

# Thomas Donald Grant Ferguson

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## Current Position

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2022 to Present      Postdoctoral Researcher, Department of Computing Science  
University of Alberta & Alberta Machine Intelligence Institute, Edmonton, AB  
Supervisors: Alona Fyshe, PhD; Adam White, PhD

## Education

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2017 to 2022      Doctor of Philosophy (**PhD**), Cognition and Brain Science  
University of Victoria, Victoria, B.C.  
**Dissertation title:** The impact of stress on the explore-exploit dilemma  
Supervisors: Olave E. Krigolson, PhD; Michael E. J. Masson, PhD

2014 to 2016      Master of Science, Experimental Neuropsychology  
University of Victoria, Victoria, B.C.  
**Thesis title:** Navigational cognition: What you do and what you show isn't always all you know  
Supervisor: Ronald W. Skelton, PhD

2009 to 2014      Bachelor of Science (with distinction), Psychology  
University of Victoria, Victoria, B.C.

## Fellowships, Honours, and Awards

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2023-2024      NSERC Postdoctoral Fellowship (\$105 000)

2023      University of Alberta Graduate Studies Travel Award (\$500)

2022      Dr. Rowland and Muriel Haryett Neuroscience Fellowship (\$50 000)

2021      R.B. May Graduate Award (\$1000)

2021      Mitacs Accelerate Fellowship (\$15 000)

2021      University of Victoria Graduate Award (\$3000) & University of Victoria - Outstanding publication Award (\$1000)

2021      Biotalent Canada Student Work Placement Grant (\$5000)

2020      Biotalent Canada Student Work Placement Grant (\$7500)

2020      Mitacs Accelerate Fellowship (\$30 000)

2020      University of Victoria Donor Award (\$972.50) – Norma Wilson Graduate Scholarship

2020      University of Victoria Graduate Award (\$4000)

2019      University of Victoria Donor Award - Dr. Julius F. Schleicher Graduate Scholarship (\$6960)

2019      University of Victoria Graduate Award (\$4500) & University of Victoria – Outstanding Publication Award (\$1500)

2018      Mitacs Accelerate Fellowship (\$15 000)

2015      NSERC Scholarship CGS: Master's Program (\$17 500) & University of Victoria President's Research Scholarship (\$4000)

2014      University of Victoria Graduate Entrance Scholarship (\$13 500) & University of Victoria Graduate Award (\$5000)

## Journal Articles

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### Accepted or Published

1. **Ferguson, T.D.**, Fyshe, A., & White, A. (manuscript accepted). Electrophysiological signatures of the effect of context on exploration: Greater attentional and learning signals when exploration is costly. *Brain Research*.

