THE LEADING EDGE

BCDB Newsletter *Winter 2022/23*

Congratulations to the 2022-2023 BCDB executive committee and thank you to those who have served previously!

Director: Christine Dunham, Ph.D.
Director of Graduate Studies: Larry Boise, Ph.D.
Director of Recruitment: Jennifer Kwong, Ph.D.
Rotations: Guy Benian, M.D.
BCDB Curriculum: Homa Ghalei, Ph.D.
Senior Student Progression: Dorothy Lerit, Ph.D.
Examinations: Andreas Fritz, Ph.D.
Faculty Compliance and Membership: Graeme Conn, Ph.D.
Communications: Bo Liang, Ph.D.
Diversity Equity & Inclusion (DEI): Hyojung Choo, Ph.D.

Important dates:

Recruitment

Accepted student visit (NEW DATES): March 17-18, 2023

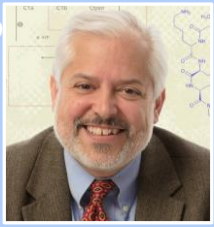
Social Committee

DEI X Social Committees: Taste of BCDB: March 1st1PM(after advanced seminar); https://forms.gle/fECYopRUQR4qQDyL8

LGS Professional Development and Career Planning

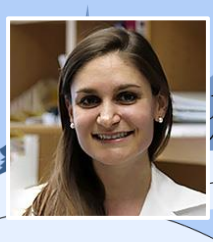
Workshops for graduate students: Several dates and topics are provided at the provided link including presentations by some of our faculty members. Some topics include **Planning Your Postdoc**, **Funding Mechanisms Available to Grad Students**, and **A View Inside the Academic Job Market for Graduate Students**
https://www.trumba.com/calendars/emory_LGS_professional_development

Faculty Spotlight



Nael McCarty, PhD, has joined the Emory faculty twice: first in 1994, as Assistant Professor of Physiology, then again in 2007, as Associate Professor of Pediatrics. From 2001-2007, he was Associate Professor of Biology at Georgia Tech. He now is Marcus Professor of Cystic Fibrosis (CF), and Director of CF@LANTA: the Emory+Children's CF Center of Excellence. Dr. McCarty has studied CF from the molecular level through clinical research. He is best known for studies of CFTR, the protein defective in this genetic disease, using high-resolution electrophysiological approaches to understand the function of this unique protein in the wildtype protein, how disease-associated mutations affect its function, and how new therapeutics can recover function. His lab now focuses primarily on CF-related diabetes, the second most-common comorbidity facing people with CF, and his team has uncovered mechanisms by which mutant CFTR impacts barrier function, glucose handling, and insulin-mediated signaling in airway epithelial cells. He is a co-founder of the Atlanta Society of Mentors.

Joshua Chandler, Ph.D. joined the ranks of Emory faculty in 2017, when he accepted a position in the Department of Pediatrics, Division of Pulmonary, Allergy & Immunology, Cystic Fibrosis and Sleep. His research is focused on the role of metabolites at the interface of inflammatory cells and the lung airway environment, including airway fluid, host cells, and microbes. A major and longstanding interest is the role of myeloperoxidase, a protein abundant in neutrophils that can produce oxidant hypochlorous acid, on early-stage cystic fibrosis lung disease. Other research areas include asthma, tuberculosis, and COVID-19. Dr. Chandler's focus on pathological mechanisms of inflammation led to the development of a rigorous, state-of-the-art mass spectrometry pipeline for metabolomic profiling of clinical specimens and translational samples. This platform enables metabolite profiling of >500 species validated by the lab with reference standards, novel metabolite discovery using MS and MS/MS spectral matching, and isotope tracing. In addition to research, Dr. Chandler greatly enjoys teaching and mentoring. One of his greatest joys in research is witnessing a hard-working trainee become a bona fide topic expert in redox and metabolism research.



