



Psychology Research

A MAJOR'S RESOURCE GUIDE



COLLEGE OF THE
Holy Cross

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Have you ever wondered ...

- How can I figure out whether graduate school would be right for me?
- How can I increase my chances of being accepted into a good graduate program or getting a good psychology-related job?
- How can I get to know my professors in a setting outside of class?
- How can I learn about psychology in an active, hands-on way?
- How can I obtain an in-depth understanding of topics that interest me?
- How can I become more involved in the Department?
- How could I become an author of a published paper or do a presentation at a national conference?

If you have ever asked yourself any of these questions, then you might be interested to know more about the opportunities that exist for you to get involved in research in the Department of Psychology at the College of the Holy Cross.

The Psychology faculty at Holy Cross are actively involved in research. At any given time, there are many different research projects underway in the Department. Psychology is a broad discipline, and the research interests of the Psychology faculty fully reflect this breadth. We do both human and animal research; we study people across the entire lifespan: from children, to adolescents, to the elderly; and we are interested in topics that range broadly from culture and social behavior to neuropsychology. Contact your professors if you are curious to know what research projects they are working on. Psychologists love to talk about their research! More important, many members of the Psychology faculty welcome the opportunity to involve students in their research. Collaborating in this way provides us with an opportunity to work closely with individual students and we greatly value the contributions they can make to our research projects. We also greatly enjoy the opportunity to help students realize their own potential as researcher/scholars and strengthen their commitment to the discipline of psychology.

The purpose of this booklet is to provide you information about the wide range of research opportunities that are available in the Psychology Department at Holy Cross. There are many different ways that you can involve yourself in research, whether it is by enrolling in a Directed Readings (PSYC 470) or Research Projects (PSYC 480) course, or simply volunteering some time to work with a professor on a specific project. This booklet describes the types of research projects that are carried out here. Following each profile, selected publications are listed. If you are interested in finding out more about how you could get involved in research, it would be a good idea to contact any professor whose research seems interesting to you.



Professor Florencia Anggoro

Conceptual Development

How do children and adults acquire and reason with complex concepts and systems of knowledge? What is common to all humans, and what is the influence of the learning context? How do we design the conditions that support the acquisition of complex concepts? My overarching interest in conceptual development has led me to pursue several lines of research.

In one line of research, I have examined whether and how people's concepts about the biological world is shaped by the naming practices of their communities. This work adopts a cross-cultural perspective to examine U.S. and Indonesian children's acquisition of fundamental biological concepts (ANIMAL, PLANT, LIVING THING), their names, and the relations among them. Our studies showed that cross-linguistic differences are reflected in children's categorization and reasoning, and that even adult Indonesian speakers make judgments that seem illogical but are consistent with their naming practice. In related work, I have examined Indonesian children's and adults' beliefs about common illnesses such as colds and the flu, as well as a culturally-constructed illness concept known as *masuk angin* (literally "trapped wind").

Selected Publications

- John, M., Sibuma, B., Wunnava, S., Anggoro, F., Dubosarsky, M. (2018). An iterative participatory approach to developing an early childhood problem-based STEM curriculum. *European Journal of STEM Education*.
- Gentner, D., & Anggoro, F. (2015). Comparison as a route to insight. *Riabilitazione Neurocognitiva: Quadrimestrale di Scienze del Recupero*, Anno X, n. 2. Centro Studi di Riabilitazione Neurocognitiva. Comune di Santorso, Vicenza, Italy.
- Anggoro, F. K. (2014). Language defies logic? Naming practices trump logical consistency for Indonesian adults. *Journal of Cognition and Culture*, 14(3-4).
- Anggoro, F. K., Stein, N. L., & Jee, B. D. (2012). Cognitive factors that influence children's learning from a multimedia science lesson. *International Electronic Journal of Elementary Education*, 5(1), 93-108.
- Orton, J. M., Anggoro, F. K., & Jee, B. D. (2012). Mutual alignment facilitates abstraction and transfer of a complex scientific concept. *Educational Studies*, 1-5. <http://dx.doi.org/10.1080/03055698.2011.643104>
- Jee, B. D., & Anggoro, F. K. (2012). Comic cognition: Exploring the potential cognitive impacts of science comics. *Journal of Cognitive Education and Psychology*, 11(2), 196-208.
- Anggoro, F. K. (2012). A mammal that is not an animal? Naming and the ANIMAL concept in English and Indonesian speakers. *Journal of Cognition and Culture*, 12(1-2), 31-48.
- Gentner, D., Anggoro, F. K., & Klibanoff, R. S. (2011). Structure mapping and relational language support children's learning of relational categories. *Child Development*, 82(4), 1173-1188.
- Anggoro, F. K., Medin, D. L., & Waxman, S. R. (2010). Language and experience influence children's biological induction. *Journal of Cognition and Culture*, 10(1-2), 171-187.
- Stein, N. L., Hernandez, M. W., & Anggoro, F. K. (2010). A theory of coherence and complex learning in the physical sciences: What works (and what doesn't). In N. L. Stein & S. Raudenbush (Eds.), *Developmental cognitive science goes to school*. New York, NY: Routledge.
- Anggoro, F. K., Waxman, S. R., & Medin, D. L. (2008). Naming practices and the acquisition of key biological concepts: Evidence from English and Indonesian. *Psychological Science*, 19(4), 314-319.

A second line of research examines whether supports for cognitively integrating Earth-based observations and space-based explanations increases children's understanding of space science. In IES-funded research, we manipulated the cognitive supports that children received during instruction about the day-night cycle. These supports included embodied simulations (e.g., the child rotating like Earth), 3D model simulations, and *relational scaffolding* in the form of explicit comparisons between Earth-based and space-based perspectives. We found that (1) children who received relational scaffolding (RS) outperformed those in the other experimental conditions (in fact, the RS children more than *doubled* their pretest understanding), and (2) the RS advantage was more pronounced for those with low initial knowledge.

My third line of research examines the cognitive mechanisms that support relational learning and representation in general. Our results suggest that comparison and relational language promote children's relational abstraction, and young children in particular benefit from a combination of enriched comparison and relational language.



Professor John Axelson

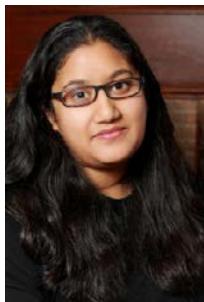
Behavioral Neuroendocrinology,
Health & Medicine

My graduate training was in physiological psychology and for many years my research efforts focused on investigating how steroid hormones alter brain structures and functions. The publications listed below provide examples of work examining the development of sex differences in brain structures controlling a variety of social behaviors. In recent years my interests have moved away from traditional “lab work” as I have become interested in issues concerning health and medicine. In particular, I’m interested in understanding why so many Americans use some form of “Complementary and Alternative Medicine” (CAM). Survey research has documented Americans that use alternative approaches, do so for a variety of reasons. Many CAM users report that alternative therapies provides them a sense of control that is often missing from mainstream medicine.