2. **Ferguson, T.D.**, Fyshe, A., White, A., & Krigolson, O.E. (2023). Humans adopt different exploration strategies depending on the environment. *Computational Brain and Behaviour*, 6(4), 671-696.
3. Hammerstrom, M.R., **Ferguson, T.D.**, Pepler, H.L., Pluta, A., Binstead, G., & Krigolson, O.E. (2023). Using neural signals to investigate athlete burnout. *Journal for Sports Neuroscience*, 1(2), 10
4. Rowe, J.L., **Ferguson, T.D.**, & Krigolson, O.E. (2021). The impact of stress and anxiety on contextual updating and feedback learning. *The Arbutus Review*, 12 (1), 84-103.
5. Stegemoller, E.L., **Ferguson, T.D.**, Zaman, A., Hibbing, P., Izbicki, P., & Krigolson, O.E. (2021). Finger tapping to different styles of music and changes in cortical oscillations. *Brain and Behaviour*, 1-10.
6. **Ferguson, T.D.**, Bub, D.N., Masson, M.E.J., and Krigolson, O.E. (2021). The role of cognitive control and top-down processes in motor affordances. *Attention, Perception, & Psychophysics*, 82, 2017-2032.
7. Krigolson, O.E., **Ferguson, T.D.**, Colino, F.L., & Binsted, G. (2021) Distribution of Practice Combined with Observational Learning has Time Dependent Effects on Motor Skill Acquisition. *Perceptual & Motor Skills*, 128(2), 885-899.
8. Hammerstrom, M.R., **Ferguson, T.D.**, Williams, C.C., & Krigolson, O.E. (2021). What happens when right means wrong? The impact of conflict arising from competing feedback responses. *Brain Research*, 1791, 147393.
9. Williams, C.C., **Ferguson, T.D.**, Hassall, C.D., Wright, B., and Krigolson, O.E. (2021d). Dissociated Neural Signals of Conflict and Surprise in Effortful Decision Making. *Neuropsychologia*, 155, e13722.
10. Williams, C.C., **Ferguson, T.D.**, Hassall, C.D., Abimbola, W., and Krigolson, O.E. (2021e). The ERP, Frequency, and Time-Frequency Correlates of Reward Processing: Insights from a Large Sample Study. *Psychophysiology*, 58 (2), e13722
11. Toppings, J.L., **Ferguson, T.D.**, & Krigolson, O.E. (2020). The effects of acute stress on neural correlates of decision making. *The Arbutus Review*, 11 (2), 62-90.
12. **Ferguson, T.D.**, Williams, C.C., Skelton, R.W., & Krigolson, O.E. (2019a). Reward processing of cues following completion of a spatial navigation task, *Cognition*, 189, 65-75.
13. **Ferguson, T.D.**, Livingstone-Lee, S.A., & Skelton, R.W. (2019b). Incidental learning and competence in allocentric and egocentric strategies by both men and women in a dual-strategy virtual Morris Water Maze. *Behavioural Brain Research*, 364, 281-295.
14. van Gerven, D.J.H., **Ferguson, T.D.**, & Skelton, R.W. (2016). Acute stress switches spatial navigation strategy from egocentric to allocentric in a virtual Morris water maze. *Neurobiology of learning and memory*, 132, 29-39.

## Presentations (Invited Talks and Oral Presentations)

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1. **Ferguson, T.D.**, Zhu, G. Fyshe, A., & White, A. (2024). Environmental uncertainty but not environmental quality changes how people explore: Evidence from multiple feedback learning tasks. Oral presentation at the Canadian Society for Brain, Behavioural, and Cognitive Science 2024 Annual Meeting, Edmonton, AB, Canada.
2. **Ferguson T.D.** (2024). Modeling Human Data in Python. Invited talk given to the Human-Computer Interaction Lab, University of Alberta, Edmonton, AB, Canada.
3. **Ferguson, T.D.** (2024). Reinforcement Learning and Exploration in Humans. Invited talk given to Artificial Intelligence Everywhere (INT-D 161), University of Alberta, Edmonton, A.B, Canada.
4. **Ferguson, T.D.**, Fyshe, A., White, A., & Krigolson, O.E. (2023). People flexibly use different exploration strategies across learning environments. Oral presentation at the Canadian Society for Brain, Behavioural, and Cognitive Science 2023 Annual Meeting, Toronto, ONT, Canada.
5. **Ferguson, T.D.** (2022). Computational modelling of human choice data. Talk given to the department of Computing Science, University of Alberta, Edmonton, A.B, Canada.
6. **Ferguson, T.D.**, & Krigolson, O.E. (2020). Using EEG to investigate multiple neuromodulatory systems underlying stress & decision making. Oral presentation at the Cognitive Neuroscience Society's 2020 Annual Meeting, Virtual Conference.
7. **Ferguson, T.D.**, Geneau, M., & Krigolson, O.E. (2020). The effect of mindfulness training on decision making performance in athletes. Talk given at Canadian Sports Institute Pacific, Victoria, B.C.
8. **Ferguson, T.D.** (2019). Using EEG to better understand the Brain-Behaviour relationship, Invited talk given for Introduction to Biopsychology (PSYC 351D), University of Victoria, Victoria, B.C.
9. **Ferguson, T.D.** (2019). The effect of stress on executive function and decision making, Invited talk given for Advanced Biopsychology (PSYC 451D), University of Victoria, Victoria, B.C.

10. **Ferguson, T.D.**, Williams, C.C., Colino, F.C., Wright, B., & Krigolson, O. E. (2018). Chronic and acute stress modulate attention and control in a decision-making paradigm. Oral presentation at Northwest Cognition and Memory, Richmond, B.C.
11. **Ferguson, T.D.** (2018). An introduction to EEG as a research method, Invited talk given for Introduction to Biopsychology (PSYC 351D), University of Victoria, Victoria, B.C.

