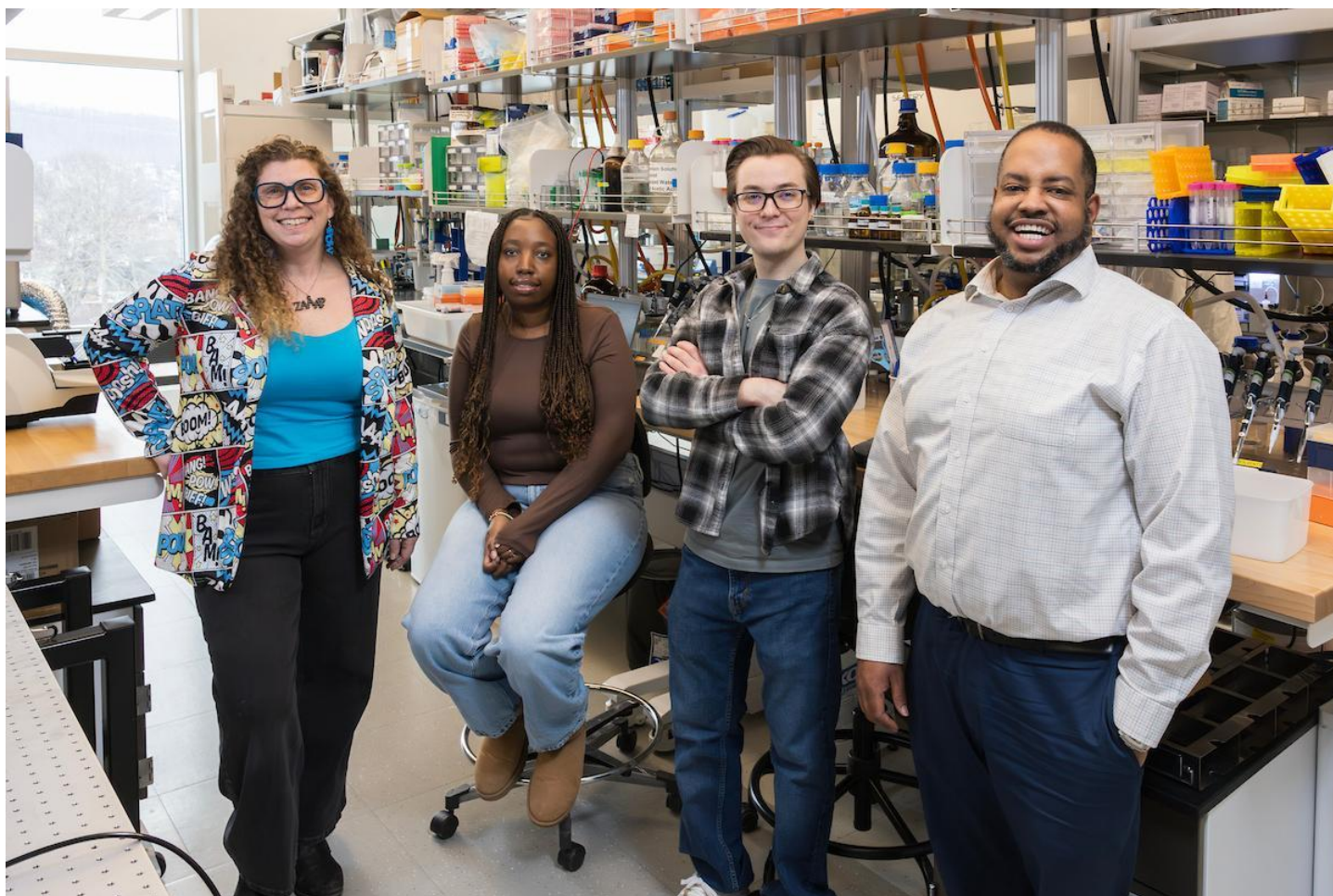


Beckman Scholars Program



Student Mentor Guide

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Program Overview



Dr. Stephen Ortiz
Director

sortiz@binghamton.edu



Dr. Beth Polzin
Associate Director

bpolzin@binghamton.edu

About the Beckman Scholars Program

The Beckman Scholars Program is a national grant sponsored by the Arnold and Mabel Beckman Foundation. Since 1998, the Beckman Scholars Program has provided financial support to young scientists during their undergraduate career. Selected participants undergo a 15-month (May 2026 - October 2027) mentored research experience and receive \$21,000 to support their development and research endeavors. For the three-year duration of Binghamton's award, two applicants will be selected annually to participate in the Beckman Scholars Program.

Program Eligibility

APPLICANTS MUST BE:

- Full-time Binghamton University student in good academic standing.
- Stated interest in an advanced science or engineering degree (e.g. Ph.D., MD, MD-Ph.D.) or other pursuits within the STEM workforce.
- Prospective or declared major in **biochemistry, biological sciences, biomedical engineering, chemistry, or integrative neuroscience.**
- A citizen or permanent resident of the U.S. or its territories and possessions or have DACA status.
- Students who will not graduate until or after December 2027.

Award Breakdown

Students receive an \$18,200 stipend distribution as follows:

- First summer: \$6,800
- Academic year: \$4,600
- Second summer: \$6,800

Student Scientific Supply and Travel stipend:

- \$2,800 distributed as needed to support current research activities

Total Award Amount: \$21,000

Application Process

Deadline

Monday, February 23, 2026

Submit application materials in this Google Form

Please address any questions about your application to Dr. Stephen Ortiz at: sortiz@binghamton.edu

Questions?

Stop in for walk-in advising to speak with someone about your application and to learn more about our office. Scan the QR code to see our advising hours!



Application Requirements

Applicants must provide the following information in their application:

- **Basic information** including name, contact information, major, and general academic and career goals.
- Consult the following pages for information about eligible mentors. You will be asked in the form to **rank your top three potential mentors**. (You will have the opportunity to re-rank if you move on in the process.)
- “About My Path” response. **You can submit this response as either a one-page essay, a 3-page slide deck, or a 3-minute audio or video recording.** The greatest scientific minds have had to chart their own path. Tell us the story of your own journey, touching on (1) your past, (2) your present, and (3) your future. What drives you? What challenges have you faced? Where do you want to go?”
- The **names and emails of two potential references** who can speak to your curiosity, work ethic, leadership, or other unique attributes. These references need not be faculty or academic mentors.

Arnold Beckman 7 Rules for Success

1. There is no satisfactory substitute for excellence.
2. Absolute integrity in everything.
3. Everything in moderation, including moderation itself.
4. Hire the best people—then get out of their way.

5. Don't be afraid of making mistakes. If you're not making mistakes, then you're probably not doing very much.
6. Acquire new knowledge and always ask why.
7. Don't take yourself too seriously.

Dr. Claire Besson



Assistant Professor
Department of Chemistry

Research Summary

Researchers in the Besson group are coordination chemists, that is to say, they study in molecules containing metal ions. We currently have two areas of interest: magnetic molecules and molecular machines. In the first case, we are investigating molecules with unpaired electrons for applications in molecular spintronics or molecule-based quantum computing. In the second case, we are designing and synthesizing molecular “claw-machines” capable of capturing and releasing a given type of metal ion upon an electric signal. Applications of this work include recycling of Li-ion batteries or treatment of spent nuclear fuel.

Student Engagement

- Mentored 22 undergraduates throughout career
- 4 active undergraduates in the lab as of Spring 2024

Student Accomplishments

Students working with Dr. Besson have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: External presentations: 3*
- *Internal presentations: 10*

Student Outcomes

- *Graduate students in chemistry (University of Wisconsin-Madison, UC Irvine, University of New Hampshire, University of Maryland) or in other fields (University of Minnesota School of Public Health, Duke University Pratt School of Engineering)*
- *Senior scientist or senior consultant in large pharmaceutical companies*
- *Chef at a Michelin-starred restaurant*

Offered Projects

Specifics of each project can be defined depending on the Beckman Scholar’s interests and goals, as well as our latest results, but some components will always be present:

Multistep synthesis including organic (for the ligands) and inorganic (to incorporate the metal center) components

Identification of all products by spectroscopy (IR, NMR etc.) and/or single crystal X-ray diffraction

Investigation of the targeted properties such as magnetism or ion-capture ability.

Collaboration with other scientists world-wide to incorporate the synthesized species into functional devices.



Dr. Claire Besson | cbesson@binghamton.edu | (607) 777-2411

Mentor Philosophy

Our ideal is that in our group, everybody is always learning from everybody else. For initial training and the day-to-day of research work, new group members are able to rely on the advice and supervision of a graduate student in the group, supplemented by frequent discussions with other group members as well as Dr. Besson, who is always delighted to have a chance to come to the lab or look at fresh data. Weekly group meetings allow for taking stock and planning ahead as well as exchanging ideas and best practices regarding all aspects of developing as a successful scientist. Dr. Besson will also endeavor to provide the Beckman Scholar with opportunities to build relationships outside the group that can provide additional mentorship especially relevant to the Scholar's identity, career interests etc. In turn, the Scholar will be expected to participate, with appropriate support, in the mentoring of more junior researchers.