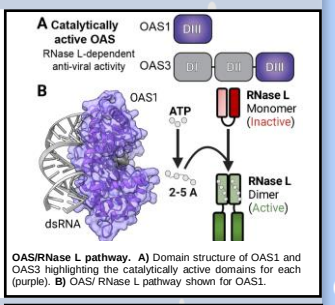
Lindsey Seldin, Ph.D. joined the Emory faculty in 2022 as an Assistant Professor in the Department of Cell Biology with a secondary appointment in Dermatology. Dr. Seldin's research focuses on the role of stem cells in epithelial tissue development, homeostasis, and cancer. Her lab applies transgenic mouse models, 3-D organoids, confocal imaging, and RNA sequencing to understand how the microenvironment modulates stem cell function in the epidermis and mammary gland. Dr. Seldin is currently serving on the BCDB Admissions Committee.

Our students make great discoveries

Alejandro Oviedo
Conn Lab, 3rd Year

My research is focused on uncovering the mechanism by which a cellular RNA with a complex tertiary structure (nc886) has in regulating 2',5'-oligoadenylate synthetase (OAS1 and OAS3) activity. My goals are to define the RNA sequence(s) necessary for forming the nc886 apical-stem tertiary structure, to define how OAS proteins bind to nc886, and to determine the first high-resolution structures of the OAS1-nc886 and OAS3-nc886 complexes. My research will add to our understanding how cellular RNAs can modulate the activity of an important component of the innate immune system in the absence of infection.

In addition to my research, I enjoy serving as president of the Latinx Graduate Student Association (we aim to build a supportive community that enables Latinx students excel in graduate school) and representing BCDB graduate students in the BCDB Executive Committee.

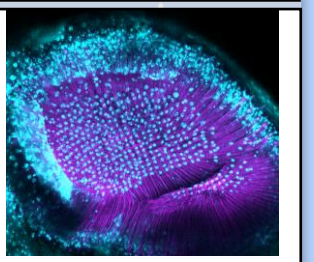


OAS/RNase L pathway. A) Domain structure of OAS1 and OAS3 highlighting the catalytically active domains for each (purple). **B)** OAS/ RNase L pathway shown for OAS1.

Kate Hardin
Zhang Lab, 4th Year

My research focuses on studying the regulation of axon guidance, specifically focusing on the role of an actin bundling protein called fascin1. I investigate how fascin1 interacts with the actin cytoskeleton to drive the precise, directed migration of growth cones in response to external guidance cues to form complex neural networks. I utilize both an *in vitro* cultured neuron system and an *in vivo* Drosophila model to examine the role of fascin1 at the single cell and organismal levels, respectively.

Outside of lab, I have helped run BCDB recruitment for the past couple of years as well as serving as the president of the BCDB social committee for one year.

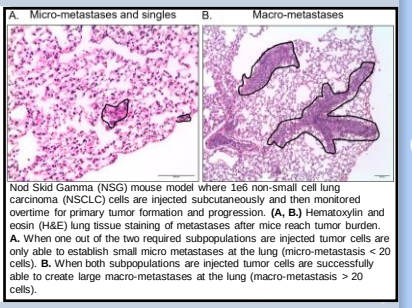


Phalloidin and DAPI staining of the Drosophila compound eye shows the organization of rhabdomeres that make up each visual unit, called an ommatidium.

Tala Khatib
Marcus Lab, 5th Year

Tumors are comprised of cellular subpopulations that can cooperate to drive tumor progression and metastasis. Metastasis accounts for 90% of all cancer-related deaths, highlighting the need to understand how cancer spreads throughout the body. My goals are to determine which tumor cell subpopulations drive metastatic disease and elucidate which pathways promote a specialized metastatic advantage within these select subpopulations. Thus far, I have identified two subpopulations necessary for metastasis within a subtype of lung cancer and am on the verge of determining the mechanisms underlining this phenotype.

From interview weekend until now, BCDB has been a warm and welcoming atmosphere. I love getting to know faculty at formal and informal events and am grateful for the lifelong friendships I have made.