### Published Conference Proceedings

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1. **Ferguson, T.D.**, Fyshe, A., & White, A. (2023). EEG signals sensitive to control and uncertainty differ depending on the exploration strategy used. *Psychophysiology*, 62, S25.
2. Krigolson, O.E., Williams, C.C., **Ferguson, T.D.**, Hecker, K., & Binsted, G. (2021). Taking EEG to Mars: Mobile assessment of human brain performance in the HI-SEAS Mars habitat, *Psychophysiology*, 58, S83.
3. Williams, C.C., **Ferguson, T.D.**, Hassall, C.D., Abimbola, W., & Krigolson, O.E. (2020). The reward positivity, delta, and theta in a sample of 500 participants. *Psychophysiology*, 57, S47.
4. **Ferguson, T.D.**, Williams, C.C., Colino, F.C., Wright, B.E., & Krigolson, O.E. (2018). More attention, greater control: Chronic stress correlates with differences in alpha and theta levels. *Psychophysiology*, 55, S114.
5. Colino, F.C., **Ferguson, T.D.**, Williams, C.C., Colino, F.C., & Krigolson, O.E. (2018). Learning medical diagnosis: The effect of expectation to teach, *Psychophysiology*, 55, S76.
6. Van Gerven, D.J.H., **Ferguson, T.D.**, & Skelton, R.W. (2013). The acquisition of spatial and non-spatial navigation strategies in a dual-strategy virtual Morris water maze. *Canadian Journal of Experimental Psychology*, 67(4), 300.

### Posters

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1. Zhu, G., **Ferguson, T.D.**, Fyshe, A., & White, A. (2024). Humans explore differently depending on the context: Understanding exploration strategies in different learning environments. Poster Presentation at the Royce-Harder Conference, Edmonton, AB, Canada.
2. **Ferguson, T.D.**, Fyshe, A., & White, A.. (2023). Comparing human exploration in non-stationary and stationary bandit environments, Poster presented at A.I. Week, Edmonton, A.B.
3. **Ferguson, T.D.**, White, A., & Fyshe, A. (2023). Understanding the neural signals underlying exploration: An EEG investigation. Poster presented at A.I. Week, Edmonton, A.B.
4. **Ferguson, T.D.**, & Krigolson, O.E. (2022). Stress disrupts uncertainty signals and reduces exploration. Poster presented at A.I. Week, Edmonton, A.B.
5. LaCasse, J.M., Devine, S., Profitt, M., **Ferguson, T. D.**, Eppinger, B., & Brake, W.G. (2022). The impact of hormonal contraceptives on spatial navigation in the virtual Hex maze task. Poster presented at Society for Neuroscience, San Diego, CA.
6. Rowe, J.L., **Ferguson, T.D.**, & Krigolson, O.E. (2021) Decision-making under chronic stress and anxiety: State and trait anxiety impact contextual updating but not feedback learning, Talk given at North-West Cognition and Memory (2021), Virtual Conference.
7. Rowe, J.L., **Ferguson, T.D.**, & Krigolson, O.E. (2021) The impact of stress and anxiety on feedback learning and contextual updating, Poster presented at the Jamie Cassels Undergraduate Research Fair (JCURA), Victoria, B.C.
8. **Ferguson, T.D.**, & Krigolson, O.E. (2020) Using EEG to investigate multiple neuromodulatory systems underlying stress & decision making. Poster presented at the Cognitive Neuroscience Society's 2020 Annual Meeting, Virtual Conference.
9. Carey, E. **Ferguson, T.D.**, Williams, C.C., & Krigolson, O.E. (2020) The accumulation of cognitive fatigue among undergraduate university students. Poster presented at the Making Waves Conference 2020, Victoria, B.C.
10. Toppings, J.L, **Ferguson, T.D.**, & Krigolson, O.E. (2020) Is stress ruining your life? The effects of acute stress on the neural correlates of decision-making. Poster presented at the Jamie Cassels Undergraduate Research Fair (JCURA), Victoria, B.C.
11. Gill, G., **Ferguson, T.D.**, Luehr, S., & Krigolson, O.E. (2019) An Implicit Measure of Cognitive Focus: Evidence from an Oddball Paradigm. Poster presented at the Northwest Cognition and Memory 2019, Victoria, B.C