Research Preparation

Through a combination of formal training, apprenticeship and learning-by-doing, the Scholar will acquire many of the skills that are essential to success in graduate school: accurate record keeping, literature searching, communication with supervisor, peers and community, teamwork, goal setting, planning, time management. This will significantly strengthen the Scholar's graduate school applications and greatly smooth the transition to graduate studies. In addition, they will acquire specific technical skills that, depending on their choice of fields, might be useful for their future career. Through participation in the life of the group and the department, including seminar and outreach events, the Scholar will also be provided with opportunities to explore a variety of interests and possible career paths in science, from research, academic or industrial, to science communication and writing or teaching at various levels.

Select Publications: *Undergraduate Authors are Underlined*

1. Hossack, C. Cahill, C. Besson, "Utility of all-pyrazole heteroscorpionates in f-element chemistry", Dalton Trans. 2023, 52, 17656–17665.
2. C. Besson, P. Stegmann, M. Schnee, Z. Zanolli, S. Achilli, N. Wittemeier, A. Vierck, R. Frielinghaus, P. Kögerler, J. Maultzsch, P. Ordejón, C. M. Schneider, A. Hucht, J. König, C. Meyer, "Independent and coherent transitions between antiferromagnetic states of few-molecule systems", Phys. Rev. B 2023, 107, 245414.
3. C. Hossack, F. Abdul, C. Cahill, C. Besson, "Tuning the optical and magnetic properties of lanthanide single-ion magnets using nitro-functionalized trispyrazolylborate ligands", Dalton Trans. 2023, 52, 7336–7351.
4. C. Ma, C. Besson, "Precise control of the degree and regioselectivity of functionalization in nitro- and amino-functionalized di(trispyrazolylborato)iron(II) spin crossover complexes", Dalton Trans. 2021, 50, 18077–18088.
5. C. H. Hossack, R. J. Butcher, C. L. Cahill, C. Besson, "Structural Diversity of Lanthanide 3-Nitrotrispyrazolylborates: Tunable Nuclearity and Intra-Ligand Charge Transfer Sensitization of Visible and NIR Ln³⁺ Emission", Inorg. Chem. 2021, 60, 15724–15743.

Dr. Christopher Bishop



Director
Integrative Neuroscience Program
Professor
Department of Psychology

Research Summary

In my laboratory, we use rodent models of Parkinson's disease to understand how the brain compensates for disease-related cell death and symptoms, thereby identifying novel targets for intervention and treatment. Since I started as a faculty member at Binghamton University 19 years ago, undergraduate students have been involved in almost all aspects of our research from handling rats to presenting findings to the research community. Our translational research is technically and conceptually ideal for training undergraduates, and since many students are interested in the nexus of neurobiology and human disease, they find our work imminently tangible.

Student Engagement

- *Mentored about 100 undergraduate students since 2005*
- *10 hours of lab experience per week*
- *10 active undergraduates in the lab as of Spring 2024*
- *40% of undergraduates contribute to a peer-reviewed publication*
- *Mentored two Beckman Scholars*

Student Accomplishments

Students working with Dr. Bishop have accomplished the following:

- *Accumulated time in lab: 19+*
- *Co-authored articles published: 21*
- *External presentations: 11*
- *Internal presentations: 12*

Student Outcomes

Students involved in this lab are now:

- *Graduate programs*
- *Medical programs*
- *Doctoral programs*
- *Professional programs*
- *Professional careers*

Offered Projects

As part of my Scholar Mentorship Plan (SMP), the Beckman Scholar will be expected to work a minimum of 10 hours per week, participate in weekly lab meetings, and display progressive mastery of the methods of our discipline. This includes care, handling, and neurosurgery in rodents, drug preparation and administration, behavioral assays, histological methods, data handling and analysis, and finally, scientific communication. This final step is expected to include a poster presentation at a local and/or national conference, such as the Society for Neuroscience.



Dr. Christopher Bishop cbishop@binghamton.edu | (607)777-3410

Mentor Philosophy

While undergraduate researchers may differ in their preparation and need for oversight, it will be important to interact with the Beckman Scholar, 1-on-1, on a regular basis. This will begin prior to working in the laboratory at which time we will discuss our joint expectations and set goals. I will provide them with seminal readings and training videos that we have created for new students. Thereafter, with immersion in the laboratory, periodic 1-on-1 meetings will happen 3 times/semester or more, depending upon the needs of the student. Part of this process is evaluative from my perspective where I can give the Scholar constructive feedback based on my observations and those of senior lab members; the other is to listen, where I gauge what the Scholar needs to continue their trajectory towards scientific independence.

Research Preparation

Throughout the training process, a major goal for the Beckman Scholar will be a transition to independent research. This will be accomplished through the establishment of clear goals, regular feedback, and the advancement of scientific ideas and products. Having trained 12 doctoral students, it is clear to me that positive feedback and clear achievement milestones not only instantiate confidence but also portend success at the graduate level and beyond. Moreover, students who train in my laboratory are placed in a system where leadership is not only encouraged but expected. Scholars begin as trainees, mentored by more experienced students, but will themselves become mentors as their expertise emerges.

Selected Publications: *Undergraduate Authors are Underlined*

1. Holden, H., Venkatesh, S., Budrow, C., Nezaria, S., Coyle, M., Centner, A., Lipari, N., McManus, G., Bishop, C. (2024). The effects of L-DOPA on gait abnormalities in a unilateral 6-OHDA rat model of PD. Physiology & Behavior (in press).
2. Centner, A., Del Priore, I., Chambers, N., Cohen, S., Terry, M., Coyle, M., Glinski, J., Sortwell, C., Bishop, C. (2024). Characterization of striatal dopamine dynamics in the pre-formed fibril rat model of PD. European Journal of Neuroscience 59(7):1585-1603.
3. Budrow, C., Elder, K., Coyle, M., Centner, A., Lipari, N., Cohen, S., Glinski, J., Kinzonzi, N., Wheelis, E., McManus, G., Manfredsson, F.P., Bishop, C. (2023). Broad serotonergic actions of Vortioxetine as a promising avenue for the treatment of L-DOPA-induced dyskinesia. Cells. 12(6):837.
4. Lipari, N., Centner, A., Glinski, J., Cohen, S.R., Manfredsson, F.P. and Bishop, C. (2022). Characterizing the relationship between L-DOPA-induced dyskinesia and psychosis-like behaviors in a bilateral rat model of PD. Neurobiology of Disease 176:105965.
5. Cohen, S.R., Terry M.L., Coyle, M., Wheelis, E., Centner, A., Smith, S., Glinski, J., Lipari, N., Budrow, C., Manfredsson, F.P., Bishop, C. (2022). Investigating the anti-dyskinetic effects of co-administered serotonin- and glutamate-acting compounds Vilazodone and Amantadine, in hemiparkinsonian rats. Pharmacology, Biochemistry, and Behavior May 2;217:173393.

Dr. Tracy Brooks



Associate Professor and Chair

Department of Pharmaceutical Sciences

Menner Family Endowed Faculty Fellow in Pharmacy

Student Engagement

- *Mentored 56 undergraduates*
- *5 active undergraduates in the lab as of Spring 2025*

Student Accomplishments

Students working with Dr. Brooks have accomplished the following:

- *Accumulated time in lab: 19+ months*
- *Co-authored articles published: 5*
- *External presentations: 7*
- *Internal presentations: 10*

Research Summary

Dr. Brooks's research has centered on oncology, anti-cancer therapeutics and development of new targets for drugs through a focus on DNA and the proteins that it controls. She has a project that focuses on validating CBD-based products as safe and efficacious for diseases like inflammatory pain and cancer, and collaborates with colleagues on novel drug development for cancer and inflammation. Pancreatic, breast, ovarian, colorectal and lymphoma cancers have high-value druggable targets that people haven't been able to hit before. She and her team take a new approach and target the DNA that makes these high-value druggable proteins.

Offered Projects

Central to my mentoring philosophy is creating an environment where intellectual risk-taking is not only encouraged but celebrated. When a Beckman scholar proposes a novel hypothesis or suggests an unconventional experimental approach, my instinctive response is "Let's try it!" This supportive framework allows students to push boundaries while knowing they have guidance and support when challenges arise. I strive to build confidence in my mentees by consistently acknowledging their contributions, celebrating their growth, and helping them develop their scientific identity.