What are the possible benefits (psychological and physiological) of gaining a sense of control? How does gaining a sense of control relate to what social psychologists refer to as self-efficacy? If there are benefits from gaining a sense of control, are they merely placebo effects? If so, how are placebo effects defined and studied? It is interesting that while mainstream medicine usually attempts to “control” for the placebo effect, much of CAM attempts to harness mechanisms related to mind-body interactions. In addition to exploring these issues, my overall interest in questions concerning health and medicine extends to the importance of diet and nutrition. Many of the leading causes of death (cardiovascular disease, diabetes, cancer) are all related to lifestyle, most importantly our diet. Clearly, gaining a sense of control of one’s diet appears to be a crucial factor contributing to our health and well-being.

Selected Publications

- Axelson, J. F., Smith, M., & Duarte, M. (1999). Prenatal flutamide treatment eliminates the adult male rat's dependency upon vasopressin when forming social memories. *Hormones & Behavior*, 36, 109-118.
- Van Leeuwen, F. W., Chouham, S., Axelson, J. F., Swaab, D. F., & Van Eerdenburg, F.J.C.M. (1995). Sex differences in the distribution of estrogen receptors in the septal area and hypothalamus of the domestic pig (*Sus Scrofa*). *Neuroscience*, 64, 261-27.
- Axelson, J. F., Shannon, W. & Van Leeuwen, F. W. (1992). Immunocytochemical localization of estrogen receptors within neurotensin cells in the rostral preoptic area of the rat hypothalamus. *Neuroscience Letters*, 136, 5-9.
- Ferris, C. F., Irvin, R. W. Potegal, M. & Axelson, J. F. (1990). Kainic acid lesions of vasopressinergic neurons in the hypothalamus disrupt flank marking behavior in golden hamsters. *Journal of Neuroendocrinology*, 2, 123-129.



Professor Alo Basu

Neuroscience

The nervous system integrates information about the environment, internal states, and past experiences to produce organismal behavior. Stressful experiences trigger dramatic physiological responses that alter nervous system function in profound, complex, and long-lasting ways. Ideally, responses to stress are adaptive and promote survival of the individual. Of the multiple genetic and environmental factors that contribute to risk of developing psychiatric disorders, stressful life experience is arguably the most common risk factor, and exacerbating factor. We are interested in long-term changes in brain structure, physiology, cognition, and behavior that result from stressful experience.

Most of the known neural mechanisms of experience-dependent synaptic plasticity in the developing and adult mammalian brain involve excitatory neurotransmission of glutamate via the N-methyl-D-aspartate (NMDA) receptor pathway. This receptor pathway is of particular interest in schizophrenia because blockade of the NMDA receptor engenders a clinical syndrome that includes many hallmarks of the disorder. The NMDA receptor has several endogenous modulators of its function, which are regulated by genes that have been identified as putative risk factors for psychiatric disease. One of these modulators is D-serine, which is made available in the brain by the enzyme serine racemase, most prominently expressed throughout the limbic forebrain. With a multidisciplinary team of collaborators, I characterized the phenotype

of a mutant mouse in which the serine racemase gene was functionally deleted using recombinant DNA technology. Among the consequences of this genetic manipulation were near complete loss of brain D-serine, decreased NMDA-mediated neurotransmission, loss of NMDA-mediated long-term potentiation of hippocampal synapses, and deficits in spatial memory. This initial characterization of the mutant phenotype of the serine racemase knockout mouse has given traction to investigation of the role of D-serine in other domains of neuroplasticity, cognition, and behavior. I am particularly interested in the role of NMDA receptors in stress-induced synaptic plasticity.

There are many basic questions in the behavioral neuroscience of stress that we hope to address using mice as our model system: Stressful experiences can have very different effects at the cellular and circuit levels in different regions of the brain. What is the sequence and interdependency if any of these changes? Why do similar manipulations have different effects at different stages of development, and can these differences be understood in terms of transitions in the naturalistic behaviors of a species? Early life stress can promote either risk for or resilience to stressful experience later in life, a finding that has far-reaching implications for the biological basis of vulnerability to psychiatric illness. Can the experimental application of a stressor be titrated to produce risk versus resilience to future stressful experience? If so, what neural mechanisms mediate the inflection point between the possible outcomes?

Selected Publications

- Basu AC, Tsai GE, Ma CL, Ehmsen JT, Mustafa AK, Han L, Jiang ZI, Benneyworth MA, Froimowitz MP, Lange N, Snyder SH, Bergeron R, Coyle JT. Targeted disruption of serine racemase affects glutamatergic neurotransmission and behavior. *Molecular Psychiatry*. 2009 Jul;14(7):719-27.
- Coyle JT, Basu A, Benneyworth M, Balu D, Konopaske G. Glutamatergic synaptic dysregulation in schizophrenia: therapeutic implications. *Handb Exp Pharmacol*. 2012;(213):267-95. Review.
- Balu DT, Basu AC, Corradi JP, Cacace AM, Coyle JT. The NMDA receptor co-agonists, D-serine and glycine, regulate neuronal dendritic architecture in the somatosensory cortex. *Neurobiol Dis*. 2012 eb;45(2):671-82.
- Li Y, Sacchi S, Pollegioni L, Basu AC, Coyle JT, Bolshakov VY. Identity of endogenous NMDAR glycine site agonist in amygdala is determined by synaptic activity level. *Nat Commun*. 2013;4:1760.
- Balu DT, Li Y, Puhl MD, Benneyworth MA, Basu AC, Takagi S, Bolshakov VY, Coyle JT. Multiple risk pathways for schizophrenia converge in serine racemase knockout mice, a mouse model of NMDA receptor hypofunction. *Proc Natl Acad Sci U S A*. 2013 Jun 25;110(26):E2400-9.



Professor Noah Berman

Clinical Psychology and Developmental Psychopathology

As a clinical psychologist, the integration of science and practice is the cornerstone of my profession. I am passionate about evaluating new translational methodologies, applying them to evidence-based clinical care, and disseminating findings to the community. My research predominately examines the symptoms of Obsessive-Compulsive Disorder (OCD) and related conditions (e.g., body dysmorphic disorder; trichotillomania; olfactory reference syndrome). I aim to identify, and ultimately disrupt, the pathways by which dysfunctional beliefs develop, and uncover the mechanisms underlying the efficacy of cognitive-behavioral therapy (CBT).

