

# Mark Daniel Miller

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## PROFILE

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I am an assistant professor at Hokkaido University's *Center for Human Nature, Artificial Intelligence and Neuroscience* (Japan).

As a philosopher of cognition, I apply the tools of conceptual analysis and theoretical model building to help answer fundamental questions about human cognition — about the way that human beings think. Over the past few years my research has investigated the implications of a leading new perspective on cognition, which conceptualizes the mind as an engine of knowledge-driven predictions (i.e., *Predictive Processing*, or *Active Inference*). I have worked to integrate this framework with core ideas from 4E cognitive science, which emphasizes the role of embodied processes in cognition. Most recently, I have begun to explore how these same developments in computational neuroscience may help us gain a clearer understanding of the impact that our increasingly technologically-mediated world has on our well-being.

PhD in Philosophy and Cognitive Science, awarded in 2018,

**Areas of Specialism:** Cognitive Science, Philosophy of Neuroscience (especially Affective and Social Neuroscience), Philosophy of Mind, Philosophy of Psychology, Philosophy of Psychiatry, Phenomenology, Philosophy and Ethics of Technology and Artificial Intelligence

**Areas of Competence:** Philosophy of Science, Contemporary Ethics (especially Neuroethics).

## EDUCATION

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**PhD Philosophy** **2014–2018**

*Degree awarded by University of Edinburgh (with No Corrections)*

Thesis Title: *Entangled Predictive Brain: Prediction, Emotion and Embodied Cognition* (<https://era.ed.ac.uk/handle/1842/33218>)

Examination Committee: Professor Sean Gallagher (University of Memphis), Professor Dave Ward (University of Edinburgh) & Professor Tillman Virkant (University of Edinburgh).

**MSc Mind, Language and Embodied Cognition** **2010–2011**

*Degree awarded by University of Edinburgh (with First Class Honours)*

**BA (Honours) Philosophy & English Literature** **2005–2008**

*Degree awarded by University of Toronto (3.91 GPA).*

## ACADEMIC POSITIONS

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**Center for Human Nature, Artificial Intelligence and Neuroscience, Hokkaido University, Japan**  
*Assistant Professor (February 2021–present)*

**Department of Informatics, University of Sussex, UK**  
*Postdoctoral Researcher (May 2019–April 2021)*

**Department of Philosophy, Psychology and Language Sciences, University of Edinburgh, UK**  
*Postdoctoral Researcher (September 2018–May 2019)*

**Department of Philosophy, Psychology and Language Sciences, University of Edinburgh, UK**  
Social Media Coordinator for the MOOC *Philosophy, Science and Religion*

## PUBLICATIONS

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### Articles

- Schoeller, F., **Miller, M.** & Friston, K. (forthcoming) Human Trust as Extended Control: Active Inference and User Feedback During Human-Robot Collaboration. Special issue on Understanding in Machine and Humans in *Frontiers in Systems Neuroscience*.
- Ramstead, M., Wiese, W., **Miller, M.** & Friston, K. (forthcoming) Deep neurophenomenology: An Active Inference Account of Some Features of Conscious Experience and of their Disturbance in *Major Depressive Disorder*. In *Expected Experiences: The Predictive Mind in an Uncertain World*. Routledge, Tony Cheng, Ryoji Sato, and Jakob Hohwy (Eds.).
- **Miller, M.**, Clark, A. Deane G. & Nave, K. (forthcoming). The Structure of Consciousness: Predictive Processing, Social Embodiment, and Layered Control. In *Phenomenal Expectations: New Essays on Predictive Processing and Consciousness*, edited by Miller, M., Schlicht, T. & Clark, A. Philosophy and Psychology.
- **Miller, M.**, Deane G. & Nave, K. & Clark, A. (forthcoming). Expecting some action: predictive processing and the construction of conscious experience. In *Phenomenal Expectations: New Essays on Predictive Processing and Consciousness*, edited by **Miller, M.**, Schlicht, T. & Clark, A. Review of Philosophy and Psychology.
- White, B. & Miller, M. (forthcoming) Filtered States: Active Inference, Social Media and Mental Health. In *AEON*.
- **Miller, M.**, Nave, K., Deane, G. & Clark, A. (2020) The Value of Uncertainty. In *AEON*, [https://aeon.co/essays/use-uncertainty-to-leverage-the-power-of-your-predictive-brain?utm\\_medium=feed&utm\\_source=rss-feed](https://aeon.co/essays/use-uncertainty-to-leverage-the-power-of-your-predictive-brain?utm_medium=feed&utm_source=rss-feed).
- **Miller, M.**, Deane, G. & Wilkinson, S. (2020) Losing Ourselves: Active Inference, Depersonalization and Meditation. *Frontiers of Psychology*,
- Miller, M., Clark, A., Deane, G. & Nave, K. (2020). Wilding the Predictive Brain: Embodied, Emotional and Extended. *Wiley Interdisciplinary Reviews: Cognitive Science*. <https://doi.org/10.1002/wcs.1542>.