Dr. Tracy Brooks | tbrooks@binghamton.edu | (607)777-5842

Mentor Philosophy

My approach to mentoring a Beckman scholar begins with understanding their unique interests and career aspirations. I start by engaging new scholars in discussions about our work while exploring their background, motivations, and goals. From these conversations, we collaboratively design a project that serves both their intellectual curiosity and our research objectives. My mentoring approach is shaped by formal pedagogical training focused on inclusive, equitable learning. Drawing on this pedagogical foundation, the Beckman scholar would initially learn fundamental techniques and assays through hands-on training with experienced lab members and me. However, my mentorship philosophy extends far beyond technical skill acquisition. I believe in progressive independence, where students gradually transition from following protocols to designing experiments and developing their own research questions.

Research Preparation

I prepare Beckman scholars for research and leadership through a structured progression of skill-building, beginning with foundational data analysis and advancing to scientific communication. Early on, students collaborate with me and experienced lab members to master analytical techniques, then develop oral presentation skills in bi-weekly lab meetings where they present findings, receive feedback, and engage in scientific discourse. As their confidence grows, they learn to craft written research narratives that connect their results to broader scientific and societal questions. This development culminates in guided poster and manuscript preparation, where students gain experience in visual communication, scientific writing, peer review, and collaborative publication. By the end of their research experience, scholars are equipped with the full range of communication skills essential for scientific leadership. I encourage my mentees to document both successes and missteps, creating a comprehensive roadmap of their intellectual journey and scientific growth.

Selected Publications: *Undergraduate Authors are Underlined*

1. Gray, ME; Zielinski, KM; Xu, F; Elder, KK; McKay, SJ; Ojo, VT; Benjamin, SR; Yaseen, AA; Brooks, TA; Tumey, LN. "A comparison of the activity, lysosomal stability, and efficacy of legumain-cleavable and cathepsin cleavable ADC linkers". *Xenobiotica*, 2024. May 2; p458-468.
2. Fang, S; Brems, BM; Olawode, EO; Miller, JT; Brooks, TA; Tumey, LN. "Design and Characterization of Immune-Stimulating Imidazo[4,5-c]quinoline Antibody-Drug Conjugates". *Mol Pharm*, 2022. Sept 5;19(9):3228-3241.
3. Psaras, AM; Carty, RK; Miller, JT; Tumey, LN; Brooks, TA. "Indoloquinoline-Mediated Targeted Downregulation of KRAS through Selective Stabilization of the Mid-Promoter G-Quadruplex Structure". *Genes*, 2022. Aug 13;13(8):1440.
4. Morgan, RK; Lassiter, Q; Raymer, K; Brooks, TA. "G-quadruplex deconvolution with physiological mimicry enhances primary screening: optimizing the FRET Melt2 Assay". 2020 Jan, *BBA-GRM*, 1863(1): 194478.
5. Morgan, RK; Molnar, MM; Batra, H; Summerford, B; Wadkins, RM; Brooks, TA. "Effects of 5-hydroxymethylcytosine epigenetic modification on the stability and molecular recognition of VEGF i-Motif and G-quadruplex structures". 2018 May 16, 2018:9281286, *Journal of Nucleic Acids*.

Dr. Tony Davis



Assistant Professor
Department of Pharmaceutical Sciences

Student Engagement

- *Mentored 21 undergraduates*
- *4 active undergraduates in the lab as of Spring 2025*
- *2 mentees completed Honors theses in the lab*

Student Accomplishments

Students working with Dr. Davis have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 1*
- *External presentations: 7*
- *Internal presentations: 8*

Student Outcomes

Students involved in this lab continued to:

- *University of Rochester*
- *Albert Einstein College of Medicine*

Research Summary

My research program leverages synthetic chemistry and biophysical techniques to investigate biological systems and design new agents to treat drug-resistant cancers and microbial infections. His current research involves interrogating the molecular basis of substrate and protein recognition of natural product methyltransferase enzymes with potential implications for drug discovery, biocatalysis and combinatorial biosynthesis. Additional research interests include the development of potential therapeutic compounds for infectious diseases, cancer, and neurological disorders. Our work is multidisciplinary in nature and offers Beckman Scholars a unique opportunity to gain broad technical and conceptual training in organic chemistry, pharmacology, or molecular biology, depending on their interests.

Offered Projects

Initially, the Scholar will be assigned a mini-project integrated with the ongoing work of a PhD student in the lab. I develop projects that help undergraduates build rigorous record-keeping and data-management practices, master relevant lab techniques, and understand the broader scientific context of their work. As the Scholar gains technical proficiency, we will scaffold higher-order skills such as data analysis, interpretation, scientific communication, and critical thinking to support their intellectual development. I also mentor Scholars in professional development, offering feedback on fellowship applications (e.g., NSF-GRFP) and graduate school materials. These activities create a robust framework for a successful transition to graduate study.



Dr. Tony Davis | tdavis@binghamton.edu | (607)777-5831

Mentor Philosophy

I have an open-door policy and am readily available to address student questions, concerns, challenges, or to celebrate exciting data. To acclimate the Beckman Scholar, we will meet daily during their first six weeks to review the prior day's results, set goals for the day, and review safety precautions. During this time, the Scholar will also construct an Individual Development Plan (IDP), which will be updated annually, where I will work with the Scholar to align their progress with both short- and long-term goals. As the Scholar becomes more comfortable in the lab, we will meet weekly one-on-one to discuss research progress and challenges. Prior to each meeting, the Scholar will submit a brief (1-page) summary of the previous week's work, including challenges and goals for the upcoming week. After the Beckman Scholars Program concludes, I will continue working with the Scholar on a Senior Honors Thesis, peer-reviewed publications, graduate fellowships, and application materials.

Research Preparation

The Beckman Scholar will receive technical training in chemical synthesis, pharmacology, molecular biology, or a combination thereof, based on their background and interests. A doctoral student directly supervises these activities, and I am available as needed for advanced training. While developing technical expertise, the Scholar will critically read project-related literature to understand the background and significance of their work. Because undergraduates often find scientific literature daunting due to limited lab experience and jargon, I provide formal training through interactive workshops on how to critically read and evaluate research. The Scholar will attend weekly group meetings to sharpen their oral communication skills, which include giving a 5-minute synopsis of one major accomplishment and one challenge from the previous week; presenting occasional comprehensive 45-minute research overviews or leading a discussion on a recent paper, and, quarterly, the Beckman Scholar will lead a literature discussion on a paper of their choice, and twice a year, presenting their research project.

Selected Publications: *Undergraduate Authors are Underlined*

1. Chen, A; Re, RN; Davis, TD; Tran, K; Moriuchi, YW; Wu, S; La Clair JJ; Louie, GV; Bowman, ME; Clarke, DJ; Mackay, CL; Campopiano, DJ; Noel, JP; Burkart, MD. "Visualizing the Interface of Biotin and Fatty Acid Biosynthesis Through SuFEx Probes." J. Am. Chem. Soc. 2024, 146, 1388–1395.
2. Bartholow, TG; Sztain-Pedone, T; Young, MA; Lee, DJ; Davis, TD; Abagyan, R; Burkart, MD. "Control of Unsaturation in De Novo Fatty Acid Biosynthesis in FabA." Biochemistry 2022, 61, 608–615.
3. Bartholow, TG; Sztain-Pedone, T; Young, MA; Davis, TD; Abagyan, R; Burkart, MD. "Protein-Protein Interaction Based Substrate Control in the E. coli Octanoic Acid Transferase, LipB." RSC Chem. Biol. 2021, 61, 608–615.
4. Misson, LE;* Mindrebo, JT;* Davis, TD;* Patel, AB;* McCammon, JA; Noel, JP; Burkart, MD. "Interfacial Plasticity of Facilitates High Reaction Rate of E. coli FAS Malonyl-CoA:ACP Transacylase FabD" PNAS 2020, 117, 24224–24233.
5. Corpuz, JC; Podust, LM; Davis, TD; Jaremko, MJ; Burkart, MD.; "Dynamic Visualization of Type II Peptidyl Carrier Protein Recognition in Pyoluteorin Biosynthesis." RSC Chem. Biol. 2020, 1, 8–12.

Dr. Brandon Gibb



SUNY Distinguished Professor
Department of Psychology

Student Engagement

- *Mentored 87 undergraduates*
- *6 active undergraduates in the lab as of Spring 2025*

Student Accomplishments

Students working with Dr. Gibb have accomplished the following:

- *Accumulated time in lab: 19+ months*
- *Co-authored articles published: 4*
- *External presentations: 2*
- *Internal presentations: 10*

Research Summary

My research focuses on factors that contribute to the development and maintenance of depression across the lifespan, with a particular focus on risk in children and adolescents. This research has been supported by the National Institute of Mental Health and National Institute for Child Health and Human Development for over 20 years and has led to over 150 publications. Our research incorporates both clinical and nonclinical samples and includes both cross-sectional and multi-wave prospective designs using assessments across multiple units of analysis (e.g., genetic, physiological, neural, behavioral). The overall goal is to develop a more fine-grained understanding of risk for depression and related outcomes so that more targeted prevention and intervention efforts can be developed.