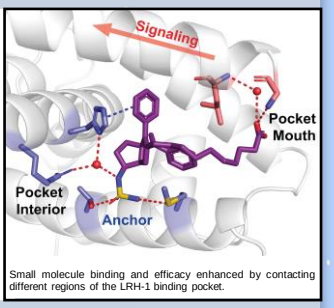


Nod Skid Gamma (NSG) mouse model where 1e6 non-small cell lung carcinoma (NSCLC) cells are injected subcutaneously and then monitored overtime for primary tumor formation and progression. **(A, B.)** Hematoxylin and eosin (H&E) lung tissue staining of metastases after mice reach tumor burden. **A.** When one out of the two required subpopulations are injected tumor cells are only able to establish small micro metastases at the lung (micro-metastasis < 20 cells). **B.** When both subpopulations are injected tumor cells are successfully able to create large macro-metastases at the lung (macro-metastasis > 20 cells).

Michael Cato
Ortlund Lab, 6th Year

My research focuses on a transcription factor called LRH-1, which regulates genes implicated in several physiological and pathophysiological processes, ranging from liver lipid metabolism to breast cancer. By making structure-guided modifications to an early LRH-1 synthetic ligand, we have been able to develop molecules that increase and decrease target gene expression. The resulting compounds are useful tools for exploring LRH-1 biology and targeting LRH-1 in disease contexts.

My greatest passion is exploring molecular mechanisms that drive large-scale biological processes and teaching related concepts to students. I also like strength training, running, movies, and video games. What I enjoy most about BCDB is the collaborative environment fostered by first-year courses and student-led seminars.



Small molecule binding and efficacy enhanced by contacting different regions of the LRH-1 binding pocket.

Congratulations to our 3rd years on reaching candidacy and receiving their white coats!

Left to right: Hannah Hrncir, Lexi Snyder, Heidi Ulrichs, Monica Cortez, Will McFadden, and Yasmin Ibrahim. *Not pictured:* Alejandro Oviedo, Lauren Askew, Levi Gifford, and Sarah Mansour.

Publications and awards

- Congrats to Emily Legan (Li Lab) on her first author paper published in *Blood!* Type 2B von Willebrand disease mutations differentially perturb autoinhibition of the A1 domain. Legan ER, Liu Y, Arce NA, Parker ET, Lollar P, Zhang XF, Li R. Type 2B von Willebrand disease mutations differentially perturb autoinhibition of the A1 domain. Blood. 2022:blood.2022017239. doi: 10.1182/blood.2022017239.
- Congrats to Sara Sagadiev (Melikian Lab) on her co-first author paper published in *Autophagy*! Transcriptomic analysis of pathways associated with ITGAV/alpha(v) integrin-dependent autophagy in human B cells. Muir V, Sagadiev S, Liu S, Holder U, Armendariz AM, Suchland E, Meitlis I, Camp N, Giltiay N, Tam JM, Garner EC, Wivagg CN, Shows D, James RG, Lacy-Hulbert A, Acharya M. Transcriptomic analysis of pathways associated with ITGAV/alpha(v) integrin-dependent autophagy in human B cells. Autophagy. 2022:1-17. doi: 10.1080/15548627.2022.2113296.
- Congrats to Will McFadden (Sarafianos Lab) on his middle author paper published in *iScience*! Activation of HIV-1 proviruses increases downstream chromatin accessibility. Shah R, Gallardo CM, Jung YH, Clock B, Dixon JR, McFadden WM, Majumder K, Pintel DJ, Corces VG, Torbett BE, Tedbury PR, Sarafianos SG. Activation of HIV-1 proviruses increases downstream chromatin accessibility. iScience. 2022;25(12):105490. Epub 2022/12/13. doi: 10.1016/j.isci.2022.105490. PubMed PMID: 36505924; PMCID: PMC9732416.
- Congrats to Sara Sagadiev (Melikian Lab) on her second author paper published in *Cells!* Autophagy Induced by Toll-like Receptor Ligands Regulates Antigen Extraction and Presentation by B Cells. Lagos J, Sagadiev S, Diaz J, Bozo JP, Guzman F, Stefani C, Zanlungo S, Acharya M, Yuseff MI. Autophagy Induced by Toll-like Receptor Ligands Regulates Antigen Extraction and Presentation by B Cells2022;11(23):3883. PubMed PMID: doi:10.3390/cells11233883.
- Congrats to Maria Sterrett (Corbett Lab) on her first author paper published in *BioRxiv*! In vivo Characterization of the Critical Interaction between the RNA Exosome and the Essential RNA Helicase Mtr4 in Saccharomyces cerevisiae. Sterrett MC, Farchi D, Strassler SE, Boise LH, Fasken MB, Corbett AH. *In vivo* Characterization of the Critical Interaction between the RNA Exosome and the Essential RNA Helicase Mtr4 in *Saccharomyces cerevisiae*. 2022:2022.10.31.514520. doi: 10.1101/2022.10.31.514520 %J bioRxiv.
- Congrats to Felipe Takaesu (Davis Lab) on his first author paper published in *JBC*! Computational analysis of serum-derived extracellular vesicle miRNAs in juvenile sheep model of single stage Fontan procedure. Park H-J, Kelly JM, Hoffman JR, Takaesu F, Schwartzman W, Ulziibayar A, Kitsuka T, Heuer E, Yimit A, Malbrue R, Anderson C, Morrison A, Naguib A, McKee C, Harrison A, Boe B, Armstrong A, Salavitabar A, Yates A, Shinoka T, Carrillo S, Breuer CK, Davis ME. Computational analysis of serum-derived extracellular vesicle miRNAs in juvenile sheep model of single stage Fontan procedure. Extracellular Vesicle. 2022;1:100013. doi: https://doi.org/10.1016/j.vesic.2022.100013.
- Congrats to Will McFadden on his recent NIH NRSA F31 fellowship award!

