

# ZACHARY C. IRVING

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## EMPLOYMENT

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### **University of California, Berkeley**

*SSHRC Postdoctoral Scholar, January 2016—December 2017*

- Project: *A Wandering Lens on the Imagination*
- Supervisor: Alison Gopnik

## EDUCATION

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### **University of Toronto**

*PhD in Philosophy, 2015*

- Dissertation: *The Wandering Mind*
- Supervisors: Diana Raffman and Evan Thompson

*Honors BA in Philosophy and English, 2009*

- High distinction
- Minor in Psychology

### **University of California, Berkeley**

*Visiting Student, Spring/Summer 2014*

### **University of British Columbia**

*Visiting Student, Fall 2014*

## AREAS OF SPECIALIZATION

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Philosophy of Mind, Cognitive Science

## AREAS OF COMPETENCE

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Philosophy of Science, Philosophy of Action, Epistemology, Logic

## PHILOSOPHICAL AND THEORETICAL PUBLICATIONS

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Jessica Andrews-Hanna, Kieran Fox, **Zachary C Irving**, Nathan Spreng, and Kalina Christoff (forthcoming) “The Neuroscience of Spontaneous Thought: An Evolving, Interdisciplinary Field” in Kalina Christoff, and Kieran Fox *Oxford Volume on Spontaneous Thought And Creativity* Oxford: Oxford University Press.

**Zachary C Irving** and Evan Thompson (forthcoming) “The Philosophy of Mind-Wandering” in Kalina Christoff, and Kieran Fox *Oxford Volume on Spontaneous Thought And Creativity* Oxford: Oxford University Press.

Kalina Christoff, **Zachary C Irving**, Kieran Fox, Nathan Spreng, and Jessica Andrews-Hanna (2016) “Mind-Wandering as Spontaneous Thought: A Dynamic Framework” *Nature Reviews Neuroscience* 17: 718–731. Selected Media Coverage: [Scientific American Mind](#) (forthcoming), [Huffington Post](#), [Daily Californian](#), [Science Daily](#), [Medical Daily](#), [Hacker News](#), [Berkeley News](#)

**Zachary C Irving** (2016) “Mind-Wandering is Unguided Attention: Accounting for the ‘Purposeful’ Wanderer” *Philosophical Studies* 173 (2): 547–571.

Michael Arsenault\* and **Zachary C Irving**\* (2013) “Aha! Trick Questions, Independence, and the Epistemology of Disagreement” with Michael Arsenault *Thought: A Journal of Philosophy* 1 (3): 185–194.

**Zachary C Irving** (2011) “Style, But Substance: On Graphical versus Numerical Representation in Scientific Practice” *Philosophy of Science* 78 (5): 774–787.

\* Shared First Authorship

## EMPIRICAL PUBLICATIONS

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Matt L. Dixon, Jessica Andrews-Hanna, R Nathan Spreng, **Zachary C Irving**, and Kalina Christoff (revise and resubmit). “Anticorrelation between default and dorsal attention networks varies across default subsystems and cognitive states” *Neuroimage*.

## INVITED PRESENTATIONS

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“Author Meets Critics Session for Jennifer Windt’s *Dreaming: A Conceptual Framework for Philosophy of Mind and Empirical Research*” (2017) *Pacific APA*, Seattle.

“The Philosophy of Mind-Wandering” (2016) *Cognition Area Seminar: Psychology Department*, University of British Columbia, Vancouver.

“Where is the “Wander” in Mind-Wandering?” (2015) *Science of Ethics Workshop: Imagination and Alternative Possibilities*, University of Michigan, Ann Arbor.

“Executive Resources and Mind-Wandering: Friends or Foes?” (2015) with Kalina Christoff and Kieran Fox (co-authors) *Society for Applied Research in Memory and Cognition XI Invited Symposium: Mind-Wandering in the Real World*, Victoria, BC.

#### PEER REVIEWED PRESENTATIONS

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“Reflections on the Wandering Mind: A Puzzle for Dual Process Theory”

- (2017) *Eastern APA*, Baltimore.
- (2014) *Society for Philosophy and Psychology*, University of British Columbia.

“Is Mind-Wandering Disunified or Unguided? A Critique of Carruthers’ The Centered Mind”

- (2016) *Society for Philosophy and Psychology*, University of Texas at Austin.
- (2016) *Pacific APA*, San Francisco.

“Mind-Wandering is Unguided Attention: Accounting for the ‘Purposeful’ Wanderer” (2015) *Conference on Intentions*, University of Antwerp, Belgium.