Pathways of Development: We all have unusual thoughts that provoke discomfort or even panic (e.g., “my husband is late because he has been in a car crash”). But why do some of us perceive those passing thoughts to be innocuous internal experiences, while others misinterpret them to be threatening? Interpreting unwanted intrusions as highly threatening and important (e.g., because I had this thought, it *must* be true) is referred to as a cognitive bias and is considered a distinct psychological diathesis and precursor for OCD. In an effort to identify vulnerable

populations at greatest risk of developing OC symptoms, I evaluate the psychological and cultural factors associated with the development of OC-related cognitive biases. At Holy Cross, I hope to develop prevention programs that target idiosyncratic risk factors (e.g., high conflict in the home) in order to alter children’s developmental trajectory.

Mechanisms Underlying Effective Treatment of OCD: In CBT for OCD, the clinician conducts “exposure with response prevention” by encouraging the patient to approach feared situations (e.g., public bathrooms) while refraining from compulsions (e.g., hand washing). Given the inherent difficulty associated with activating anxiety and challenging habitual avoidance patterns, I aim to elucidate the processes, such as emotion regulation, which facilitate a favorable response. At Holy Cross, I hope to evaluate idiosyncratic barriers to treatment success by recruiting pre-clinical (i.e., elevated scores on a psychiatric measure that do not surpass the diagnostic cut-off) and clinical (i.e., scores on a psychiatric measure that surpass the diagnostic cut-off) participants and administering empirically-validated laboratory paradigms that integrate multiple modalities (e.g., eye-tracking, ECG, galvanic skin response).

Selected Publications

- Berman, N. C., Shaw, A., & Wilhelm, S. (in press). Emotion regulation in patients with obsessive compulsive disorder: Unique effects for those with “taboo thoughts.” *Cognitive Therapy and Research*.
- Wilhelm, S., Berman, N. C., Small, B., Porth, R., Geller, D., & Storch, E. (2018). D-cycloserine augmentation of cognitive behavior therapy for pediatric OCD: Predictors and moderators of outcome. *Journal of Affective Disorders*, 241, 454-460.
- Berman, N. C., Shaw, A. M., Curley, E. E., & Wilhelm, S. (2018). Emotion regulation and obsessive-compulsive phenomena in youth. *Journal of Obsessive and Compulsive Related Disorders*, 19, 44-49.
- Berman, N. C., Wilver, N., & Wilhelm, S. (2018). My child’s thoughts frighten me: Maladaptive effects associated with parents’ interpretation and management of children’s intrusive thoughts. *Journal of Behavior Therapy and Experimental Psychiatry*, 61, 87-96.
- Berman, N. C., Jacoby, R. J., Sullivan, A., Hoepnner, S., Micco, J., & Wilhelm, S. (2018). Parent-level risk factors for children’s obsessive beliefs, interpretation biases, and obsessive-compulsive symptoms: A cross-sectional examination. *Journal of Obsessive and Compulsive Related Disorders*, 18, 8-17.
- Greenberg, J., Berman, N. C., Braddick, V., Schwartz, R., Mothi, S., Wilhelm, S., & Mothi, S. (2018). Treatment utilization and barriers to treatment engagement among individuals with olfactory reference syndrome (ORS). *Journal of Psychosomatic Research*, 105, 31-36.
- Fang, A., Berman, N. C., Chen, J., & Zakhary, L. (2018). Treating postpartum obsessive-compulsive disorder: Diagnostic and cultural considerations. *Harvard Review of Psychiatry*, 26(2), 82-29.



Professor Daniel Bitran

Psychopharmacology

I am a biological psychologist broadly trained in the field of brain-behavior relationships. I teach introductory, intermediate, and advanced courses, including introduction to psychology, physiological psychology, biological basis of mental disorders, drugs of abuse, and the neurobiology of stress. I have also developed a course entitled "Medicine, Science, and the Holocaust" in which the role of science and medicine is examined relative to the fields of eugenics, genetics, and biomedical ethics.

My general area of research interest is in the neuroscience of psychiatric disorders. I have studied behavioral responses to drugs that alter brain chemistry in animal models of anxiety, depression, and schizophrenia. I have published nearly 40 papers on the effects of gonadal steroids, or sex hormones, on brain function and behavior. Most recently, my lab is studying ways by which antipsychotic medications alleviate symptoms of schizophrenia. We use a simple behavioral assay in which the startle response to an acoustic stimulus (pulse) is decreased or inhibited by a barely audible sound that precedes the pulse (prepulse). This prepulse inhibition (PPI) is indicative of an attentional

process - one that is disrupted in schizophrenia. By administering drugs that disrupt PPI in mice, thus mimicking the symptom of schizophrenia, we can study neurochemical mechanisms that act to rescue PPI, as some of the antipsychotic medications do. Although all of my work involves rodent models of psychiatric disorders, my research has broad implications for furthering the understanding of how pharmaceutical agents work to alleviate psychiatric symptoms of mental disorders and, in so doing, shedding light on the biological basis of mental disorders.

As the College's Science Coordinator, I organize the College's Summer Science Research Program. The Program engages approximately 70 undergraduates students for 9 weeks in full-time primary research activities in physics, math and computer science, chemistry, biology, and psychology. Students are provided a stipend, a room, and a budget for research supplies and travel to regional and national conferences. Funds for the Summer Research Program are solicited from private corporations, trusts, and federal agencies, including the NIH and NSF.

Selected Publications

- Liu, F., Day, M., Muniz, L. C., Arias, R., Bitran, D., Revilla-Sanchez R., Grauer, S., Zhang, G., Kelley, C., Pulito, V., Sung, A., Mervis, R. F., Navarra, R., Hirst, W. D., Reinhart, P. H., Marquis, K. L., Moss, S. J., Pangalos, M. N., Brandon, N. J. (2008). Activation of estrogen receptor beta regulates hippocampal synaptic plasticity and improves memory. *Nature Neuroscience*, 11, 334-343.
- Bitran, D. and Solano, S. M. (2005). Termination of pseudopregnancy in the rat alters the response to progesterone, chlordiazepoxide, and MK-801 in the elevated plus-maze. *Psychopharmacology*, 180, 447-454.
- Bitran, D. and Smith, S. S. (2004). Termination of pseudopregnancy in the rat produces an anxiogenic-like response that is associated with an increase in benzodiazepine receptor number and a decrease in GABA-stimulated chloride influx in the hippocampus. *Brain Research Bulletin*, 64, 511-518.
- Skorowronski-Lutz, E. M. and Bitran, D. (2004). FGIN-1-X – A series of novel specific and efficacious ligands for the peripheral benzodiazepine receptor. In: Smith, S. S. (Ed.): *Neurosteroid Effects in the Central Nervous System: The Role of the GABA_A Receptor* (pp. 197-218), CRC Press, Boca Raton: FL.
- Winneker, R. C., Bitran, D., and Zhang, Z. (2003). The preclinical biology of a new potent and selective progestin: trimegestone. *Steroids*, 68, 915-920.