Offered Projects

In addition to the supportive lab environment described in the Scholar Development section, several additional steps will be taken to prepare any Beckman Scholar joining my group. A key element of this preparation is the selection of the Scholar's research project. My approach begins with identifying the student's general interests and then shaping those ideas into a feasible project with the potential to make a novel contribution to the field. When selecting a project, I ensure that the student has both a research goal and a training goal. The training component may involve gaining deeper familiarity with relevant literature, learning a specific assessment method used in our lab, or acquiring a new statistical technique needed to test their hypotheses.



Dr. Brandon Gibb | bgibb@binghamton.edu | (607) 777-2511

Mentor Philosophy

With many years of experience, I take a developmental approach to mentoring. I provide strong supervision and guidance from the outset, while encouraging students to take on increasing levels of independence as they progress. My goal is to help students build the self-confidence and research skills necessary to design, complete, and disseminate independent research. I emphasize both depth and breadth in research training. Depth is achieved through focused work on the student's individual project, which requires them to develop expertise in specific topics and methodologies. Breadth is fostered through exposure to the wider range of research conducted in the lab—including my grant-funded studies, the work of graduate students, and independent projects led by other undergraduates. Students also participate in broader discussions of emerging research in the field, enhancing their ability to situate their work within the scientific landscape of depression risk.

Research Preparation

As part of this broader exposure, students gain hands-on experience with cutting-edge approaches in clinical science, including EEG/ERP, psychophysiology (e.g., respiratory sinus arrhythmia), eye tracking, and gold-standard assessments of environmental stress. These methods offer not only technical skill development but also help students understand how different approaches are used to answer complex research questions. This exposure enriches their intellectual engagement and prepares them to critically evaluate and contribute to scientific inquiry. A Beckman Scholar in my lab would follow a structured yet personalized path of development. Early in their appointment, the Scholar would be immersed in the research environment through onboarding, targeted readings, and hands-on training in lab protocols. They would be guided in identifying a research question of interest aligned with the lab's broader goals. The Scholar's responsibilities would include reviewing literature, developing hypotheses, collecting and managing data, conducting analyses, and interpreting findings.

Select Publications: *Undergraduate Authors are Underlined*

1. Woody, M. L., Tsydes, A., Burkhouse, K. B., Feurer, C., Champagne, K., & Gibb, B. E. (2022). Development of overgeneral autobiographical memory in children of depressed mothers. *Journal of Clinical Child and Adolescent Psychology*, 51, 73-84.
2. Israel, E.S., & Gibb, B.E. (2023). Transactional relations between peer victimization and depressive symptoms among youth at risk for developing depression: Evidence of gender differences. *Research on Child and Adolescent Psychopathology*, 51, 625-637.
3. James, K.M., Balderrama-Durbin, C., Kobezak, H., Recchia, N., Foster, C.E., & Gibb, B.E. (2023). Dynamics of affective reactivity during mother-daughter interactions: The impact of adolescent nonsuicidal self-injury. *Research on Child and Adolescent Psychopathology*, 51, 597-611.
4. Israel, E.S., & Gibb, B.E. (2024). A transactional mediation model of risk for the intergenerational transmission of depression: The role of maternal criticism. *Development and Psychopathology*, 36, 92-100.
5. James, K.M., Balderrama-Durbin, C., Israel, E., Feurer, C., & Gibb, B.E. (2024). Self- and co-regulation of physiological activity during mother-daughter interactions: The role of adolescent non-suicidal self-injury. *Journal of Child Psychology and Psychiatry*, 65, 91-99.

Dr. Christof Grewer



Undergraduate Program Director and Professor
Department of Chemistry

Student Engagement

- *Mentored 28 undergraduates since joining Binghamton University*
- *4 active undergraduates in lab as of Spring 2024*

Student Accomplishments

Students working with Dr. Grewer have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 7*
- *Internal presentations: 7*
- *Chancellor's Award*
- *Barry Goldwater Fellowship*

Student Outcomes

Students involved in this lab continued to:

- *Mount Sinai*
- *New York University*

Research Summary

My laboratory has long-standing experience in the functional analysis of secondary-active neurotransmitters and amino acid transporters and has been supported by an NIH grant since 2004. We combine experimental analysis of transport function and organic synthesis of active compounds with computational approaches, both on the all-atom level (molecular dynamics simulations) and at lower level (electrostatics calculations). My laboratory works on two general projects: the first project focuses on the molecular mechanism of glutamate transport proteins, and the second project investigates transport proteins as potential targets for anti-cancer agents.

Offered Projects

My laboratory currently works on two general projects that have been funded by the NIH since 2014, both of which involve undergraduates. Both projects focus on glutamine transporters transport proteins as potential targets for anti-cancer agents. We develop novel compounds, by computational docking and screening, synthesis, and experimental testing, for two glutamine transporters, from the solute carrier (SLC) 1 and 6 families. As we have done in the past, we will continue to offer research opportunities for an average of four or five undergraduate students at any point in time, including summers. These students are trained in literature review, experimental design, supervised experimentation, data analyses, unsupervised research and hypothesis building, as well as troubleshooting and problem solving. Students also learn to present their findings in weekly group meetings, and to prepare short talks, posters, and manuscripts for publication



Dr. Christof Grewer | cgrewer@binghamton.edu | (607) 777-3250

Mentor Philosophy

I will meet the Beckman scholar on a regular basis, at least twice a week, to discuss progress on the project, problems and pitfalls, and possible strategies of how to overcome these problems. In addition, the student will be assigned to a graduate student mentor for direct supervision and training. As an added benefit, this will allow the graduate student to gain experience as an advisor and project manager, while working with a promising student committed over a 15-month period. When the scholar is ready to apply to graduate school, MD, or MD/PhD programs, or advance to the next stage of their training, I will be available to work with them in writing recommendation letters, cover letters for job applications, resume review, and general preparation for interviews.

Research Preparation

In my regular meetings with the Beckman Scholar, we will discuss career goals and opportunities for presentations of research -- first at local and regional, and later at national scientific meetings. I will use meetings as an opportunity to guide participation in writing and editing scientific manuscripts, and fostering a laboratory environment that encourages learning, innovation, continuous literature review, and cutting-edge science. Student leadership is encouraged by first observing other leaders, such as myself and senior graduate students, and later by taking leadership roles in project development and experiment troubleshooting. Senior and advanced undergraduate research students in the lab are often asked to supervise and train new undergraduate students, and assist them with everyday laboratory activities, a role the Scholar can perform their second summer.

Select Publications: *Undergraduate Authors are Underlined*

1. Zielewicz LJ, Wang J, Ndaru E, Maney B, Yu X, Albers T, Grewer C. Design and Characterization of Prodrug-like Inhibitors for Preventing Glutamate Efflux through Reverse Transport. ACS Chem Neurosci. 2023 Dec 6;14(23):4252-4263.
2. Dong Y, Wang J, Garib Singh RA, Hutchinson K, Shi Y, Eisenberg G, Yu X, Schlessinger A, Grewer C. Conserved allosteric inhibition mechanism in SLC1 transporters. Elife. 2023 Mar 1;12:e83464. doi: 10.7554/eLife.83464. PMID:36856089
3. Garib Singh RA, Ndaru E, Garaeva AA, Shi Y, Zielewicz L, Zakrepine P, Bonomi M, Slotboom DJ, Paulino C, Grewer C, Schlessinger A. Rational design of ASCT2 inhibitors using an integrated experimental-computational approach. Proc Natl Acad Sci U S A. 2021 Sep 14;118(37):e2104093118. doi: 0.1073/pnas.2104093118.
4. Wang J, Li P, Yu X, Grewer C. Observing spontaneous, accelerated substrate binding in molecular dynamics simulations of glutamate transporters. PLoS One. 2021 Apr 23;16(4):e0250635.
5. Wang J, Zhang K, Goyal P, Grewer C. Mechanism and potential sites of potassium Interaction with glutamate transporters. J Gen Physiol. 2020 Oct 5; 152(10):e202012577.

Dr. Tracy Hookway



Associate Professor

Department of Biomedical Engineering

Student Engagement

- *Mentored 25 undergraduates since joining Binghamton University*
- *3 active undergraduates in lab as of Spring 2025*

Student Accomplishments

Students working with Dr. Hookway have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 8*
- *External Presentations: 11*
- *Internal presentations: 10*

Research Summary

My research focuses on development of predictive models of cardiovascular tissues to be used for therapeutic purposes. A central objective of my work is the engineering of three-dimensional tissues from stem cell sources, with applications in in vitro modeling, diagnostics, and regenerative medicine. My laboratory leverages multi-scale, 3D cultures of differentiated stem cells to guide multicellular organization and recapitulate complex tissue structure and function of native tissues.