“Venturing Beyond Vanilla: A Risky Extension of Belief-Desire Psychology” (2014) *Formal Epistemology Workshop*, California Institute of Technology.

“Realism’s Risk: How Should We Interpret Buchak’s Risk Function?” (2013) *Formal Epistemology Festival*, University of Toronto.

“I Wander About That ...Why Mind-Wandering is not Task Unrelated Thought” (2013) *Society for Philosophy and Psychology*, Brown University.

“The Epistemic Rationality of Mind-Wandering”

- (2013) *Pacific APA*, San Francisco.
- (2012) *International Workshop on Cognitive Science*, Institute for Language Cognition Logic and Information, Donostia, Spain.

“Style, But Substance: On Graphical versus Numerical Representation in Scientific Practice” (2010) *Philosophy of Science Association*, Montreal, Canada.

#### AWARDS

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Postdoctoral Award, Social Sciences and Humanities Research Council of Canada (SSHRC) (CAD 81,000, 2016–2017)

Postdoctoral Award, SSHRC (through Kalina Christoff) (CAD 7,000, 2016–2017)

Postdoctoral Award, Templeton Foundation (through Alison Gonpik) (CAD 11,000, 2016–2017)

Research Award, Balzan Styles of Reasoning Project (CAD 14,000; 2015–2016)

Visiting Researcher Honorarium, University of British Columbia (CAD 7,000; airfare, accommodations; 2014–2015)

Teaching Excellence Award, University of Toronto (Finalist; One of the year's top 12 teaching assistants; 2014)

Michael Smith Foreign Study Supplement, SSHRC (Supporting research at UC Berkeley; CAD 6,000; 2014)

Doctoral Canadian Graduate Scholarship, SSHRC (CAD 105,000; 2011–14)

Entrance Award, Philosophy Department, University of Toronto (CAD 5,000; 2011; Declined)

Masters Canadian Graduate Scholarship, SSHRC (CAD 17,500; 2009–2010)

Graduation Award, University of Toronto (CAD 1,250; 2009)

Chancellor's Award, Trinity College, University of Toronto (CAD 1,000; 2009)

Queen Elizabeth II Scholarship, Government of Ontario (CAD 14,000; 2005–08)

George Gray Falle Scholarship in English, Trinity College, University of Toronto (CAD 1,200; 2007)

Excellence Award, University of Toronto (Supporting undergraduate research in psychology; CAD 5,800; 2007)

Scholars Program, University of Toronto (Awarded to the top 100 students in each year; CAD 1,000; 2006)

## TEACHING EXPERIENCE

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### **Instructor**

*Issues in Philosophy of Mind: Philosophy of Memory* (at the University of Toronto; Summer 2016)

*Graduate Seminar in Philosophy of Mind: Attention and Mind-Wandering* (at UBC; with co-instructor Evan Thompson; Fall 2014)

*Graduate Seminar in Cognitive Neuroscience: Varieties of Spontaneous Thought* (at UBC Psychology Department; with co-instructor Kalina Christoff; Spring 2015)

## **Tutorial Leader**

*Introduction to Ethics* (Kyle Menken Summer 2014)

*Minds and Machines* (Gurpreet Rattan; Fall 2013)

- Selected as one of University of Toronto's top 12 TAs

*Persons, Minds, and Bodies* (Jim John; Spring 2013)

*Persons, Minds, and Bodies*, (Adrienne Prettyman; Summer 2012)

*Introduction to Philosophy* (Mark Kingwell; Fall 2008–Spring 2009)

*Modern Symbolic Logic* (Niko Sharer; Fall 2011–Spring 2012)

## **Grader**

*Probability and Inductive Logic* (Jonathan Weisberg; Spring 2015)

*Theories of Mind* (Jim John; Fall 2012)

*Modern Symbolic Logic* (Jaqueline Brunning; Fall 2009–Spring 2011, Fall 2015)

## **PROFESSIONAL SERVICE**

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Referee: *Southern Journal of Philosophy*, *Philosophical Psychology*, *Studies in the History and Philosophy of Science*, *Philosophy and Technology*, and *Spontaneous Generations: A Journal for the History and Philosophy of Science*

Keynote Organizer: University of Toronto Graduate Philosophy Conference (2015)