Professor Danuta Bukatko

Child Development

My general research interests are in the area of cognitive development in young children, specifically preschoolers. I have had a longstanding interest in young children's memory, concept development, and problem-solving skills. My current projects focus on the ways in which developmental science offers ideas for benefiting the education of young children, particularly in the area of mathematics. What are the general cognitive processes that underlie early numerical understanding, especially those mathematical competencies that forecast later academic achievement? Why does a good understanding of the number line, for example, or skill with patterns, enhance numerical reasoning? Can certain kinds of intervention activities facilitate early mathematical reasoning and understanding? How can new technological tools like the iPad enhance this kind of learning?

My second area of interest concerns young children's understanding of gender concepts, and in particular, the types of cues they use to make judgments of social status and power. Many studies point to the fact that children develop gender stereotypes as early as age two. For example, they are readily able to identify activities, personality characteristics, and occupations typically associated with males and females. The studies we have conducted so far examine children's judgments about the importance and status associated with gender-typed personality traits, activities, occupations, and conversation styles. We are now interested in uncovering the kinds of verbal and nonverbal cues that children use to make assessments about who has power and status and whether these cues retain their salience in cross-cultural comparisons. These social cognitions may have important implications for children's peer relationships, judgments of self-competence, and successful leadership.

Selected Publications

- Suprawati, M., Anggoro, F. K., & Bukatko, D. (2014). "I think I can": Achievement-oriented themes in storybooks from Indonesia, Japan, and the United States. *Frontiers in Psychology*, 5: 167. doi: 10.3389/fpsyg.2014.000167.
- Bukatko, D., and Daehler, M. W. (2012). *Child development: A thematic approach* (6th ed.). Belmont, CA: Cengage Learning.
- Fox, A., Bukatko, D., Hallahan, M. & Crawford, M. (2007). The medium makes a difference: Gender similarities and differences in instant messaging. *Journal of Language and Social Psychology*, 2, 389-397.
- Carli, L. L., & Bukatko, D. (2000). Gender, communication, and social influence: A developmental perspective. In T. Eckes & H. M. Trautner (Eds.), *The developmental social psychology of gender*. Mahwah, NJ: Erlbaum.



Professor Stephenie Chaudoir

Social and Health Psychology

Stigma is a social phenomenon that pervades time, social context, and culture. Social psychologists and other behavioral scientists have advanced knowledge about how and why stigma can pose deleterious risks for its targets. Yet, the vast majority of this knowledge has focused on stigmas that are visible such as race and gender. My portfolio of research is designed to directly address this important theoretical and empirical gap and to advance the study of concealable stigmatized identities (e.g., mental illness, HIV/AIDS, chronic illness).

In my first line of research, I examine when and why disclosure of concealable stigmatized identities can be beneficial. Specifically, my work in this area examines the role of goals—representing activation of approach or avoidance motivational systems—in affecting the ways in which people communicate with others about concealable stigmas. This work has examined how goals affect communication strategies that people use in their disclosures, such as the amount of information they provide about their identities and whether they choose face-to-face modalities to communicate this sensitive information. Further, this work also examines how goals and their concomitant communication strategies affect the likelihood that disclosure will yield beneficial outcomes for the discloser.

My second line of research investigates the extent to which concealable stigmatized identities pose a unique risk to psychological and physical health. This work focuses on identifying factors related to both the stigmatized person—their expectations and experiences of stigmatization—and their environment—the degree of cultural stigma associated with a given attribute—that impact well-being. Further, this work considers how this constellation of factors contributes to psychological and physical health disparities via pathways such as stress, health behaviors, and physiological changes. In essence, this work asks the questions—How does stigma “get under the skin” to affect health disparities? And, how might these pathways differ if one’s stigmatized attribute is visible vs. concealable?

As a social-health psychologist, I adopt a multidisciplinary approach to studying these issues. I utilize both lab- and field-based studies to investigate these questions among college, clinical, and community samples. Psychology students play a key role in the success of this research. Students contribute to the full range of research activities—from initial hypothesis formation and study design to data analysis, writing, and dissemination of research findings at regional and national conferences—as assistant and lead researchers in CSI Lab.

Selected Publications

- Chaudoir, S. R., Wang, K., & Pachankis, J.E. (2017). What reduces the effect of sexual minority stress on health disparities? A review of the intervention “toolkit.” *Journal of Social Issues: Translating Stigma and Intergroup Relations Research to Explain and Reduce Sexual and Gender Minority Health Disparities*, 73, 587-618. doi: 10.1111/josi.12233
- Chaudoir, S. R., & Quinn, D. M. (2016). Evidence that anticipated stigma predicts poorer depressive symptom trajectories among emerging adults living with concealable stigmatized identities. *Self and Identity*, 15, 139-151. doi: 10.1080/15298868.2015.1091378
- Chaudoir, S. R., Earnshaw, V. A., & Andel, S. (2013). “Discredited” vs. “discreditable”: Understanding how shared and unique stigma mechanisms affect psychological and physical health disparities. *Basic and Applied Social Psychology: Special Issue: Fifty Years of Stigma Research—Lessons learned and lingering issues*, 35, 75-87. doi: 10.1080/01973533.2012.746612
- Chaudoir, S. R., & Fisher, J. D. (2010). The disclosure processes model: Understanding disclosure decision-making and post-disclosure outcomes among people living with a concealable stigmatized identity. *Psychological Bulletin*, 136, 236-256. doi:10.1037/a0018193



Professor Gregory DiGirolamo

Cognitive Neuroscience of Attention, Control and Consciousness

The human mind is undoubtedly one of the most fascinating products of evolution. It has been studied from many different points of view -- philosophical, computational, psychological, and recently, also biological. It has become clear that collaboration between these approaches is needed to answer the ultimate question "how does the brain give rise to the mind?" This collaboration has resulted in the new field known as cognitive neuroscience. I am a cognitive neuroscientist who studies attention, control and consciousness. All normal people have a strong subjective feeling of intentional or voluntary control of their behavior. Asking people about goals or intention is probably the single most predictive indicator of their behavior. The importance of intentions

and goals is illustrated by observations of patients with frontal lesions or mental disorders that cause disruption in either their central control over behavior or the subjective feelings of such control. My research has been directed at understanding the complex functions and intricate mechanism of executive control and consciousness and how the human brain implements them. I have investigated the cognitive operations and neural areas that instantiate cognitive control, tested limitations in these control operations, and assayed how control processes can be used (or not!) to modify ongoing cognitive operations or go wrong in psychopathologies like addiction.