Offered Projects

Introduce students to cardiovascular tissue engineering through a structured progression. We begin by reading and analyzing key publications, identifying hypotheses, evaluating data, and discussing broader implications and gaps in knowledge. Together, we then formulate a specific research hypothesis that meets three key criteria: 1) it aligns with ongoing projects in the lab, 2) it addresses a new and unanswered gap in knowledge, and 3) it aligns with the student's interests. Alongside hypothesis development and planning, students are introduced to wet-lab techniques by shadowing graduate students and receiving targeted instruction. By the end of the first semester, they understand the rationale behind their projects, are proficient in required methods, and are motivated to pursue their hypotheses. In the second semester, the focus shifts to executing experiments, analyzing data, and strengthening communication skills through presentations, posters, and manuscript writing.

**Dr. Tracy Hookway** | thookway@binghamton.edu

Mentor Philosophy

While I am passionate about research and strive to instill that enthusiasm in my trainees, I firmly believe in supporting students' individual career aspirations, whether in academia, industry, or beyond. I prioritize career development discussions with all my students, regularly checking in on their evolving 1-, 5-, and 10-year goals. This student-centered approach has earned me recognition as a Career Champion at Binghamton University for the past four years. As a Beckman Scholar mentor, I am committed to providing comprehensive training in the scientific process, science communication, critical thinking, ethical decision making, and multidisciplinary collaboration. My goal is to ensure students are well-equipped to navigate the next stages of their professional journey with confidence and purpose.

Research Preparation

My goal in mentoring undergraduate students is to equip them with the skills, knowledge, and mindset for a successful research career. I strive to develop independent thinkers who can formulate hypotheses, design rigorous experiments, interpret complex data, and communicate effectively. Scientific mastery is a lifelong pursuit, and I emphasize the importance of continuous skill refinement. Alongside hypothesis development and planning, students are introduced to wet-lab techniques by shadowing graduate students and receiving targeted instruction. By the end of the first semester, they understand the rationale behind their projects, are proficient in required methods, and are motivated to pursue their hypotheses. In the second semester, the focus shifts to executing experiments, analyzing data, and strengthening communication skills through presentations, posters, and manuscript writing. For Beckman Scholars, my goal is for them to present their research at both national and local conferences and contribute to manuscript submissions.

Select Publications: *Undergraduate Authors are Underlined*

1. Dorsainvil JS, McDonald M, Pachter N, Manashirov D, Patel S, Hookway TA, Koh A. Multifunctional Fibrous Mats: Stretchable, Conductive, and Hydrophilic Platforms for Wearable Electronics. Adv Mat Tech, e00342, 2025.
2. Allen K, Pachter N, Bandl A, Alex Ropars, Haleema Qamar, Hookway TA. Short-term Electrical Stimulation Impacts Cardiac Cell Structure and Function. Accepted, J of Tiss Eng and Regen Med, Preprint, BioRxiv; <https://doi.org/10.1101/2024.05.19.594880>.
3. Pachter N, Allen K, Hookway TA. Modeling cardiac fibrosis through the addition of exogenous extracellular matrix molecules. In final revision at J of Biomed Mat Res, Part A, Preprint, BioRxiv; <https://doi.org/10.1101/2024.08.20.608840>.
4. Butler K, Ahmed S, Jablonski J, Hookway TA. Engineered heart microtissue biofabrication using iPSC-derived epicardial cells. Under Review, Preprint, BioRxiv; <https://doi.org/10.1101/2024.05.13.593960>.
5. Ittycheri A, Lipsky ZW, Hookway TA, German G. Ultraviolet light induces mechanical and structural changes in full thickness skin. J of Mech Behav of Biomed Mat 143, 2023.

Dr. Anushree Karkhanis



Empire Innovation Associate Professor
Department of Psychology

Student Engagement

- *Mentored 30 undergraduates throughout career*
- *9 active undergraduates in the lab as of Spring 2024*
- *6 mentees completed Honors theses in the lab*

Student Accomplishments

Students working with Dr. Karkhanis have accomplished the following:

- *Accumulated time in lab: 19+ months*
- *Co-authored articles published: 4*
- *External presentations: 5*
- *Internal presentations: 9*

Student Outcomes

Students involved in this lab continued to:

- *Six completed honors theses*
- *Two students published in internationally recognized journals*
- *Three undergraduates presented posters at the international annual conferences*

Research Summary

The overarching theme of my lab's research program is to elucidate neural changes resulting from adversity during adolescence, such as social deprivation or alcohol exposure (and the ensuing withdrawal-associated stress), which may subsequently augment drug addiction vulnerability to develop alcohol and substance use disorders, and other health issues such as chronic pain, and difficulty with pain management. Identifying neural substrates of drug addiction at a cellular and circuit level will enable the advancement of evidence-based treatments. We use multi-disciplinary approaches ranging from neurochemical analysis to controlling behavioral outcomes using chemogenetics and optogenetics that allow us to manipulate selective neuron subtypes.

Offered Projects

The Beckman Scholar will focus on one of two projects in the lab:

- The impact of adolescent social deprivation on addictive behaviors and the underlying neurobiology
- Adolescent alcohol exposure mediated changes in pain sensitivity and the related neural mechanisms.

Summer will be focused on developing a good conceptual foundation and learning basic techniques used in the lab. Towards the end of the summer and throughout the academic year, the Beckman Scholar will collect and statistically analyze data, and present at our lab meetings. The Beckman Scholar will also present a poster at the Research Day and a regional conference.



Dr. Anushree Karkhanis | akarkhan@binghamton.edu | (607)777-4876

Mentor Philosophy

The Beckman Scholar will receive a holistic academic research experience, including multidisciplinary technical training, conceptual understanding, data analysis, and formal scientific communication, including writing and presentation. I will meet with the Beckman Scholar biweekly in a formal setting to discuss their progress in data collection, data analysis, and conceptual development. Furthermore, they will have extensive interactions with doctoral students in my lab and daily informal interactions with me when I am in the lab. Moreover, they will be expected to actively participate in our weekly lab meetings and present their data formally (at least once/semester) and informally (at least thrice/semester). Finally, the Beckman Scholar will also have the opportunity to continue in my lab beyond the Beckman Scholarship, throughout the remainder of their undergraduate career. If they choose to do so, I will encourage them to complete an honors thesis.

Research Preparation

Over the 18-month duration of the Beckman fellowship, the scholar will receive training to establish holistic independent thinking about their project. In addition to the technical training, I will work with the scholar to develop conceptual understanding, further enhancing their confidence in science communication, first to their lab mates, and then to a larger audience. As I have done with other undergraduate students in my lab, the Beckman scholar will be given opportunities to present their data in poster and oral presentation format during campus research days, as well as international, national, and regional meetings. Furthermore, given the time commitment and depending on the project progress, I will help the scholar in writing their results in a manuscript for peer-reviewed journal submission. This training beginning from developing a conceptual framework, research design, technical skills, and ending with several types of science communication will prepare them for future research-related careers.

Select Publications: *Undergraduate Authors are Underlined*

1. Kelley AM, Del Valle EJ, Zaman S, Karkhanis AN (2024) Adolescent ethanol exposure promotes mechanical allodynia and alters dopamine transmission in the nucleus accumbens shell. *Pain*, 165(6):e55-e64.
2. Pirino BE, Kelley AM, Karkhanis AN, Barson JR (2023) A critical review of effects on ethanol intake of the dynorphin/kappa opioid receptor system in the extended amygdala: From inhibition to stimulation. *Alcohol: Clinical and Experimental Research*, 47(6):1027-1038.
3. Leon Z, Shah K, Bailey LS, Karkhanis AN, Sirohi S (2021) Patterned feeding of a hyper-palatable food (oreo cookies) reduces alcohol drinking in rats. *Frontiers in Behavioral Neuroscience*, section Motivation and Reward, 15:725856.
4. Spodnick MB, Amirault RT, Towner TT, Varlinskaya EI, Spear LP, Karkhanis AN (2020) Adolescent intermittent ethanol exposure effects on kappa opioid receptor mediated dopamine transmission: Sex and age of exposure matter. *Brain Sciences*, 10(8):E472.
5. Pirino BE, Spodnick MB, Gargiulo AT, Curtis GR, Barson JR, Karkhanis AN (2020) Kappa-opioid receptor-dependent changes in dopamine and anxiety-like or approach-avoidance behavior occur differentially across the nucleus accumbens shell rostro-caudal axis. *Neuropharmacology*, 181:108341.

Dr. Gretchen Mahler



Professor

Department of Biomedical Engineering

Student Engagement

- *Trained 49 undergraduate students since 2011*
- *6 active undergraduates in the lab as of Spring 2024*

Student Accomplishments

Undergraduates working with Dr. Mahler have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 12*
- *External Presentations: 10*
- *Internal Presentations: 5*
- *NSF GRFP Awards*
- *Gaann Fellowship & Whitaker Fellowship*

Student Outcomes

Students involved in this lab continued to:

- *Boston University*
- *Cornell University*
- *Duke University*
- *George Washington University*
- *Rensselaer Polytechnic Institute*
- *University of Pennsylvania*
- *University of Pittsburgh*
- *University of Southern California*

Research Summary

My current research focus includes the development of dynamic, microfluidic, 3D models of the gastrointestinal (GI) tract, breast, kidney, and valvular endothelium for mechanobiological and toxicity testing. Our lab is currently funded by the NIH and FDA through 2025 for research that is focused on determining how common food additives affect microflora populations and nutrient absorption in the gastrointestinal tract and determining how drugs are transported into breast milk.