Founder: Berkeley Mind-Wandering Research Group (Berkeley; 2016 to current); Attentional Guidance Reading Group (Co-founder Alex Madva; Berkeley; 2014), Attention and Action Reading Group (Co-founder Aaron Henry; University of Toronto; 2013), and Visual Representation Reading Group (University of Toronto; 2010)

Conference Reporter: Indian Theories of Mind and Attention (Harvard; 2013)

## **RESEARCH ACTIVITIES**

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Member: Alison Gopnik and Tania Lombrozo's Psychology Laboratories (Berkeley; 2014 to current)

Reading Group Member: on Curiosity (2016 to current); on Wayne Wu's *Attention* (with Bill Seager; 2015) on Brian Ellis' *The Metaphysics of Scientific Realism* (with Anjan Chakravartty; 2010), on the Philosophy of Perception (with Mohan Matthen; 2009-2011), on the Philosophy of Neuroscience (with Evan Thompson; 2009-2012), on "Metapsychology" (with Jordan Peterson; 2010-2011)

Graduate Researcher: Mohan Matthen's Network for Sensory Research (2011–2013)

Research Assistant: Denis Walsh (2011)

Participant: Consortium for the History and Philosophy of Biology (IHPST Paris; 2011)

#### GRADUATE COURSES FOR CREDIT

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*Free Will and Human Action in Medieval Philosophy* (Martin Pickave; Spring 2012)

*Decision Theory*, (Jonathan Weisberg; Independent Study; Spring 2012)

*Rationality, Consciousness, and Action* (Benj Hellie and Andrew Sepielli; Spring 2012)

*PhD Proseminar: Disagreement* (Gurpreet Rattan and David Dyzenhaus; Fall 2011)

*Formal Tools in Philosophy* (Jonathan Weisberg; Fall 2011)

*Kant on the Power of Judgement* (Ulrich Schloesser; Fall 2011)

*Descartes' Passions of the Soul* (Martin Pickave; Independent Study; Fall 2010)

*Philosophy of Biology* (Denis Walsh; Summer 2010)

*Comparing Values* (Joseph Boyle; Spring 2010)

*Topics in Personality* (Jordan Peterson; Psychology; Spring 2010)

*John McDowell* (Sonia Sedivy; Spring 2010)

*Models, Truth, and Representation* (Anjan Chakravartty; Fall 2009)

*Early Analytic* (Bernard Katz; Fall 2009)

*Embodied and Embedded Mind Theories* (Evan Thompson; Fall 2009)

#### GRADUATE COURSES AUDITED

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*What Changes in Development* (Alison Gopnik and Mike Frank; Psychology; Berkeley and Stanford; Spring 2016)

*Buddhism and Cognitive Science* (Evan Thompson; Berkeley; Spring 2014)

*The Nature of Nature* (Herbert Dreyfus and Alva Noë; Berkeley; Spring 2014)

*Rationality Across Time and Persons* (Sergio Tenenbaum and Julia Nefsky; Fall 2013)

*Philosophy of Perception* (Mohan Matthen; Fall 2012)

*Attention and Consciousness* (Evan Thompson; Fall 2012)

*Metaethics: Moral Realism* (Andrew Sepielli; Summer 2011)

*Dynamical Systems Theory*, (Pascal van Lieshout; Psychology; Spring 2011)

*The Epistemology of Computer Simulations*, (Margaret Morrison; Spring 2011)

*Conscious Life* (Benj Hellie; Fall 2009)

## ABSTRACT

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*While on the subway home, your mind may drift from one thought to another. At first you picture a meal you could make tonight. You can almost taste the squash soup when your attention wanders to the faint music in another passenger's headphones. You feel like you recognize the song then, smiling, remember a joke you heard yesterday...*

Mind-wandering—the mental activity illustrated in this vignette—occupies up to half our waking thoughts and has emerged as a central topic in cognitive neuroscience. Surprisingly, philosophers of mind and action have only just begun to discuss the wandering mind. My dissertation develops one of the first systematic philosophical theories of mind-wandering, which I define as unguided attention. I then use mind-wandering as a lens on core philosophical topics, including mental action, attention, and thinking.

My dissertation begins by identifying two core tasks for the philosophy of mind-wandering. First, we must resolve a dilemma. Mind-wandering seems essentially passive. Yet it is under the influence of our goals in a way that seems active: having a goal (e.g. planning dinner) can causally motivate your mind to wander to goal-relevant thoughts (e.g. potential recipes). Second, theories of mind-wandering should account for its characteristic dynamics. When someone's mind wanders, her attention is unstable: her focus drifts from one topic to the next (e.g. from dinner to an objection). Mind-wandering is thus antithetical to stable forms of thinking such as rumination (e.g. being fixated on one's distress) and absorption (e.g. being engrossed in an intellectual idea). Current theories, including ground-breaking treatments by philosophers Carruthers, Metzinger, and Sripada, cannot accomplish these tasks.