Selected Publications

- DiGirolamo, G. J., Gonzalez, G., Smelson, D., Guevremont, N., Andre, M., Patnaik, P., & Zaniewski, Z. (2017). Increased Depression and Anxiety Symptoms are Associated with More Breakdowns in Cognitive Control to Cocaine Cues in Veterans with Cocaine Use Disorder. *Journal of Dual Diagnosis*, 13, 298-304. PMID: 29120266.
- Romero-Gonzalez, M., Shahanghi, A., DiGirolamo, G. J., & Gonzalez, G. (2017). Buprenorphine-Naloxone treatment responses differ between young adults with heroin and prescription opioid use disorders. *The American Journal on Addictions*, 26, 838-844. PMC5772882.
- DiGirolamo, G. J., Patel, N. Blaukopf, C. L. (2016). Arousal facilitates involuntary eye movements. *Experimental Brain Research*, 234(7), 1967-1976. PMCID: PMC4893927.
- DiGirolamo GJ, Sophis EJ, Daffron J, Gonzalez G, Romero-Gonzalez M, Gillespie S (2016) Breakdowns of eye movement control toward smoking cues in young adult light smokers. *Addictive Behaviors* 52, 98-102. PMCID: PMC4644462.
- DiGirolamo GJ, Guevremont N, Smelson D (2015) Cue-induced craving in patients with cocaine use disorder predicts cognitive control deficits toward cocaine cues. *Addictive Behaviors* 47, 86-90. PMCID: PMC4417429.
- Gonzalez G, DiGirolamo GJ, Romero-Gonzalez M, Smelson D, Ziedonis D, Kolodziej M (2015) Memantine improves buprenorphine/naloxome treatment for opioid dependent young adults. *Drug & Alcohol Dependence* 156, 243-253. PMCID: PMC4652072.
- DiGirolamo, G. J., Gonzalez, G. & DiGirolamo, J. M. (2014). Brain imaging: Observing ongoing neural activity. In *Encyclopedia of Life Sciences* (Vol. 3, 426-434). London: Nature Publishing Group.
- Gonzalez, G., DiGirolamo, G. J., Kolodziej, M.E., Smelson, D., & Romero-Gonzalez, M. (2014). Memantine improves buprenorphine treatment for opioid dependent young adults. Presented at the 76th Annual Meeting of the College on Problems of Drug Dependence. San Juan, Puerto Rico.
- DiGirolamo, G. J., Smelson, D. A., Guevremont, N. J., & Gonzalez, G. (2014). Inhibitory control in patients with cocaine abuse is equally disrupted by generic and personally salient cocaine images. Presented at the 76th Annual Meeting of the College on Problems of Drug Dependence. San Juan, Puerto Rico.



Professor Mark Freeman

History of Philosophy of Psychology

I am currently pursuing two main lines of research. The first of these, to which I have devoted much of my attention in recent years, is philosophically-oriented work in what has come to be known as "narrative psychology" – which in the present context refers to that portion of psychology which looks toward narratives (e.g., autobiographies, memoirs, life histories) to explore such topics as autobiographical memory, the self, the cultural fashioning of personal experience, and the challenge of formulating ideas regarding "the good life." Of special importance in this context are those issues that I examine in my book *Hindsight: The Promise and Peril of Looking Backward* (Oxford, 2010). There, and in related works, I am particularly interested in exploring those aspects of experience and selfhood that we can only know in retrospect.

My second area of research interest is quite different. In this work, my main interest is to explore those regions of human experience that take us beyond the self and even, on some level perhaps, beyond "the material world" altogether. Aesthetic and religious experience figures prominently in this line of inquiry as does (so-called) "transcendent" experience (via art, nature, etc.) more generally. While the first area of research focuses largely on the category of the self, this area focuses more on the category of the "Other," i.e., that which exists beyond the perimeter of the self and that draws us outward, into the world. These topics and more are explored in most recent book, *The Priority of the Other: Thinking and Living Beyond the Self*. My next challenge? It's to bring together my work on narrative and my work on the Other into some semblance of a workable whole. The challenge is large, indeed.

Selected Publications

- Freeman, M. (2018). The sociocultural constitution of aesthetic transcendence. In A. Rosa & J. Valsiner (Eds.), *The Cambridge Handbook of Sociocultural Psychology* (pp.351-365). Cambridge, UK: Cambridge University Press.
- Freeman, M. (2018). Commentary: The theological moment of the life story. *Journal of Theoretical and Philosophical Psychology*, 38, 107-115.
- Freeman, M. (2018). Living in verse: Sites of the poetic imagination. In O.V. Lehmann, N. Chaudhary, A.C. Bastos, & E. Abbey (Eds.), *Poetry and Imagined Worlds* (pp. 139-154). London: Palgrave Macmillan.
- Freeman, M. (2018). Discerning the history inscribed within: Significant sites of the narrative unconscious. In B. Waggoner (Ed.), *Handbook of Culture and Memory* (pp. 65-81). New York: Oxford University Press.
- Freeman, M. (2017). Worlds within and without: Thinking Otherwise about the dialogical self. *Journal of Theoretical and Philosophical Psychology*, 37, 201-213.
- Freeman, M. & Goodman, D. (2017). Thinking psychology Otherwise: A conversation with Mark Freeman (interviewed by David Goodman). In H. MacDonald, D. Goodman, & B. Becker (Eds.), *Dialogues at the Edge of American Psychological Discourse* (pp. 147-176). London: Palgrave Macmillan.
- Freeman, M. (2017). Narrative inquiry. In P. Leavy (Ed.), *Handbook of Arts-Based Research* (pp. 123-140). New York: The Guilford Press.
- Freeman, M. (2017). Narrative at the limits (Or: What is "life" really like?) In B. Schiff, A.E. McKim, & S. Patron (Eds.), *Life and Narrative: The Risks and Responsibilities of Storying Experience* (pp. 11-27). New York: Oxford University Press.
- Freeman, M. (2014). *The Priority of the Other: Thinking and Living Beyond the Self*. New York: Oxford University Press.
- Freeman, M. (2014). From absence to presence: Finding mother, ever again. In J. Wyatt and T. Adams (Eds.), *On (Writing) Families: Autoethnographies of Presence and Absence, Love and Loss* (pp. 49-56). Rotterdam, The Netherlands: Sense Publishers.
- Freeman, M. (2014). Qualitative inquiry and the self-realization of psychological science. *Qualitative Inquiry*, 20, 119-126.



Professor Mark Hallahan

Social Psychology

I am a social psychologist. Social psychology is the study of how people's thoughts and actions are influenced by the presence of others. I am interested in just about any topic that falls within this broad category. However, most of the research that I do falls within two more specific areas: person perception and attribution. These are described in more detail below.

How do we form impressions of other people? This is question of interest for person perception research. I am interested in understanding how accurate are the judgments people make about each other in social interactions. Much of my research on this question focuses on the accuracy of judgments that people make on the basis of brief observations of nonverbal behavior. This research has led me to examine many different types of social judgments, including accuracy in assessing personality traits and detecting when someone is lying. I also am interested in social factors, such as status, that might affect the accuracy of person perception. For example, I am currently working on research that investigates whether people in high and low status roles differ in how accurately they perceive each other in social interaction.