- Kiverstein, J., **Miller M.** & Rietveld E. (2020). Mood as Tuning Predictions: A Neurophenomenological Perspective on Depression. *Neuroscience of Consciousness*.
- **Miller, M.**, Kiverstein, J., & Rietveld, E. (2020). Embodying addiction: A predictive processing account. *Brain and Cognition*, 138, 105495.
- **Miller, M.**, & Nave, K. (2020). Slimes and Cyborgs: Stretching the Boundaries of Life. *Adaptive Behavior*, 28(1), 43-44.
- Kiverstein, J., **Miller, M.** & Rietveld, E. (2017). The Feeling of Grip: Error Dynamics, Novelty and the Predictive Brain. *Synthese*, 1-23.
- **Miller, M.**, & Clark, A. (2017). Happily Entangled: Prediction, Emotion, and the Embodied Mind. *Synthese*, 1-17.
- Kiverstein, J., & **Miller, M.** (2015). The Embodied Brain: Towards a Radical Embodied Cognitive Neuroscience. *Frontiers in Human Neuroscience*, 9, 237.
- Kiverstein, J., & **Miller, M.** (2015). The Cognitive-Emotional Brain is an Embodied and Social Brain. Commentary on Luiz Pessoa. *Behavioural and Brain Sciences* 38: 26-7.

### Book Chapters / Reviews

- **Miller, M.**, Anderson, M., Schoeller, F. & Kiverstein, J. (forthcoming) Getting a Kick Out of Film: Aesthetic Pleasure and Play in Prediction Error Minimizing Agents. In *Worlding the Brain*.
- Ramstead, M., Weise, W., **Miller, M.**, Friston, K. (forthcoming) Deep Neurophenomenology: An Active Inference Account of Some Features of Conscious Experience and of their Disturbance in Major Depressive Disorder. In *Expected Experiences: The Predictive Mind in an Uncertain World*. Edited by Cheng, T., Sato, R. & Hohwy, J. Routledge.
- **Miller, M.** & Markovic, J. (forthcoming). Predicting Emotions: Emotion-Cognition Interactions in the Predictive Brain. In Mendonça, D., Curado, M., & Gouveia, S. S. (Eds.) *The philosophy and science of predictive processing*. Bloomsbury Publishing.
- **Miller, M.** (2013). Book Review: of Self, No Self? Perspectives from Analytical, Phenomenological, and Indian Traditions, edited by Mark Siderits, Evan Thompson and Dan Zahavi, Oxford University Press 2011. *Journal of Consciousness Studies*.

### Edited Collections

- Phenomenal Expectations: New Essays on Predictive Processing and Consciousness (2021). (Eds) **Miller, M.**, Schlicht, T. & Clark, A. *Review for Philosophy and Psychology*.
- Expecting Wellbeing: Predictive Organisms in a (Socio-)Technological Niche (in preparation). (Eds) **Miller, M.**, Kiverstein, J. & Hipolito, I.

### Under Review/Drafts

- **Miller, M.**, Kiverstein J. and Rietveld, E. (in review at *Emotion Review*) The Predictive Dynamics of Happiness and Wellbeing.
- **Miller, M.**, White B, Miyahara, K. & Demases, D (in preparation) Third-wave artificial empathy: an active inference approach to affective computing.
- Sandved-Smith, L., **Miller, M.** & Lutz, A. (In preparation) Meditative Self-Inquiry as a Model Optimisation Strategy: An Active Inference Perspective
- **Miller, M.**, Anderson, B. and Verveke, J. (in preparation) Relevance Realization and the Predictive

Organism.

- Schoeller, F., Ashur, P. Larralde, J., Ciaunica, A., **Miller, M.** et al (in preparation) Sonification Wearable Increases Immersion and Embodiment During a Dance Improvisation: Cross Comparison of Novice, Amateur, and Experienced Dancers.
- Hesp, C., Ramstead, M, **Miller, M.** & Friston, K. (in preparation) Hedging our Bets Together: as Active Inference Formulation of Complex Emotions in the Dynamics of Human Social Behaviour
- **Miller, M.**, Sandved-Smith & Clark, A. (in preparation) Bootstrapping the Predictive Mind: Active Inference and Mind-Life-Technology Continuities
- Kiverstein, J., **Miller, M.** & Rietveld, E. (in preparation). Desire in the Predictive Organism.
- Schoeller, F., Pezzulo, G., Horowitz, A., Jain, A., Maes, P., Allen, M., **Miller, M.**, Friston, K. (In preparation). Artificial Sensations: Interoception, Technology, and Psychopathology.

