones and Modern Technology Impact Sleep and the EEG? Inaugural NSW joint ASA/ASTA state meeting, March 14, 2019, Sydney, Australia.



Loughran SP. Keynote: Sleep and Modern Technology. IMED 2019, June 1, Wollongong, Australia.

Successful Grants

- 2013** NHMRC Centre of Research Excellence (Associate Investigator): Population health Research on Electromagnetic Energy, \$2.5 Million
- 2014** SIM funding grant (School of Psychology): Quantitative EEG analysis and characterisation of the first night effect in the sleep laboratory, \$15,948; PRESEE Seed Fund: Mobile phone RF EMFs and the influence on brain cortical excitability, \$18,356
PRESEE Seed Fund: Mobile Phone Exposure and Sleep in Children and Adolescents, \$24,990
EPRI Project Grant: RF Effects on the EEG, Thermoregulation, and Cognition, \$15,985
- 2015** PRESEE Seed Fund: The effect of screen time and blue light on sleep patterns in children and adolescents, \$25,000
- 2016** PRESEE Seed Fund: Does acute RF-EMF exposure affect emotional processing in humans?, \$24,906
- 2016** University of Wollongong Major Equipment Grant, \$100,000
- 2017** NHMRC Centre of Research Excellence (Chief Investigator): Australian Centre for Radiofrequency Bioeffects Research, \$2.5 Million
- 2018** Health Psychology Research Group, \$20,000

Scientific Distinctions and Awards

- 2002** Inducted into the Golden Key International Honours Society for outstanding academic achievement and excellence
- 2004-2007** Scholarship: 3-year University endorsed PhD scholarship (SUPRA)
- 2005** 1st Prize: Best Presentation. World Health Organisation (WHO) Workshop, Melbourne, Australia
- 2006** 3rd Prize: Best Student Presentation. Bioelectromagnetics, Cancun, Mexico
- 2008** Young Scientist Award: International Union of Radio Science (URSI) General Assembly, Chicago, Illinois
- 2009** 1st Prize: Best Presentation. Zurich Integrative Human Physiology Annual Meeting, Zurich
- 2009-2010** Marie Curie training in Sleep Research and Sleep Medicine: Accepted as an experienced research fellow in the European Sleep Research Society (ESRS) and FP6 training course
- 2012-** Member of the current World Health Organisation (WHO) Radiofrequency Environmental Health Criterion evaluation committee
- 2013-** Elected member of the International Commission for Non-Ionizing Radiation Protection (ICNIRP) Scientific Expert Group
- 2015-2018** Board of Directors (Secretary): Bioelectromagnetics Society
- 2016** Alessandro Chiabrera Award for excellence in Bioelectromagnetics Research (European Bioelectromagnetics Association)
- 2016** ICNIRP young scientist award
- 2017** People's Choice Award, Best Presentation, Australian Radiation Protection Society Annual Meeting
- 2017** Leadership Group: Australian 24-Hour Movement Guidelines for Children of the Early Years
- 2017-2019** Biosafety Committee, University of Wollongong



- 2016-2020** Elected member: Data Safety Monitoring Committee for two randomised controlled trials investigating multidimensional assessments of the health impacts of infrasound. Woolcock Institute, Sydney, Australia.
- 2018-2019** Leadership Group: Australian 24-Hour Movement Guidelines for Children and Young People
- 2023** World Health Organisation Radiofrequency Task Group

**Teaching and
Research
Supervision**

- 2007** Cellular Biophysics: Undergraduate demonstrator/teacher (practical/laboratory work), Swinburne University, Melbourne, Australia.
- 2009-2010** Masters Thesis: "Individual Stability of Baseline EEG Recordings in Adolescents", Co-Supervisor of Dominik Benz, University of Zurich.
- 2008-2011** PhD Thesis: Pulse-Modulated Radiofrequency Electromagnetic Fields and Sleep – Critical Field Parameters. Co-Supervisor of Marc Schmid, University of Zurich.
- 2010-2011** Neurobiology: Design, Coordination, and co-teaching of the course on "Sleep, EEG, and Cognition", University of Zurich, Switzerland.
- 2010-2011** Teaching and coordination of practical component in undergraduate biology module: "Experimental Human Studies in Pharmacology and Physiology", University of Zurich, Switzerland.
- 2010-2011** Design, Coordination, and co-teaching of a course on scientific writing. University of Zurich, Switzerland.
- 2011** Children's University – Teaching and coordination of a course on the practical aspects of EEG monitoring for primary school children, University of Zurich, Switzerland.
- 2014-2017** PhD Thesis: Electromagnetic Hypersensitivity, Co-supervisor of Adam Verrender, University of Wollongong
- 2014-2015** Masters in Clinical Psychology Thesis: Sleep and ADHD in Children, Primary Supervisor of Patricia Joannou, University of Wollongong
- 2015** Honours Theses: Sleep and RF EMF in children, Flotation REST, sleep, and cortisol. Primary Supervisor of Nicholas Grange, Georgia Fogden, and Sheridan Findlay, University of Wollongong
- 2014 -** Lecturer: Psyc101 (Introduction to Behavioural Science), Psych121 (Foundations of Psychology A), Psyc234 (Biological Psychology and Learning)
- 2016** Honours Theses: Sleep and RF EMF in children, Sleep and ADHD in children, First night effect on the EEG. Primary Supervisor of Hayley Hargreaves, Naomi Mansell, and Rachele Wang, University of Wollongong
- 2017** Honours Theses: Sleep, RF EMF, and Screen Time Sleep. Primary Supervisor of Jess Olah and Carolina Tatossian, University of Wollongong
- 2016-2017** International Masters Thesis: Sleep, Blue Light, and Screen Time in Children: Primary research supervisor of Marijke Schutte, Utrecht University
- 2016-2018** PhD Thesis: Sleep, RF EMF, and Circadian Rhythms: Primary supervisor of Sheridan Findlay, University of Wollongong
- 2018** Honours Theses: Sleep, RF EMF, and memory consolidation. Primary Supervisor of Teh Jun Zhi, University of Wollongong
- 2018** Subject Coordinator – PSYC234 (Biological Psychology and Learning)
- 2019** Honours Theses: Sleep, RF EMF, and Thermoregulation. Primary Supervisor of Jade Burgess and Jennifer Shore, University of Wollongong