People are continually trying to figure out why things happen. I am very much interested in attribution, the process of how people generate

casual explanations for events in their social world. Attribution is an important process because our beliefs about what causes something to occur affect both our perceptions and behavior (for example, we assign less blame to people when we attribute their shortcomings to things they cannot control). I am particularly interested in understanding when and why we assume behavior to be caused by dispositional causes. (things like an individual's personality, beliefs, or talents) or by the demands and constraints of their situation.

I have done research examining cultural differences in attributions, focusing on the question of why people in Western cultures make more dispositional attributions and people in Eastern cultures make more situational attributions. I often analyze the attributions that are made in naturally occurring sources, such as newspaper editorials and sports articles and corporate annual reports.

I usually have some type of research project ongoing in each of these areas. I would welcome the opportunity to work with students who are interested in doing research in either person perception or attribution. I also, however, would be glad to work with students who have research interests in any topic relating to social psychology.

Selected Publications

- Hallahan, M. & Rosenthal, R. (2000). Interpreting and reporting results. In H. E. A. Tinsley. & S. Brown. (Eds.), *The Handbook of Applied Multivariate Statistics and Mathematical Modeling: A Comprehensive Guide for Applied Research in the Biological Sciences, Social Sciences, and Humanities*. San Diego, CA: Academic Press.
- Ambady, N., Hallahan, M., & Connor, B. (1999). Accuracy of judgments of sexual orientation from thin slices of behavior. *Journal of Personality and Social Psychology*, 77, 538-547.
- Hallahan, M. (1999). The hazards of mechanical hypothesis testing: A commentary on Krueger. *Psychology*, 10, 001. <http://www.cogscLsoton.ac.uk/cgilpsyc/newpsy?10.001>.
- Halverson, A. M., Hallahan, M., Hart, A. J., & Rosenthal, R. (1997). Reducing the biasing effect of judges' nonverbal behavior with simplified jury instructions. *Journal of Applied Psychology*, 82, 590-598.
- Hallahan, M., Lee, E., & Herzog, T. A. (1997) It's not just whether you win or lose, it's also where you play the game: A naturalistic, cross-cultural examination of the positivity bias. *Journal of Cross-Cultural Psychology*, 28, 768-778.



Professor Jumi Hayaki

Clinical Psychology and Adult Psychopathology

My research program examines the role of dysfunctional emotional processes in two related areas of clinical distress: eating disorders and substance use disorders. Previous research has shown that individuals who experience symptoms of eating disorders and substance abuse – even at subclinical levels – exhibit a number of deficits in emotional regulation, including a greater tendency to experience certain negative emotions (e.g., shame), poor coping responses to unpleasant emotional states, and a general lack of emotional awareness.

An underlying theme of my research is the notion that eating disorders and substance abuse may share core emotional deficits. For instance, the inability to tolerate negative affect, particularly anxiety, is known to trigger both binge eating and heavy drinking or drug use. If certain emotional states represent core vulnerabilities across these different psychological disorders, then their areas of overlap may also respond to similar treatment strategies. The goal of my work is therefore to identify these shared emotional mechanisms. This research has many clinical implications, such as (a) early detection of those individuals at

most emotional risk of developing an eating or substance use disorder and (b) identifying the emotional targets for clinical intervention.

Recently, I have become particularly interested in gender differences in emotion regulation. For instance, preliminary evidence suggests that emotional mechanisms may differentially explain eating disorder symptoms among women and men. In another line of research, my colleagues and I are investigating motives for caffeine use among young persons. Specifically, I hope to determine whether caffeine might be used partly in order to regulate negative emotional experiences, as has been shown to be the case for other substances.

Psychology students have contributed to my research program in many ways, such as by conducting literature reviews, collecting primary data, performing data analyses, and presenting at local and/or national conferences. Sample topics include the role of emotional clarity in bulimic symptoms and gender differences in the role of emotional expressivity in disordered eating. My research students have volunteered their time, earned academic credit, and/or received summer research fellowships.

Selected Publications

- Hayaki, J., Anderson, B. J., & Stein, M.D. (2018). Dual use of alcohol and marijuana and condomless sex in young adult men and women: A within-subject day-level analysis. *The American Journal on Addictions*, 27, 413-418.
- Hayaki, J., Anderson, B. J., & Stein, M.D. (2016). Dual cannabis and alcohol use disorders in young adults: Problems magnified. *Substance Use*, 37, 579-583.
- Hayaki, J., & *Free, S. (2016). Positive and negative eating expectancies in disordered eating among women and men. *Eating Behaviors*, 22, 22-26.
- *Perry, R. M., & Hayaki, J. (2014). Gender differences in the role of alexithymia and emotional expressivity in disordered eating. *Personality and Individual Differences*, 71, 60-65.
- Hayaki, J., Herman, D. S., Hagerty, C. E., de Dios, M. A., Anderson, B. J., & Stein, M. D. (2011). Expectancies and self-efficacy mediate the effects of impulsivity on marijuana use outcomes: An application of the acquired preparedness model. *Addictive Behaviors*, 36, 389-396.
- Hayaki, J., Hagerty, C. E., Herman, D. S., de Dios, M.A., Anderson, B.J., & Stein, M. (2010). Expectancies and marijuana use frequency and severity among young females. *Addictive Behaviors*, 35, 995-1000.
- Hayaki, J. (2009). Negative reinforcement, eating expectancies, emotion dysregulation, and symptoms of bulimia nervosa. *International Journal of Eating Disorders*, 42, 552-556.



Professor Patricia Kramer

Face Perception

My area of research is visual perception. I study the process by which we are able to perceive events; that is, objects undergoing some change in space and or time. The research is aimed at discovering the information in a visual scene that underlies an observer's ability both to perceive the environment and to successfully interact with that environment. My current research focuses on face perception. The perception of faces has been widely studied, including the perception of race, gender, emotions, and personality characteristics. While most of the past research on faces used static images of faces and concentrated on specifying the relevant facial features, many researchers (including me) believe that the perception of objects (e.g. faces) cannot be fully explained without including the role of motion. The information derived from dynamic faces is of crucial importance when we consider how we communicate with others.

It is generally accepted the face-to-face communication provides an information-rich environment from which people are able to extract information about the emotions felt by the other person and also various personality characteristics. Of course, not only do we communicate with others face-to-face, but through other modes, such as written work, telephone, and various electronic media (e.g., email and instant messaging). Interestingly, video conferencing is increasing as another mode of communication.

The degree to which other modes of communication compare with that of face-to-face has been the topic of recent research. Lantz (2001), in comparing face-to-face with chat

rooms, concluded that while face-to-face had many advantages, the chat room was seen as more efficient. Mark and Wulf (1999) found similar results in that email was seen as more efficient; however, email reduced social interaction in the workplace. Markey and Wells (2002) assessed people's ability to judge personality characteristics after engaging in conversations in a chat room. O'Malley, et al (1996) and Doherty-Sneddon, et al (1997) looked at video-conferencing versus face-to-face communication. However, the technology of that time may have influenced some of those results in which video- conferencing was inferior to face-to face communication.