12. Trska, R., **Ferguson, T.D.**, Walzak, A., Wright, B., & Krigolson, O.E. (2019), Mobile Based EEG assessment of fatigue in clinical practioners, Poster presentation at the Cognitive Neuroscience Society annual meeting, San Francisco, California
13. **Ferguson, T.D.**, Williams, C.C., Skelton, R.W., & Krigolson, O. E. (2018). Great, I found it: Evidence for the association of reward with spatial information following navigation with the use of EEG. Poster presentation at the Canadian Association for Neuroscience annual meeting, Vancouver, B.C.
14. Hammerstrom, M., Williams, C.C., **Ferguson, T.D.**, Colino, F.C., Wright, B., & Krigolson, O. E. (2018). Neural Learning Signals Reflect Task Performance in a Medical Context. Poster presented at the Northwest Cognition and Memory 2018, Richmond, B.C.
15. **Ferguson, T.D.**, van Gerven, D., & Skelton, R.W. (2015). Most people use both allocentric and egocentric strategies to solve a dual-strategy Morris water maze. Poster presented at the International Behavioral Neuroscience Society, Victoria, B.C.
16. **Ferguson, T.D.**, van Gerven, D., & Skelton, R.W. (2014). Strategy choice in a new dual strategy virtual morris water maze depends on environmental features, instructions and gender. Poster presented at NorthWest Cognition and Memory, Victoria, B.C.
17. van Heyningen, T., **Ferguson, T.D.**, van Gerven, D., & Skelton, R. (2014). Low-level stress strongly affects navigational strategy choice in a dual-strategy virtual Morris water maze in both men & women. Poster presented at NorthWest Cognition and Memory, Victoria, B.C.

### Workshops Hosted

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1. **Ferguson, T.D.** (2023). Modelling human learning using RL models: How to validate and compare across multiple models. Workshop given at the University of Victoria, Victoria, British Columbia.

### Reviewer Experience

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1. NSERC Discovery Grant External Reviewer (2024)
2. **Journals:** Scientific Reports, Nature Science of Learning, Social Sciences and Humanities Open, Biological Psychology

### Teaching & Tutoring

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2024	<b>Co-Instructor</b> , Department of Psychology University of Alberta, Alberta, A.B. PSYC 354: Foundations of Cognitive Science
2020	<b>Primary Instructor</b> , Department of Psychology University of Victoria, Victoria, B.C. PSYC 300B: Statistical Methods in Psychology II
2014 – 2021	<b>Teaching Assistant</b> , Department of Psychology University of Victoria, Victoria, B.C. PSYC 300B: Statistical Methods in Psychology II, 2018-2021 (for Dr. David Medler) PSYC 300A: Statistical Methods in Psychology I, 2017-2020 (for Dr. David Medler) NRSC 587: Advanced Topics in Neuroscience, 2018 (for Dr. Olave Krigolson) PSYC 351D: Biopsychology, 2016 (for Dr. David Medler) PSYC 323: Advanced Biopsychology, 2015 (for Dr. Ronald Skelton) PSYC 201: Research Methods in Psychology, 2015 (for Dr. David Polson) PSYC 210: Conceptual Foundations of Psychology, 2015 (for Dr. Allison Barnes) PSYC 215a: Introduction to Biological Psychology, 2014 (for Dr. Ronald Skelton) PSYC 415B: Biological Psychology, 2014 (for Dr. Ronald Skelton)

2019 – 2021     **Tutoring**  
PSYC 300A: Statistical Methods in Psychology II  
PSYC 300B: Statistical Methods in Psychology II