Offered Projects

A Beckman Scholar will work on determining how common food additives affect microflora populations and nutrient absorption in the gastrointestinal tract. They will also learn sterile technique, human cell culture, bacterial cell culture, microscopy, and microfluidic device design, fabrication, characterization, and operation. The scholar will receive training in Laboratory Safety, Hazardous Waste Management / Blood Borne Pathogen Safety, and Responsible Conduct of Research.



Dr. Gretchen Mahler | gmahler@binghamton.edu | (607) 777-5238

Mentor Philosophy

I will train the Beckman Scholar with a well-developed training program over six weeks, ensuring the scholar's competence in sterile technique, cell culture, and microfluidic device fabrication and characterization. We will meet individually every week to discuss progress and future plans, and the Scholar will be invited to present at monthly lab meetings. We will work collaboratively to formulate hypotheses and experiments. The scholar will regularly be questioned by me, their lab mates, and our collaborators about the quality, meaning, and error associated with their data to underscore the importance of critical analysis. These meetings are intellectually rigorous and respectful, creating a safe environment for discovery and learning. I work closely with a biostatistician, Dr. Mei-Hsiu Chen. The scholar will work with Dr. Chen to ensure their experiments are properly designed and have adequate controls and to analyze data.

Research Preparation

The scholar will be expected to give two presentations per semester at lab meetings and monthly presentations to the co-PIs of our collaborative grants. The Scholar will be encouraged to submit abstracts to national meetings such as the Biomedical Engineering Society Annual meeting and other national, regional, and local conferences. We will work together on abstract and manuscript writing, and as their research progresses; I will continue to provide critical feedback on presenting and writing skills. I make every effort to secure funding so students can attend these meetings.

Select Publications: *Undergraduate Authors are Underlined*

1. Azimi-Boulali J, Mahler GJ, Murray BT, Huang P. Multiscale computational modeling of aortic valve calcification. *Biomechanics and Modeling in Mechanobiology*. 2023, doi: 10.1007/s10237-023-01793-4.
2. Nwasike C, Purr E, Singh Naji J, Mahler GJ, Doiron AL. Incorporation of targeting biomolecule improves interpolymer complex-superparamagnetic iron oxide nanoparticles attachment to and activation of T2 MR signals in M2 macrophages. *International Journal of Nanomedicine*. 2023; 18: 473-487. doi:10.2147/IJN.S392567.
3. Bramsen JA, Alber BA, Mendoza M, Murray BT, Chen M, Huang P, Mahler GJ. Glycosaminoglycans affect endothelial to mesenchymal transformation, proliferation, and calcification in a 3D model of aortic valve disease. *Frontiers Cardiovascular Medicine*. 2022; 9:975732. doi: 10.3389/fcvm.2022.975732.
4. Brown MS, Somma L, Mendoza M, Noh Y, Mahler GJ, Koh A. Upcycling compact discs for flexible and stretchable bioelectronic applications. *Nature Communications*. 2022; 13: 3727. doi: 10.1038/s41467-022-31338-9.
5. García-Rodríguez A, Stillwell AA, Tochilovsky BV, Tanzman JV, Limage R, Kolba N, Tako E, Marques CNH, Mahler GJ. The mechanistic effects of human digestion on magnesium oxide nanoparticles: implications for probiotics *Lactobacillus rhamnosus* GG and *Bifidobacterium bifidum* VPI 1124. *Environmental Science: Nano*. 2022; 9(12): 4540-4557. doi: 10.1039/d2en00150k.

Dr. Kirsten Prior



Associate Professor

Department of Biological Sciences

Research Summary

My lab group's research aims to describe biodiversity and the relationship between biodiversity and essential ecosystem functions and services. We study drivers of patterns in biodiversity and species interactions and uncover how they are affected by anthropogenic change, including climate change, land use change, and invasive species. Our lab works on insects, organisms that are sensitive to environmental change. Researchers in the lab employ various approaches, including field collections and experiments, molecular and taxonomic work, and advanced statistics to uncover cryptic and complex relationships between insects and their environment.

Student Engagement

- *Mentored over 70 undergraduates throughout career*
- *13 active undergraduates in the lab as of Spring 2024*

Student Accomplishments

Undergraduates working with Dr. Prior have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 18*
- *External Presentations: 6*
- *Internal Presentations: 20*

Student Outcomes

Students involved in this lab continued to:

- *Columbia University*
- *Department of Natural Resources*
- *McGill University*
- *University of California, Los Angeles*
- *University of Florida*

Offered Projects

The Scholar will develop their own project based on one of the lab's pre-existing studies and learn valuable techniques such as DNA barcoding, field sample collection, and genomics. After deciding on feasible projects that suit the Scholar's interests, we will develop an experimental and data collection plan. Throughout the school year, the Scholar will perform lab work and work with me to familiarize themselves with the code-based statistical program R that is used to analyze ecological data. During the summers, the Scholar has the opportunity to collect data in the field. I will work with Scholars to create compelling presentations and present at national conferences, including the Ecological Society of America. I will work with them to publish their work in peer-reviewed journals. Scholars will also have opportunities to engage in our educational outreach programs.



Dr. Kirsten Prior | kprior@binghamton.edu

Mentor Philosophy

I am a hands-on mentor, tailoring each mentorship experience to students. I will meet with Scholars at the start of their program and provide them with reading to develop ideas that suit their interest while fitting in the scope of the lab. We will meet weekly to develop and design the Scholar's project and then work directly in the lab and the field. We will read through books to learn coding ("R Crash Course for Biologists") and writing ("The Scientist's Guide to Writing"). Scholars will attend weekly lab meetings, where we will read literature about topics related to biodiversity and global change and other issues related to academia, such as engaging in ethical science, learning data practices, and applying to graduate school. Scholars may also have a graduate student mentor (depending on the project), thereby providing additional engagement in all aspects of their project and experience.

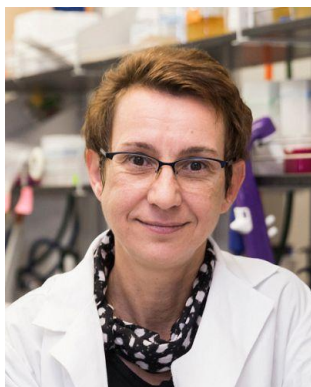
Research Preparation

Scholars will prepare for graduate-level research by engaging in independent research, from formulating the idea to writing and submitting a manuscript. I will guide them in designing their work to be published in a high-quality peer-reviewed journal. Students will be encouraged to attend Department reading groups and seminars, engage in outreach activities – including in leadership roles (e.g., we run an annual BioBlitz), and attend our department's "hacky hours." I will encourage and support them in applying for fellowships and grants and with presenting at conferences. After their first summer, I will encourage them to have an undergraduate assistant helping with their project, where they will gain project management and mentorship experience. I will also encourage them to participate in our primary association's undergraduate program, the ESA SEEDS program.

Select Publications: *Undergraduate Authors are Underlined*

1. Prior KM, Jones DG, Meadley-Dunphy SA, Lee S, Milks AK, Daughton S, Forbes AA, Powell THQ. 2023. Host-enemy interactions provide limited biotic resistance for a range-expanding species via reduced apparent competition. Diversity & Distributions doi.org/10.1111/ddi.13763
2. Buono CM, Lofaso J, Smisko WR, Gerth C, Santare J, Prior KM. 2023. Historical forest disturbance results in variation in functional resilience of seed dispersal mutualisms. Ecology. doi.org/10.1002/ecy.3978
3. Jones DG, Kobelt, J, Ross JM, Powell THQ, Prior KM. 2022. Latitudinal gradient in species diversity provides high niche opportunities for a range-expanding phytophagous insect. Journal of Animal Ecology. doi.org/10.1111/1365-2656.13780
4. Buono CM, Quartuccia GI, Smisko WR, Lupinski AJ, Radin AQW, Powell THQ, Prior KM. 2022. Uncovering how behavioral variation underlying interchangeability of mutualist partners is distributed across a species complex of seed-dispersing ants. Insectes Sociaux doi.org/10.1007/s00040-022-00865-5
5. Parker WJ, Buono CM, Prior KM. 2021. Antagonistic and mutualistic interactions alter seed dispersal at forest edges. Ecosphere 12:e03397

Dr. Karin Sauer



Chair and Professor

Department of Biological Sciences

Student Engagement

- *Mentored over 80 undergraduates since 2002*
- *10 active undergraduates in the lab as of Spring 2024*
- *Supervised 9 honors thesis*
- *Mentored a Beckman Scholar*

Student Accomplishments

Students working with Dr. Sauer have accomplished the following:

- *Accumulated time in lab: 19+ months*
- *Co-authored articles published: 4*
- *External Presentations: 5*
- *Internal Presentations: 9*

Student Outcomes

Students involved in this lab continued to:

- *PhD programs*
- *MS programs*

Research Summary

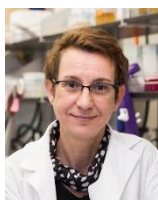
My research has focused on microorganisms that form biofilms with the goal of identifying ways to control and manage biofilms and their resistance to antimicrobial agents. Some of my other projects include:

1. The role of the SagS interactome in biofilm antibiotic tolerance,
2. Biofilm antibiotic tolerance and oxidative stress,
3. Effectors and regulators modulating biofilm antibiotic tolerance,
4. Elucidating the mechanism of biofilm dispersion and its effect on antibiotic resistance and virulence,
5. Persistence of the dispersion phenotype.