## TALKS

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- *Getting a Kick Out of Film: Aesthetic Pleasure and Play in Prediction Error Minimizing Agents.* European Philosophical Society for the Study of Emotions June 10-12 2021..
- *The Joy of Horror Films: Active Inference, Aesthetic Pleasure and the Paradox of Horror.* Art and Affect in the Predictive Mind Conference. <https://sites.google.com/view/artandaffectinpp/about?authuser=0>. Online June 30-July 2 2021.
- *Active Inference and the Paradox of Horror.* Prediction and Emotion Conference. <https://emotionprediction.wixsite.com/workshop>. March 31-April 2021.
- *Curiosity in the Predictive Brain.* Symposium title: Surprising Play, Interacting Minds and Predictive Brains, with Andreas Roepstorff., Marc Malmdorf Andersen, Savannah Schulz and Meredith Bak. Learning through Play and Imagination, Society for Research in Child Development Conference, St. Louis, USA, 2021.
- *Predictive Minds in a Socio-Technological Niche;* Keynote at WASP-HS Winter Conference, Lund, Sweden. February 9-11 2021.
- *Curiosity in an Ecological-Enactive Predictive Organism.* Learning, Breaking, Making: Analysing Processes of Play, Second International PLAYTRACK Conference, Aarhus University, Denmark. 2021.
- *Why Neuroscience Needs Philosophy.* Corpus Curiosum: Stimulating Critical Thinking in Neuroscience. Online June 23 2020. <https://corpuscuriosum.com/#pastseries>.
- *Why Neuroscience Needs Philosophy.* July 16th Colloquium Lecture of Cognitive Science, Tübingen University. Online July 16.
- *Losing Ourselves: Active Inference, Depersonalization and Enlightenment.* Plenary talk at the Science of Consciousness conference Nov 9 2020. [https://www.youtube.com/watch?v=ojzKvU8G0x0&feature=emb\\_logo](https://www.youtube.com/watch?v=ojzKvU8G0x0&feature=emb_logo)
- *Rewilding the Predictive Brain: Embodied, Emotional and Extended.* York University Neurology Group, Jan 16 2020.
- *Rewilding the Predictive Brain: Embodied, Emotional and Extended.* University of Toronto Cognitive Science and Artificial Intelligence Student Association, Jan 10 2020.
- *Hitting the Slopes: Temporal Error Dynamics and the Surprise-Loving Predictive Organism.* Keynote at Timescales of Life and Mind Conference. University of Edinburgh, Nov 4-6 2019.