I propose that mind-wandering is unguided attention. Roughly speaking, an individual's attention is guided when she would feel pulled back, were she distracted from her current focus. In contrast, a wandering attention drifts from topic to topic unchecked. I resolve the aforementioned dilemma by distinguishing between two core features of agency—guidance and motivation—that often track together. Although our wandering thoughts are never guided, they are frequently motivated, in that their causal antecedents include the agent's beliefs and goals. I therefore use mind-wandering as a case study to pull motivation and guidance apart, whereas philosophers of mind and action typically conflate them.

Through the lens of mind-wandering, I then investigate the relationship between attention, consciousness, and action. I argue that mind-wandering is a rare choice-point between philosophers who define attention in terms of consciousness versus agency. These philosophers should classify mind-wandering as a form of attention and inattention, respectively.

Drawing on White's monograph *Attention* (1964), I reconcile these competing pictures of mind-wandering—and by extension, of attention. Each picture illuminates a distinct notion of attention: spectator attention is focused consciousness, which becomes agent or patient attention when it is guided. Mind-wandering is pure (i.e. unguided) spectator attention.

Finally, I use mind-wandering to put pressure on dual process theorists who classify thinking either as unconscious and automatic (Type 1) or conscious and analytic (Type 2). Here's the rough problem: our wandering thoughts are neither unconscious nor automatic; yet standard cases of Type 2 thought (e.g. arithmetical reasoning) are controlled in a way that mind-wandering is not. To accommodate mind-wandering, we must enrich dual process theory in a novel way: among Type 2 processes, we must distinguish between those that are guided (e.g., reasoning, planning) and those that are unguided (e.g., mind-wandering, brainstorming).

#### RESEARCH STATEMENT

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Mind-wandering—roughly, unconstrained thinking that meanders from topic to topic—is a central facet of the stream of consciousness. This mental activity has emerged as a leading topic in cognitive science, shedding light on traditional philosophical questions about consciousness that date back to the British Empiricists. Surprisingly, contemporary philosophers of mind and action have only just begun to discuss the wandering mind. My dissertation and publications develop one of the first systematic philosophical theories of mind-wandering, which I define as unguided attention.

My postdoctoral research at UC Berkeley extends this project in three related directions. One project further explores the significance of mind-wandering for mental action. Another develops philosophical foundations for the cognitive neuroscience of mind-wandering. A final project uses mind-wandering to gain traction on philosophical questions about imagination, epistemic rationality, and the nature of cognition in childhood.

In my dissertation, I argue that philosophers of mind-wandering must account for its characteristic dynamics (*Philosophical Studies*, 2016; *Oxford Handbook on Spontaneous Thought and Creativity*, forthcoming). Mind-wandering is antithetical to dynamically stable forms of cognition such as goal-directed thinking and rumination. I explain these dynamics by defining mind-wandering as unguided attention, expanding upon ideas from Thomas Hobbes. Roughly speaking, an individual's attention is guided when she would feel pulled back, were she distracted from her current focus. In contrast, a wandering attention drifts from topic to topic unchecked. Mind-wandering is less stable than goal-directed forms of thinking, because it is not guided to remain on topic.

My first postdoctoral project extends my dissertation research on mind-wandering and mental action. Specifically, I use mind-wandering to distinguish between two ways in which thinking can be “directed”. A train of thought can be *directed towards* a goal, in the sense that it is moving towards some endpoint (e.g. the solution to a problem). A train of thought can also be *directed by* a goal, in the sense it is guided to remain on topic as it unfolds over

time (e.g. when you follow the thread of a conversation). I then use this pair of categories to advance two debates in the philosophical literature on mind-wandering and attention. First, I vindicate current mind-wandering research methods, which prominent cognitive neuroscientists and Thomas Metzinger have recently critiqued. I argue that their criticisms rest on the presupposition that mind-wandering is directed towards a goal, which it is not. Second, I contend that Philipp Koralus' influential theory of attention captures only those cases where attention is directed *towards* a goal, not cases where attention is directed *by* a goal.