Careers after BCDB

Maria Cilento, Ph.D

Dr. Maria Cilento *graduated from Dr. Stefan Sarafianos's lab in 2022 and recently began a career in industry at Merck. We are grateful to Maria for offering her feedback on her new career and congratulate our many BCDB alumni as they make a difference in the world.*

Job title: Senior scientist at Merck

Useful skills acquired during Maria's Ph.D.: Generally, critical thinking and assay development skills. I think those will help you anywhere. Specifically, I work mostly with small molecules/drug discovery for various viruses. The Sarafianos lab really prepared me for these topics.

Interview process: For Merck, its typically a meeting with HR (~ 10-20 minutes), a meeting with the hiring manager, then Merck flew me out for a dinner and a day long interview (45-minute seminar with 15 minutes of questions) followed by 4-5 hours of interviews (30 to 45 minutes each). Some do zoom-based interviews and some have more rounds than that. It just depends on the company. Two smaller companies I interviewed for had a similar layout, except they were zoom-based on the "long interview" day and then I had a final round with the chief strategy officer (CSO).

Recommendations to prepare for a career in industry: I don't think there is a one size fits all but, in my opinion, working hard, networking, and building/fostering those connections is important. Also, find a good mentor that supports your journey to industry. Also, practice interviewing. Your connections help you get the interview/get your foot in the door, but after that, most of the interview is how well your talk goes (did they understand it? were your experimental goals and conclusions clear?), how well did you answer their questions?

Excitement moving forward: Industry is a whole new field, understanding how it works is so interesting. All the technology and resources we have to do experiments is also awesome.

Acknowledgements

Communications committee is recruiting! If you are interested in joining communications committee please contact Hannah Hrncir at hhrncir@emory.edu.

Many thanks to our faculty who volunteer to teach courses and overall work hard to ensure the success of their trainees.

This newsletter was written and compiled by Dr. Bo Liang, Paul Zakutansky, and Hannah Hrncir.

@EmoryBCDB BCDB Website

Dr. Maria Cilento graduated from BCDB in 2022 and began a job at Merck. Congrats Maria!