- *Mood as Predicting Momentum*. Symposium title: Losing Our Grip: Psychopathology and Embodied Predictive Processing, with Julian Kiverstein, Jelle Bruineberg and Regina Fabry. European Conference on Cognitive Science. Bochum, DE. Sept 2-4 2019. Edinburgh UK. Jan 23 2019.
- *The Gripless Grip: A Predictive Processing Account of Buddhist Awakening, Pint of Science*, Edinburgh, UK. May 21 2019.
- *Embodying Addiction: A Predictive Processing Account*, keynote at Beyond the Brain: Academic Conference at the University of Edinburgh on Reconceptualizing Mental Disorders, University of Edinburgh, UK. May 9-10 2019.
- *Still Happily Entangled: Prediction, Emotion and Embodied Cognition* Philosophy, Psychology and Informatics Group Seminar Series, University of Edinburgh UK. Jan 23 2019.
- *Feelings Gone Wild*. 2nd Annual X-Spect Workshop, University of Edinburgh. Nov 02 2018.
- *Fleshing Out Visual Consciousness: Philosophy, Neuropsychology and the Two- Visual Systems*. Philosophy of Mind, Language, and Cognitive Science Graduate Conference. Western University, Canada. May, 14-16th 2018
- *Predictive Coding and the Bodily Self*. 25th Annual University of Waterloo Philosophy Graduate Student Association Conference. Waterloo, Canada. March, 8th 2018
- *The Neuroscience of Human Perception and the Image of Self*. University of Edinburgh Psychedelic Society. Edinburgh, UK. April, 5th 2017. Wisdom and Compassion in the Predictive Brain.
- *Compassion and Wisdom in the Predictive Brain. A Patient's Tale: compassion in our NHS?* Global Compassion Initiative, Royal College of Physicians. Edinburgh UK. March, 13 2017.
- *The Puzzle of Curiosity: Why Would a Prediction Error Minimizing Brain Move Agents to Seek Out Novelty?* Presented with Julian Kiverstein at Worlding the Brain: Predictive Processing as an Interdisciplinary Concept. University of Amsterdam, NL. November, 16 2016.
- *Embodying the Brain*. 4th Global Experts Meeting on Neuropharmacology. San Antonio, USA. September, 15-17 2016.
- *Predictive Brains and Compassionate Hearts*. TEDx Compassion and Courage Salon. Edinburgh, UK. June, 28 2016.
- *Predictive Emotions, Emotional Predicting*. The Second Annual Conference of the European Philosophical Society for the Study of Emotions. Edinburgh, UK. July, 15-17 2015.
- *Is the Brain a Prediction Machine?* International Society for the History, Philosophy, and Social Studies of Biology Meeting. Montreal, CA. July, 5-10 2015.
- *Affective Realism: The Light and Dark Side of Seeing-With-Feeling*. The World as We Feel It - Talking About Emotions Across the Disciplines Lecture Series. University of Edinburgh, UK. April, 28 2015.
- *The Embodied Brain*. The Second Symposium on Embodied Cognition and Performance at The Society for the Study of Artificial Intelligence and Simulation of Behaviour Conference. Kent, UK. April, 22 2015.
- *Is Empathy (Radically) Embodied?* Cognition of Self and Other: Perceptual and Social Processes. University of Stirling Psychology Symposium, UK. November, 13 2014.

### Conferences & Workshops Organized

- *Emotion and Prediction Conference*. Organized with Jose Araya, Pablo Fernandez & Slawa Loev. (University of Chile). <https://emotionprediction.wixsite.com/workshop>. Online March 31-April 1 2021.
- *All Things Predictive*. Expecting Ourselves International Conference, Online. November 4-6 2020.

- *Wilding the Predictive Brain: Prediction, Culture and Context*. 3rd Annual Expecting Ourselves Workshop, University of Sussex UK. November 1 2019.
- *Innovative Minds: Prediction, Embodiment and Consciousness*. Six-week online course June-July 2019.
- *Beyond the Brain: Academic Conference at the University of Edinburgh Reconceptualizing Mental Disorder*, University of Edinburgh, UK, May 9-10 2019.
- *State of the Art (and Just Beyond)*. 2nd Annual Expecting Ourselves Workshop, University of Edinburgh UK. November 10 2018.
- *Embodied Mind, Embodied Design*. University of Edinburgh, November 9 2015.
- *The Mindful Brain: Meditation and Cognitive Science*. Eight-week course, University of Edinburgh's Student Association, October 20 2015.

## **MEDIA & ENGAGEMENT**

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- *On Being a Cognitive Scientist*. Cognitive Science Society Podcast. June 2021.
- *Philosophy and Cognitive Science: The Predictive Brain*. The Scientistt Podcast. <https://anchor.fm/scientistt/episodes/Philosophy-and-Cognitive-Science-The-Predictive-Brain-ev15k8/a-a58unil>. April 17 2021.
- The Cognitive Science Society Podcast
- Public Outreach, presenting research outputs from Expecting Ourselves to the public at The Digital Festival, Brighton UK, October 13 2019.
- Public Outreach, presenting neuroscience behind the award-winning psychological illusion 'The Mirage Box'. Camera Obscura, Edinburgh UK, September 2017.
- *Embodying Addiction*. Interview on the podcast Philosophers Chatting with Clinicians. February 11th 2020. [philscinschat.podbean.com/e/3-maka/](http://philscinschat.podbean.com/e/3-maka/).