My other postdoctoral projects are deeply engaged with cognitive neuroscience and developmental psychology. One project articulates philosophical foundations for the cognitive neuroscience of mind-wandering and spontaneous thought, which I have developed in collaboration with leading mind-wandering researcher Kalina Christoff. Our work on this topic is forthcoming in *Nature Reviews Neuroscience*, the field's highest impact journal. Drawing on my philosophical work, we critique current theories that define mind-wandering in terms of the contents of a wandering mental state, rather than the dynamic instability of a wandering stream of thoughts. We then build on my philosophical theory that guidance is what stabilizes the stream of consciousness, curtailing its tendency to wander. We argue that guidance arises due to interactions between large-scale neural networks and that the mind wanders during periods when these interactions subside. Finally, we use our philosophical and neural model to explain the distinction between clinical disorders characterized by streams of thought that are excessively stable (e.g. depressive rumination) versus excessively variable (e.g. ADHD).

My work under philosopher and developmental psychologist Alison Gopnik explores the connection between mind-wandering and imagination in childhood. Many of our wandering thoughts are imaginative: for example, the wanderer might imagine how a conversation with her boss will unfold. Yet mind-wandering contrasts with the types of directed imagination that philosophers typically discuss: e.g. a mover mentally picturing how to fit a couch up a narrow staircase. Similarly, directed imagination seems to contrast with the free-wheeling imagination of children. I argue that the difference arises because directed imagination is guided, whereas the spontaneous imagination of mind-wanderers and children is not.

The distinction between directed and spontaneous imagination has implications for imagination's rational role. In general, imagination provides us with counterfactual knowledge about what would be the case if the world were to change in specific ways. I hold that directed and spontaneous imagination are complementary sources of counterfactual knowledge, each serving to offset the other's limitations. Directed imagination is guided toward counterfactuals that seem relevant to one's goals and realistic given one's background moral and epistemic beliefs. One example of this sort of guidance is "imaginative resistance", which occurs when subjects find it difficult to imagine deviant scenarios such as worlds where murder is a minor transgression. Such constraints are often valuable insofar as they direct one's imagination away from counterfactual scenarios that seem unlikely to be of practical or epistemic import.

However, counterfactuals that initially seem irrelevant are not always so; imaginative resistance may guide you to ignore a counterfactual that appears outlandish, but is actually

important. Spontaneous imagination may help us attend to such outlandish scenarios. This would explain empirical evidence that children and mind-wanderers (a) often think more flexibly than goal-directed adults and (b) freely imagine the sorts of bizarre scenarios that imaginative resistance guides us to ignore. It's through the balance between guided and unguided imagination that imaginers avoid the dual threats of irrelevance and myopia.

In collaboration with Professor Gopnik, I am testing empirical predictions that flow from my philosophical work on mind-wandering and imagination. To investigate whether children's imagination is less guided than that of adults, we have developed novel methods to compare the dynamic stability of stories imagined by children and goal-directed adults. We are also testing the hypothesis that adults who "wake" from mind-wandering think in a child-like manner, and thus perform as well as children on tasks where adults are typically inflexible. I am committed to pursuing philosophy that is not only empirically informed, but empirically informative, working with scientists to guide the research that I discuss.

My work on mind-wandering is connected with broader interest in the philosophy of science and epistemology (especially formal epistemology). Specifically, I attempt to reconcile the contingent nature of human psychology with rational norms that govern scientific practice and everyday reasoning. In one paper (*Philosophy of Science*, 2011), I object to Nelson Goodman's purely formal account of scientific visual representations. Inspired by Paul Humphreys work on computer simulations, I argue that an appreciation of the human visual system is necessary to account for the epistemic role of visual representations in scientific practice. Michael Arsenault and I co-authored a paper (*Thought*, 2013) that presents a family of counter-examples to David Christensen's Independence Criterion, which is central to the epistemology of disagreement. Our examples are inspired by the psychological phenomenon of insight, which I discuss in my work on mind-wandering and imagination. Another paper in preparation, which I presented at the *Formal Epistemology Festival* and *Formal Epistemology Workshop*, investigates a core component of practical rationality: risk aversion. Standard philosophical treatments of risk aversion aim to be either descriptively adequate or normatively rational, but not both. I expand on Lara Buchak's work to reconcile descriptive and rational theories of choice. Yet doing so requires that we expand the orthodox picture of rational psychology, allowing that *venturesomeness* is a sui generis mental state.

In our neglect of mind-wandering, philosophers have overlooked not only a central facet of consciousness, but also of rationality. We will learn much about the mind, if we bring our wandering thoughts back into focus.