## Industry and Work Experience

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- Oct 2020 - Present     Science and Research Consultant**  
*Companies: 40 Years of Zen, SixEight Solutions Inc.*  
Role: Conducted EEG data collection and analysis, interfaced with clients to discuss and interpret EEG results, completed multiple literature reviews, grant writing
- Sep 2016 - Feb 2022     Alternative Technology Assistant & Exam Invigilator**  
*Centre for Accessible Learning, University of Victoria*  
Role: Prepared accessible textbooks and course materials, interfaced with academic publishing companies to acquire materials, invigilated exams for students with accessibility requirements
- Aug 2021 - Apr 2022     Database Manager (Mitacs internship)**  
*40 Years of Zen*  
Project: Assessing the effects of neurofeedback through a comprehensive systematic review (Grant Number: IT26984)  
Role: Developed a sortable database which summarized published research on neurofeedback, conducted a systematic review on neurofeedback and EEG signals
- May 2021 - Aug 2021     Data Analyst (Mitacs internship)**  
*Mental Stats Technology*  
Project: Assessing Sport Performance Using Mobile EEG (Grant Number: IT23072)  
Role: Collected and analyzed EEG data from a variety of high-performance athletes, developed data processing and analysis code, prepared monthly reports summarizing the findings, published a scientific paper in an accredited journal
- Jul 2020 - Apr 2021     Research Intern (Mitacs internship)**  
*Rootd*  
Validation of the Rootd App for Reducing Anxiety and Panic Attacks (Grant Number: IT19842)  
Role: Conducted a multi-month survey study assessing the impact of a mobile application to reduce anxiety and panic, identified and coded surveys on Survey Monkey, developed code to analyze application usage and survey responses, prepared summary figures and bi-weekly reports, gave presentations to employees
- Jan 2018 - Aug 2018     EEG Researcher and Analyst (Mitacs internship)**  
*Thompson Creek Metals*  
Project: Detecting Work Site Fatigue for High-Risk Positions Utilizing Portable Electroencephalography (Grant Number: IT11013)  
Role: Collected and analyzed EEG data on-site at a mine in Northern British Columbia, prepared summary figures and a final report

## Professional activities and leadership skills

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- 2017-2022     PhD Candidate – Dr. Olave Krigolson  
Role: trained undergrads, mentoring honours and master's students, organized a paper discussion group
- 2012-2016     Lab Manager/MSc Student – Dr. Ronald Skelton

Role: trained and coordinated undergrads, ran a paper discussion group

### **Honours Students Supervised (with Dr. Olave Krigolson)**

Juliet Rowe – 2020 to 2021 – Thesis: The effect of chronic stress and anxiety on neural decision making in a 300-person sample

Patrick Montgomery – 2020 to 2021 – Thesis: Understanding the interaction between acute stress and common event-related potential components

Jill Toppings – 2019 to 2020 – Thesis: The effect of acute stress on neural decision making

### **Workshops**

July 2022 – 2022 CIFAR Deep Learning and Reinforcement Learning Summer School, Online

August 2019 – 2019 Model Based Neuroscience Summer School – University of Amsterdam, Amsterdam, Netherlands

September 2017 – Time-series analysis of physiological data – University of Victoria, Victoria, British Columbia

September 2016 – Learning and Teaching in Higher Education – University of Victoria, Victoria, British Columbia

### **Science Outreach**

February 2020 – Community-based presentation on the principals of conducting cognitive neuroscience research

March 2019 – Making Waves in Psychology (Undergraduate conference) – Abstract evaluation

February & March 2019 – Presenter to visiting secondary students the basics of conducting research in cognitive neuroscience

March 2018 – Community-based presentation on the principals of conducting research held by the Café Scientifique

February 2018 – Panelist for “Demystifying graduate school” held by the Centre for Biomedical Research

### **University Service**

2018-2022 – University of Victoria Psychology Graduate Student Council (PGSC) – Founding member and GSS representative

2018-2022 – University of Victoria Graduate Student Society Representative – Student Affairs, and Bylaw and Policy committees

2017-2018 – University of Victoria Graduate Executive Committee – Student Representative

### **Programming and Technical Skills**

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**Advanced Knowledge:** MATLAB, R, Python, Unreal Engine, PsychoPy

**Intermediate Knowledge:** HTML5, iOS Applications (Swift), Markdown

**Beginner Knowledge:** Unity

**Other skills:** Computational Modeling, Bayesian and Frequentist Statistics, Neuroimaging (EEG), Microsoft Office suite, JASP, SPSS