A former Beckman Scholar investigated how peptidomimetic polyurethanes (PPs) prevent biofilm formation by *Pseudomonas aeruginosa*.

Offered Projects

The Scholar will receive training that will enable them to become proficient with aseptic techniques, biofilm growth conditions, molecular techniques including PCR, real-time PCR, cloning, and gene manipulation, as well as biochemical techniques including protein extraction and immunoblotting. The Biofilms center holds regular training workshops that will also be available to the Beckman Scholar as they begin immersing themselves in the lab. In addition to laboratory techniques, students in my lab are taught quantitative data analysis and statistics, and a Beckman Scholar would be expected to become proficient with these skills as well. The Scholar will eventually start working independently on a small project.



Dr. Karin Sauer | ksauer@binghamton.edu | (607) 777-3157

Mentor Philosophy

The Beckman Scholar will be expected to participate in our weekly lab meeting which is a forum for presenting research findings, problems, and discussion of potential pitfalls and solutions. This allows students the opportunity to not only present their own findings, but participate in scientific discussions as well as obtain an overview of the diverse ongoing research projects. In addition to the lab training, I meet with all members of the lab at least once a week in discussion about background, research findings, troubleshooting, and plans for the next step in their project.

Research Preparation

The weekly mentorship discussions with the Beckman Scholar will frequently include career planning, guidance with scientific writing and presentations, and development of hypotheses. I believe that the combination of hands-on training, weekly group meetings, and individual meetings provide a solid intellectual environment for students to flourish and succeed but also to experience up close graduate level research and future leadership roles in scientific research and innovation.

Select Publications: *Undergraduate Authors are Underlined*

1. Park, S., J. Dingemans, M. Gowett, and K. Sauer. Glucose-6-phosphate acts as an extracellular signal of SagS to modulate *Pseudomonas aeruginosa* c-di-GMP levels, attachment and biofilm formation. *mSphere* 6:e01231-01220.
2. Tao, T., I.-T. Bae, K.B. Woodruff, K. Sauer, and J. Cho. 2019. Hydrothermally- Grown Nanostructured Anatase TiO₂ Coatings Tailored for Photocatalytic and Antibacterial Properties. *Ceramics International* 45: 23216-23224.
3. Dingemans, J., Al-Feghali, R. E., H. Sondermann, and K. Sauer. 2019. Signal sensing and transduction is conserved between the periplasmic sensory HmsP domains of BifA and SagS. *mSphere* 4: e00442-19.
4. Goodwine, J., J. Gil, A. Doiron, J. Valdes, M. Solis, A. Higa, S. Davis, and K. Sauer. 2019. Pyruvate-depleting conditions induce biofilm dispersion and enhance the efficacy of antibiotics in killing biofilms in vitro and in vivo. *Scientific Reports* 9, 3763.
5. Dingemans, J., Al-Feghali, R. E., Lau, G. W. and K. Sauer. 2019. Controlling chronic *Pseudomonas aeruginosa* infections by strategically interfering with the sensory function of SagS. *Molecular Microbiology* 111, 1211-1228, doi:10.1111/mmi.14215.

Dr. Adam Session



Assistant Professor

Department of Biological Sciences

Student Engagement

- *Mentored 7 undergraduates throughout career*
- *1 active undergraduate in the lab as of Spring 2024*

Student Accomplishments

Students working with Dr. Session have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *External presentations: 1*
- *Internal presentations: 1*

Student Outcomes

Students involved in this lab continued to:

- *Medical School*
- *PhD programs*

Research Summary

My genomics lab's research program explores the origin and evolution of polyploid genomes and uses these natural experiments to answer questions about diploid genome evolution.

Offered Projects

There are currently two primary projects in my lab; (1) studying the evolution of polyploid *Xenopus* genomes with a focus on repetitive element evolution and describing the decay of pseudogenes and (2) studying the evolution of duplicate genes in human that originated during the ancient vertebrate polyploidy events. Students interested in studying the *Xenopus* polyploidy require a stronger programming background as the most of the analysis requires novel scripts, while studying the ancient vertebrate genome duplications is part literature search and part coding as we download existing data sets to ask questions about gene expression in a developed pipeline.



Dr. Adam Session | asession@binghamton.edu

Mentor Philosophy

Currently, I run a small hands-on lab and meet weekly with each student one-on-one to discuss both the science and technical computational details to ensure their advancement. In addition, we run a weekly lab meeting to either discuss data when available, or more often currently, we use the meeting as a journal club to discuss papers and pipelines that are useful. I would expect the same weekly meeting schedule with the Beckman scholar to guide their scientific and technical development.

Research Preparation

The Beckman Scholar would be prepared for a graduate level research role by leading their own graduate level research project that is similar to the introductory projects my PhD students begin with. The work is designed to be scientifically rigorous while allowing learning of the basics of programming. Even if the student does not want to pursue a career in computational biology, learning the details of the analysis steps will enable them to improve their experimental design and analysis skills. In addition to research, the literature the Scholar will read and discuss for their project and during lab meetings will prepare them to communicate complex ideas, a necessity for a successful scientific career. The scholar will also attend departmental activities, such as the seminars and Evolution/Ecology journal club, as well as participate in presenting papers at the journal club. These activities will help develop both their scientific and leadership skills.

Select Publications: *Undergraduate Authors are Underlined*

1. Chapman, J.A., Mascher, M., Buluç, A., Barry, K., Georganas, E., Session, A., Strnadova, V., Jenkins, J., Sehgal, S., Olikar, L., 2015. A whole-genome shotgun approach for assembling and anchoring the hexaploid bread wheat genome. *Genome biology* 16, 1–17.
2. Session, A.M., Uno, Y., Kwon, T., Chapman, J.A., Toyoda, A., Takahashi, S., Fukui, A., Hikosaka, A., Suzuki, A., Kondo, M., Mozaffari, S., et al. 2016. Genome evolution in the allotetraploid frog *Xenopus laevis*. *Nature* 538, 336–343.
3. Miller, K.E., Session, A.M., Heald, R., 2019. Kif2a scales meiotic spindle size in *Hymenochirus boettgeri*. *Current Biology* 29, 3720–3727.
4. Mitros, T., Lyons, J.B., Session, A.M., Jenkins, J., Shu, S., Kwon, T., Lane, M., Ng, C., Grammer, T.C., Khokha, M.K., 2019. A chromosome-scale genome assembly and dense genetic map for *Xenopus tropicalis*. *Developmental biology* 452, 8–20.
5. Gordon, S.P., Contreras-Moreira, B., Levy, J.J., Djamei, A., Czedik-Eysenberg, A., Tartaglio, V.S., Session, A., Martin, J., Cartwright, A., Katz, A., 2020. Gradual polyploid genome evolution revealed by pan-genomic analysis of *Brachypodium hybridum* and its diploid progenitors. *Nature Communications* 11, 3670.

Dr. John Swierk



Associate Professor

Department of Chemistry

Research Summary

Research in my group primarily focuses on photochemistry, the use of light to drive chemical reactions. Our work often revolves around asking the question, “How does this work?” with applications ranging from why light causes tattoos to fade to how light-driven pharmaceutical reactions work to how we can use electricity to recycle rubber. Undergraduate research and development are also core pillars of the work we do. Common examples of these techniques include, transient laser spectroscopy, electrochemistry, NMR spectroscopy, and steady state photochemical measurements. A former Beckman scholar developed an independent project focused on the synthesis of light-absorbing uranium complexes.