The work in my lab is extending the research by comparing four modes of communication (most of the other studies looked at face-to-face and one other mode): face-to-face, video-conferencing, audio-conferencing, and instant messaging. In comparing these four modes, we are interested in several issues: 1) the efficiency with which a task can be performed, 2) the perceived social aspects of the interaction, 3) the extent to which personality attributes can be perceived, and 4) the characteristics of the content of the conversations. Understanding the extent to which of these different modes of communication convey the same quality of information as face-to-face interactions is important as our society becomes increasingly more dependent upon electronic modes communication.

In my Sensation and Perception course, the role of motion in object perception is discussed in detail. A broad investigation of the perception of faces takes place in my Face Perception seminar.



Professor Charles Locurto

Implicit Learning

Our lab studies what nonhuman subjects (monkeys and pigeons) learn when they don't have to learn anything. We are particularly interested in this kind of learning, called implicit learning, when it involves lists of stimuli, like A → B → C → D → E, where each letter represents a picture that is presented sequentially on a touch screen. The subject is required to touch the stimulus to advance the list to the next item, but there is nothing in the sense of a correct or incorrect response. We randomly present reinforcement (food) to the subject, more to maintain their performance than to stamp in correct responding. We measure learning after a number of sessions in which the A → E list has been presented by suddenly randomizing the list and measuring whether or not the subjects' latencies increase.

We study learning in this format for two reasons. First, while learning is usually studied in explicit formats where there is reinforcement for correct responding, it is clear that many important skills like human language are acquired without direct reinforcement for correct performance. Children it is said simply seem to pick up language from repeated

exposure to it. We want to see whether nonhuman animals can also learn when learning is technically speaking not demanded by the experimental contingencies. Second, we use the learning of lists to study the extent to which nonhumans can master sequences of stimuli, much in the manner that a child has to master the correct sequences in learning a skill like riding a bicycle or in learning language. Language is a particular interest in this regard. We know that language in its full-blown development is uniquely human, but most comparative psychologists like myself do not believe that the foundations for language, which would include a highly-developed appreciation for learning and performing lists, is uniquely human. Currently we are using pigeons to study implicit list learning. Pigeons and humans last shared an ancestor approximately 250 million years ago. By studying pigeons we are asking how sophisticated implicit list learning might have been that long ago.

To date we have found that both monkeys and pigeons are able to learn lists implicitly with a high degree of precision. Our work on this topic has been published in the sources listed below:

Selected Publications

- Locurto, C., Eckert, A., Gould, J., McMaster, D., & Morrow, M. (2018). A swap methodology applied to implicit sequence learning. *Journal Of Experimental Psychology: Animal Learning And Cognition*, 44(2), 168-179.
doi:10.1037/xan0000163
- Locurto, C. (2016). "G and: Two markers of a general cognitive ability, or none?" Commentary on Burkart, J., Schubiger, M., & Van Schaik, C. (2016). *The evolution of general intelligence*. *Behavioral and Brain Sciences*, 1-65.
(doi:10.1017/S0140525X1600163)
- Locurto, C., *Fox, M. & *Mazzella, A. (2015). Implicit learning in cotton-top tamarins (*Saguinus oedipus*) and pigeons (*Columba livia*). *Learning & Behavior*, 43(2), 129-142, (DOI 10.3758/s13420-015-0167-0).
- Locurto, C., Dillon*, L., Collins*, M., Conway*, M., & Cunningham*, K. (2013). Implicit chaining in cotton-top tamarins (*Saguinus oedipus*) with elements equated for probability of reinforcement. *Animal Cognition*, 16, 611 – 625.
- Locurto, C., Gagne*, M., & Nutile*, L. (2010). Characteristics of implicit chaining in cotton-top tamarins (*Saguinus oedipus*). *Animal Cognition*, 13, 617-629.
- Locurto, C., Gagne*, M., & Levesque*, K. (2009). Implicit chaining in cotton-top tamarins (*Saguinus oedipus*). *Journal of Experimental Psychology: Animal Behavior Processes*, 35, 116-122.

* denotes student

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Professor Alison Bryant Ludden

Adolescent Development

My research focuses on adolescent development and the influence of the multiple contexts of school, family, peers, and communities on the promotion of adolescents' educational resilience and healthy development. My research with adolescents in urban and rural public secondary schools has included focus groups with high school students examining their views about caffeine use; survey studies examining civic activities among rural adolescents and role models among African-American adolescents from an urban environment; as well as an in depth examination of the links between achievement motivation and substance use over time. In general, my research focuses on positive youth development; my current interests are in understanding the etiology of caffeine use among adolescents. Some of the themes across my various interests relate to better understanding how achievement and substance use behaviors in school and out of school are connected and how various contexts can support and promote positive youth development.

I have ongoing projects related to

- expectations and reasons associated with adolescents' caffeine use;
- contexts of development among adolescents in rural communities; and
- adolescents' engagement in civic activities in schools, with their families, and in community settings.

Psychology students have been involved with moderating focus groups with students in local high schools, designing and administering surveys to adolescents, and analyzing survey data from my existing studies of rural and urban adolescents. Student projects have focused on adolescents' reasons for caffeine use, links between extracurricular activities and substance use, adolescents' religiosity and spirituality, and ethnic and gender differences in motivation and achievement. In addition, a number of students have collected their own survey data from adolescents in local schools, on topics from religiosity to eating behaviors.

Selected Publications (Current or former students at the College of the Holy Cross are in italics.)

- Ludden, A. B., O'Brien, E. M., & Pasch, K. E. (2017). Beliefs, behaviors, and contexts of adolescent caffeine use: A focus group study. *Substance Use & Misuse*, 52(9), 1196-1207.
- Sullivan, S. C., Ludden, A. B., & Singleton, R. A., Jr. (2013). The impact of institutional mission on student volunteering. *Journal of College Student Development*, 54, 511 – 526.
- Ludden, A. B. (2012). Social goals, social status, and problem behavior among low-achieving and high-achieving adolescents from rural schools. *Journal of Research in Rural Education*, 27(7), 1 - 19.
- Ludden, A. B. (2012). What if you caught them using? Prospective teachers' beliefs about responding to student substance use. *Journal of Drug Education*, 42(1), 59 - 85.
- Ludden, A. B. (2011). Engagement in school and community civic activities among rural adolescents. *Journal of Youth and Adolescence*, 40, 1254 - 1270.
- Ata, R., Rojaz, A., Ludden, A. B., & Thompson, J. K. (2011). Factors influencing body image during adolescence. In V. R. Preedy's (Ed.) *Handbook of behavior, diet, and nutrition*. New York: Springer.
- Ludden, A. B. & Wolfson, A. R. (2010). Understanding adolescent caffeine use: Connecting use patterns with expectancies, reasons, and sleep. *Health Education & Behavior*, 37, 330 - 342.
- Milot, A. S. & Ludden, A. B. (2009). The effects of religion and gender on well-being, substance use, and academic engagement among rural adolescents. *Youth and Society*, 40, 311-335.
- Ludden, A. B., & Eccles, J.S. (2007). Psychosocial, motivational, and contextual profiles of youth reporting different patterns of substance use during adolescence. *Journal of Research on Adolescence*, 17, 51-88.
- Ata, R. N., Ludden, A. B., & Lally, M. M. (2007). The effects of gender, and family, friend, and media influences on eating behaviors and body image during adolescence. *Journal of Youth and Adolescence*, 36, 1024 – 1037.