## **AWARDS & HONOURS**

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- Junior Research Fellow, The Centre for Mind and Cognition at Ruhr-University, Bochum, DE 09/01/2019-09/30/2019 (1,000.00£).
- Nominated for University of Edinburgh's *Teacher of the Year* (for the undergraduate class *Introduction to Cognitive Science*). 12/01/2018.
- Royal Institute of Philosophy's Jacobson Studentship. 09/01/2017-09/01/2018 (8000.00£).
- University of Edinburgh's Gray's Prize in Philosophy for the publication *Happily Entangled: Prediction, Emotion and Embodied Cognition*. Synthese, 1-17. 06/2/2017.
- University of Edinburgh's Global International Doctoral Scholarship. 09/01/2014-09/01/2017 (44,000.00£).
- University of Edinburgh's College of Humanities and Social Sciences Doctoral Studentship 09/01/2014-09/01/2017 (50,000.00£).
- Frontier's Spotlight Award for the publication *The Embodied Brain: Towards a Radical Embodied Cognitive Neuroscience*. *Frontiers in Human Neuroscience*, 9, 237. 12/22/2015
- University of Edinburgh's Global International Master's Scholarship. 09/01/2010-09/01/2011 (3,000.00£).
- The Social Sciences and Humanities Research Council of Canada's Joseph Armand-Bombardier Canada Graduate Scholarship. 09/01/2010-09/01/2011 (7,500.00\$).

- Ontario Ministry of Training, Colleges, and Universities' Ontario Graduate Scholarship. 09/01/2010-09/01/2011 (5,000.00\$).

## **TEACHING**

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### **Teaching Assistant**

- 2017 Knowledge and Reality (Undergraduate Philosophy), University of Edinburgh, UK.

### **Lecturer**

- 2021 Topics in the Philosophy of Cognitive Science (Graduate Seminar), University of Hokkaido, Japan.
- 2018, 2019, 2020 Introduction to Cognitive Science (Undergraduate Cognitive Science), University of Edinburgh, UK.
- 2020 The Value of Uncertainty (seminar at *Touch Symposium*, an ethics of technology and artificial intelligence summer school); December 3.
- 2020 Ethics of Artificial Intelligence. Lead organizer of a 12-week online course sponsored by the Beneficial A.I. Society and Cognitive Science Society at University of Edinburgh, UK.
- 2019 Entangled Predictions: Introduction to Embodied Predictive Processing (Undergraduate Proseminar Cognitive Science), Tübingen University, DE. July 6-7.
- 2018 Advanced Topics in Mind, Language and Embodied Cognition (Graduate Philosophy, Psychology and Language Sciences), University of Edinburgh, UK.
- 2018 CogLab: Seminars in Contemporary Cognitive Science (Graduate Cognitive Science), University of Edinburgh, UK.
- 2018 Philosophy Skills (Undergraduate Philosophy Modules), University of Edinburgh, UK.

### **Guest Lecturer**

- 2021 Introduction to Cognitive Science (Undergraduate Informatics), University of Edinburgh, UK.
- 2021 Indian Philosophies of Mind and Language (Undergraduate Philosophy), University of Edinburgh, UK.
- 2018 Perception, Action and Cognition (Undergraduate Neuroscience), University of Edinburgh, UK.
- 2017 Advanced Mind, Language and Embodied Cognition (Graduate Philosophy, Psychology and Language Sciences), University of Edinburgh, UK.
- 2017 Introduction to Predictive Processing (Undergraduate Philosophy, Psychology and Language Sciences), University of Edinburgh, UK.

## **PROFESSIONAL & COMMUNITY SERVICE**

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- Associate editor at *Cognitive Systems Research*.
- Program Committee, IWAI 2021 The 2nd International Workshop on Active Inference. <https://iwaiworkshop.github.io>

- Organizational Committee, *Nested Minds Network*. The NMN connects and supports neuroscientists, machine learning researchers and philosophers from 18 Universities in 9 countries in their research as they endeavour to understand the human mind. <http://www.nestedmindsnetwork.com/home>.
- Project Leader *Cybernetic Emotions Research Group*.
- Member of the Emergent Phenomenology Research Consortium (EPRC), a research project that brings together clinical, scientific and spiritual paradigms to improve clinical outcomes. <https://theeprc.org/>.
- Organizer, *Virtual Philosophy, Psychology and Informatics Group Seminar Series*. University of Edinburgh, UK. <https://blogs.ed.ac.uk/virtualppig/>.
- Organizer, *Philosophy of Psychiatry Reading Group*. University of Sussex, UK. <https://canvas.sussex.ac.uk/courses/15059>.
- Journal Referee: *Artificial Intelligence*; *Journal of Philosophy*; *British Journal of Philosophy*; *Journal of Consciousness Studies*; *Journal of Psychology*; *Synthese*, *Behavioural Brain Research*, *Psychonomic Bulletin & Review*. *Phenomenology and the Cognitive Sciences*; *Frontiers of Psychology*, *Analysis*.
- Project Supervisor: 2019 M.Sc. *Mind, Language and Embodied Cognition* thesis (5 students), University of Edinburgh, UK. 2020 M.Sc *Cognitive Science* thesis (1 student), University of Edinburgh, UK.