Student Engagement

- *Mentored 50 undergraduates since 2018*
- *Mentored a Beckman Scholar*
- *18 active undergraduates in the lab as of Spring 2024*

Student Accomplishments

Undergraduates working with Dr. Swierk have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 9*
- *External Presentations: 5*
- *Internal Presentations: 23*
- *NSF Graduate Research Fellowship Honorable Mention*
- *Goldwater Scholarship, Binghamton President’s Award*
- *Summer Scholars and Artists awards (7; Binghamton University)*
- *Awards for outstanding chemistry majors (11)*

Offered Projects

As part of the Scholar Mentorship Plan, (SMP), new Scholars in my group will initially join an existing project to learn and contribute to. Students initially focus on learning one or two techniques in detail. For example, many new undergraduates in the lab learn to make quantum yield measurements, which relate to the amount of product generated by a given amount of light. Making these measurements familiarizes the students with the lab space, allows them to contribute to an ongoing project, and introduces them to analytical tools. Besides becoming more familiar with the lab, the incoming students gain peer mentorship and often earn an authorship on the resulting publication. After training during the first summer, the Scholar will transition to an independent project that utilizes techniques they have already mastered and requires them to both learn a wider range of techniques and take ownership of the project.



Dr. John Swierk | jswierk@binghamton.edu | (607) 777-2013

Mentor Philosophy

Mentorship in my group takes several different forms. As noted above, peer mentorship is a key component of training in my lab. In addition, I schedule one-on-one meetings with students every one to two weeks that complement informal discussions in the lab. We also hold weekly subgroup meetings, where all of the students working in a particular project area present and discuss their results from the week and their plans for the next week. All of these interactions will work to strengthen the Beckman Scholar's scientific understanding of both their project and related work in the lab. Finally, we have a weekly group meeting involving all of the members of the lab.

Research Preparation

The focus of each weekly full group meeting is entirely professional development. We will spend several weeks discussing, for example, how to design an effective presentation or how to improve as a scientific writer. During the summer, we will typically invite guests from a variety of career paths (e.g., industry, publishing, national labs) to talk about their career and the route they took to get there. We also devote at least one group meeting to a discussion of what's involved in applying to graduate school and how to be successful once there. All of these efforts will be incorporated into the SMP for a Beckman Scholar. A former Beckman scholar developed an independent project focused on the synthesis of uranyl complexes that aligns with his long-term plans to pursue a PhD in synthetic chemistry.

Select Publications: *Undergraduate Authors are Underlined*

1. K. Moseman, A. Ahmed, A. Ruhren, J.R. Swierk. What's in my ink: Characterization of tattoo inks in the American market. *Anal. Chem.* 2024, 96, 3906-3913.
2. M. Spicuzza; S.P. Gaikwad; S. Huss; A. Lee; C.V. Craescu; A. Griggs; J. Joseph; M. Puthenpurayil; W. Lin; C. Matarazzo; S. Baldwin; V. Perez; D.A. Rodriguez-Acevedo; J.R. Swierk; E. Elacqua. Visible-Light-Mediated Diels-Alder Reactions Under Single- Chain Polymer Confinement: Investigating the Role of the Crosslinking Moiety on Catalyst Activity. *Polymer Chem.* 2024, 15, 1833-1838.
3. E.D. Talbott; N.L. Burnett; J.R. Swierk. Mechanistic and Kinetic Studies of Visible Light Photoredox Reactions. *Chem. Phys. Rev.* 2023, 4, 031312.
4. B.G. Stevenson; A. V. Prascak; A.A. Lee; E.D. Talbot; L.A. Fredin; J.R. Swierk. Enhanced Basicity of an Electron Donor-Acceptor Complex. *Chem. Commun.* 2023, 59, 2943-2945.
5. B.G Stevenson; C. Gironda; E.D. Talbott; A.V. Prascsak; R.V. Nakhmiyayev; L.A. Fredin; J.R. Swierk. Photoredox Product Selectivity Controlled by Persistent Radical Stability. *J. Org. Chem.* 2023, accepted.

Dr. Florence Varodayan



Assistant Professor

Department of Psychology

Research Summary

My lab's research program is focused on understanding how alcohol and stress impact brain synapses and circuits to promote alcohol use disorder. We are particularly interested in the medial prefrontal cortex region of the brain as it regulates mood and motivation. We use a mouse model of alcohol use disorder and a systems biology approach that includes molecular biology, slice electrophysiology, chemogenetics, and behavioral pharmacology techniques. Our ultimate goal is to provide better treatment for patients suffering from comorbid alcohol- and anxiety/stress-related psychiatric diseases.

Student Engagement

- *Mentored 1 Bridges to Baccalaureate Program student*
- *Mentored 22 undergraduates, including McNair and CSTEP scholars*
- *7 active undergraduates in the lab as of Spring 2024*
- *7 mentees completed Honors theses in the lab*

Student Accomplishments

Students working with Dr. Varodayan have accomplished the following:

- *Accumulated time in lab: 10-18 months*
- *Co-authored articles published: 4*
- *External Presentations: 3*
- *Internal Presentations: 7*

Offered Projects

When undergraduate students join my lab, they spend 3-4 months building general laboratory skills, such as mouse handling, solution-making, running ethanol drinking experiments, scoring behavioral data, and performing dissections. After mastering these skills, they join specific projects based on their interests. Students interested in working with mice learn behavioral tests, while those inclined towards molecular biology are trained in real-time PCR or immunofluorescence. For Beckman Scholars, I develop comprehensive independent projects that span their entire time in the lab as part of the Scholar Mentorship Plan (SMP). Scholars learn to use scientific databases and are trained in various techniques like slice electrophysiology and real-time PCR, enabling them to address more complex research questions. They participate in all stages of research, from experimental design to data collection and statistical analysis, gaining a deeper understanding of their project's goals and limitations.



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Mentor Philosophy

For the Scholar to achieve this rapid progress towards independence, I will mentor and be available on a day-to-day basis and through weekly one-on-one meetings. During the first summer (and as needed throughout the program), I will also provide the Scholar with hands-on training. The Scholar will also be able to learn from and work with my graduate students, lab technician, and postdoctoral fellow. They will also have the opportunity to continue on in my lab throughout the rest of their undergraduate studies, in which case I will encourage them to conduct a Senior Honors Thesis during their final year. Thus, I will support all aspects of the Beckman Scholars academic career development during their time in the lab, including their learning of new techniques and conceptual approaches, experimental progress, timely presentation and publication of data, submission of research award applications, and networking and engagement at scientific conferences.

Research Preparation

Most importantly, to help the Scholar clarify their research skills, interests, and career goals, I will work with them to complete an Individual Development Plan (IDP; <http://myidp.sciencecareers.org/>). While IDPs are more commonly used to measure graduate student progress, they can easily be adapted to make them more suitable for tracking the Scholar's successes, difficulties, and how their research goals and career plans may evolve. By regularly updating the IDP, we will also be able to identify specific opportunities that can help the Scholar develop their own leadership and mentoring skills. For example, during their second summer in the program, the Scholar may be interested in mentoring a student through our campus Bridges to the Baccalaureate Program. Alternatively, they may want to attend a professional development workshop focused on scientific research and innovation and/or take a class in Python programming language.

Select Publications: *Undergraduate Authors are Underlined*

1. Sicher AR, Liss A, Vozella V, Seemiller LR, Springer M, Starnes WD, Griffith KR, Smith GC, Astefanous A, Roberto M, Varodayan FP, Crowley NA. (2024). Voluntary adolescent alcohol exposure does not increase adulthood consumption of alcohol in multiple mouse and rat models. *bioRxiv* 2024.04.30.591674.
2. Siddiqi MT, Podder D, Pahng AR, Athanason AC\$, Nadav T, Cates-Gatto C, Kreifeldt M, Contet C, Roberts AJ, Edwards A, Roberto M, Varodayan FP. (2023). Prefrontal cortex glutamatergic adaptations in a mouse model of alcohol use disorder. Online ahead of print. *Addiction Neuroscience*.
3. Athanason AC, Nadav T, Cates-Gatto C, Roberts AJ, Roberto M, Varodayan FP. (2023). Chronic ethanol alters adrenergic receptor gene expression and produces cognitive deficits in male mice. *Neurobiol Stress*, 27;24:100542.
4. Varodayan FP, Patel RR, Matzeu A, Wolfe SA, Curley DE, Khom S, Gandhi PJ, Rodriguez L, Bajo M, D'Ambrosio S, Sun H, Kerr TM, Gonzales RA, Leggio L, Natividad LA, Haass-Koffler CL, Martin-Fardon R, Roberto M. (2022). The Amygdala Noradrenergic System Is Compromised With Alcohol Use Disorder. *Biological Psychiatry*, 91(12):1008-1018.
5. Warden AS, Wolfe SA, Khom S, Varodayan FP, Patel RR, Steinman MQ, Bajo M, Montgomery SE, Vlkolinsky R, Nadav T, Polis I, Roberts AJ, Mayfield RD, Harris RA, Roberto M. (2020). Microglia Control Escalation of Drinking in Alcohol-Dependent Mice: Genomic and Synaptic Drivers. *Biological Psychiatry*, 88(12):910-921.