Professor Ryan Mruczek

Visual Neuroscience

One striking accomplishment of the human brain is the relative ease with which it allows us to interpret and interact with our environment. Object vision is a perfect example: within a few hundred milliseconds, humans can identify and act upon objects embedded within a highly cluttered and complex visual scene. My lab studies the neural computations that underlie object recognition in human and nonhuman primates using a combination of behavioral, electrophysiological, neuroimaging, and computational techniques.

In one project, I use visual illusions to study the integration of sensory information from multiple sources. With collaborators at the University of Nevada, Reno, I recently found that a dynamic Ebbinghaus illusion, in which a moving circle is surrounded by multiple expanding circles, leads to a much larger illusory effect than the classic, static Ebbinghaus illusion. Using a Bayesian framework, we proposed that the dynamic nature of the target (which also leads to eye movements) impairs the brain's ability to precisely represent its angular size (i.e., the size of an image projected onto the retina), and thus more weight is given to contextual cues (e.g., the size of nearby objects) when determining perceived size. This hypothesis makes testable predictions about the effects of motion dynamics on other illusions, and on signatures of the cue

integration process that may be measured with neuroimaging techniques such as EEG.

A second line of research explores the neural computations that support efficient object recognition. One way that efficient neural circuits emerge is through experience; repeated exposure to specific objects alters the response properties of neurons in the primate visual system and makes future recognition of those objects more efficient. We have shown that ventral visual stream neurons display higher degrees of selectivity for familiar objects, with each neuron responding to a small number of items. However, perception is thought to arise from the coordinated activity of neurons across multiple brain regions. Thus, an open question is how experience-dependent changes affect interactions between disparate neuronal populations. My lab will address these open questions using high-density EEG in human participants viewing familiar and unfamiliar objects.

These projects offer a range of opportunities for students at Holy Cross, from comparative literature reviews of primate vision, to technically easier and smaller-scale behavioral studies, to more advanced and long-term neuroimaging studies using high-density EEG.

Selected Publications

- Mruczek REB, Blair CD, Strother L & Caplovitz GP (2015). The Dynamic Ebbinghaus: motion dynamics greatly enhance the classic contextual size illusion. *Frontiers in Human Neuroscience*, 9:77.
- Mruczek REB, Blair CD & Caplovitz GP (2014). Dynamic Illusory Size Contrast: A relative-size illusion modulated by stimulus motion and eye movements. *Journal of Vision*, 14(3):2:1-15.
- Anderson B, Mruczek REB, Kawasaki K & Sheinberg DL (2008). Effects of familiarity on neural activity in monkey inferior temporal lobe. *Cerebral Cortex*, 18(11): 2540-2552.
- Mruczek REB & Sheinberg DL (2007). Context familiarity enhances target processing by inferior temporal cortex neurons. *Journal of Neuroscience*, 27: 8533-8545.
- Kastner S, Chen Q, Jeong SK & Mruczek REB (2017). A brief comparative review of primate posterior parietal cortex: a novel hypothesis on the human toolmaker. *Neuropsychologia*, 105, 123-134.



Professor Richard Schmidt

Social Motor Coordination

I investigate how people coordinate their bodily movements when they interact socially. The aim of the research is to be able to mathematically model the structure of the interpersonal bodily coordination in social interactions such as collision avoidance (like when you are walking down the hall and you and the person coming the other way have to avoid one another), competitive sports activities (like tennis) and in conversation tasks (when you are telling your roommate about your day). Past research has found that movements in social interactions are unintentionally synchronized and dance-like. That is, there is an implicit "dance" that underlies our

interactions others although we are not aware of it. The goal of my research is to capture these 'dances' in mathematical models. From these we hope to use these models to program artificial agents such as robots and avatars so that they can interact with humans naturally. Relatedly, I am also investigating how this social motor "dance" breakdowns in mental pathologies such as autism and schizophrenia. It is our hope that the mathematical understanding of the dynamics of these dances will help to not only understand the social interaction problems of these populations but also be used to create more effective therapies to facilitate remediation.

Selected Publications

- Romero, V., Fitzpatrick, P., Roulier*, S., Duncan, A., Richardson, M. J., & Schmidt, R. C. (2018). Evidence of embodied social competence in children with autism. *PLoS ONE*, 13(3), e0193906.
- Caron, R. R., Coey, C., Dhaim*, A. & Schmidt, R. C. (2017). Investigating the social behavioral dynamics and differentiation of skill in a martial arts technique. *Human Movement Science*, 54, 253-266.
- Fitzpatrick, P. A., Diorio*, R., Richardson, M. J., & Schmidt, R. C. (2013). Dynamical methods for evaluating the time-dependent unfolding of social coordination in children with autism, *Frontiers in Integrative Neuroscience*, 7:12. DOI: 10.3389/fnint.2013.00021.
- Schmidt, R. C., Mori*, S., Fitzpatrick, P. A., & Richardson, M. J. (2012). Measuring the dynamics of interactional synchrony. *Journal of Nonverbal Behavior*, 36, 263-279.
- Varlet, M., Marin, L., Raffard, S., Schmidt, R. C., Capdevielle, D., Boulenger, J. P., Del-Monte J. & Bardy, B. G. (2012). Impairments of social motor coordination in schizophrenia. *PLoS ONE*, 7, e29772. DOI:10.1371/journal.pone.0029772
- Schmidt, R. C., Fitzpatrick, P., Caron, R., & Mergeche*, J. (2011). Understanding social motor coordination. *Human Movement Science*, 30, 834-845.
- Richardson, M. J., Campbell*, W., & Schmidt, R. C. (2009). Movement interference during action observation as emergent coordination. *Neuroscience Letters*, 449, 117-122.
- Schmidt, R. C., Richardson, M. J., Arsenault*, C. A., & Galantucci, B. (2007). Visual tracking and entrainment to an environmental rhythm. *Journal of Experimental Psychology: Human Perception and Performance*, 33, 860-870.



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