

**BIOGRAPHICAL SKETCH**

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NAME: Marc Avery McLeod

eRA COMMONS USER NAME (credential, e.g., agency login): MARC.MCLEOD

POSITION TITLE: Graduate Student Research Assistant

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	START DATE MM/YYYY	END DATE MM/YYYY	FIELD OF STUDY
University of North Florida	BS	08/2014	04/2018	Biology
University of North Florida	BS	08/2014	04/2018	Chemistry
University of Florida	PHD	08/2018	TBD	Biomedical Sciences

**A. Personal Statement**

My current research goals are focused on developing and applying novel techniques for studying Non-alcoholic fatty liver disease (NAFLD) and its associated morbidities. Towards this end I am undertaking a Ph.D. in Biomedical Sciences with a concentration of Biochemistry and Molecular Biology in order to become an independent research scientist. After completion of my Ph.D. I want to continue my research into metabolic disease and develop translational insights into the inter-organ etiology of insulin resistance and hyperlipidemia for future remediation efforts.

During my undergraduate studies I cemented a stable foundation in molecular biology and analytical techniques for assessing disease etiology. Throughout my 3<sup>rd</sup> and 4<sup>th</sup> year of Undergraduate I conducted research in the Dr. David Waddell lab. During this time, I studied debilitating muscular atrophy through the lens of molecular genetics. In doing so I learned to develop and use reporter constructs in cell culture for the analysis of DNA regulatory elements and subcellular localization of a gene target. Using the knowledge, I had gleaned from my undergraduate research and studies I was able to prosper in my three graduate school rotations and learn new techniques and research designs that bridged multiple disciplines. I decided to join the Dr. Matthew Merritt lab as it offered expertise in metabolomics experimentation through NMR based methodologies and the opportunity to become proficient in computational methods.

Under Dr. Merritt's guidance I have developed a skill set conducive with metabolomics research and analysis. This skill set includes proficiency in NMR & MS based methodologies, the usage of various scripting languages (e.g. matlab, python, R) and modeling approaches to identify and pinpoint differences in metabolism. Using this skill set we have devised a comprehensive metabolomics-based project with direct applications to clinical diagnosis and treatment of NAFLD. In summation, the skills I have gained and will learn along with the impact

of the information I will generate through this project will provide the fuel to jumpstart my career as an independent research scientist.

## B. Positions and Honors

### Positions and Employment

2014	Refugee Sports Coach and English Tutor, Lutheran Social Services Jacksonville, FL
2015	SI Leader of Calculus, University of North Florida Academic Center for Excellence
2016-2018	Undergraduate Researcher, University of North Florida Dr. David S. Waddell Lab
2018	SI Leader of Genetics, University of North Florida Academic Center for Excellence
2017-2018	Landscape Steward, University of North Florida Ogier Gardens
2018	OPS Lab Technician, University of Florida College of Medicine
2018 -	Graduate Student Research Assistant, University of Florida College of Medicine

### Other Experience and Professional Memberships

2019-2020	American Association for the Advancement of Science (AAAS)
2020-	American Society for Biochemistry and Molecular Biology (ASBMB)

### Honors

2014 - 2018	University of North Florida Presidential Gold Scholarship
2014 - 2018	Florida Bright Futures Scholarship
2016	Phi Kappa Phi Honors Society, University of North Florida
2017 - 2018	Hicks Research Fellow, University of North Florida Hicks Honors College
2018	<b><i>Magna Cum Laude</i></b> , University of North Florida

## C. Contribution to Science

1. **Undergraduate Research:** I spent two years performing research in the laboratory of Dr. David S. Waddell at the University of North Florida with supplementary funding from the University of North Florida Hicks Honors College. Dr. Waddell has provided several insights into the cellular and genetic mechanisms which regulate muscle atrophy after denervation either from injury or old age. During my two years I used C<sub>2</sub>C<sub>12</sub> muscle cells to establish the genetic mechanisms which regulate the gene Zinc Finger Protein 593's (ZFP593's) expression. This included the construction and transfection of 3'-UTR constructs and KO mutants for the 5' promoter region E-box sequences with and without the global muscle transcription factors MyoD and Myogenin for a luciferase assay. Additionally, we confirmed the sub cellular localization of ZFP593 to the nucleus in C<sub>2</sub>C<sub>12</sub> Mouse Muscle Cells using overexpression of ZFP593 with GFP tagged to the N or C terminus of the protein. Through my work we determined several insights into the regulatory pathways that govern ZFP593 expression and its potential mode of action. I presented my findings at the 2017 and 2018 Experimental Biology Conferences as well as the 2018 University of North Florida SOARS conference. This work was continued after I left the University of North Florida and resulted in a publication on ZFP593's novel role in muscle cell differentiation.
  - a. **Marc McLeod** and David Waddell. Characterization of Zinc Finger Protein 593 (Zfp593) in Skeletal Muscle. 2017 Experimental Biology Conference. 31(S1)

- b. **Marc McLeod** and David Waddell. Characterization of Zinc Finger Protein 593 (Zfp593) in Skeletal Muscle. 2018 University of North Florida SOARS conference
  - c. **Marc McLeod** and David Waddell. Characterization of Zinc Finger Protein 593 (Zfp593) in Skeletal Muscle. 2018 Experimental Biology Conference. 32(S1)
  - d. Lynch, S.A., **McLeod, M.A.**, Orsech, H.C., Cirelli, A.M., and Waddell, D.S. Zinc Finger Protein 593 is Upregulated During Skeletal Muscle Atrophy and Modulates Muscle Cell Differentiation. *Experimental Cell Research*. 383(2) 2019. [doi.org/10.1016/j.yexcr.2019.111563](https://doi.org/10.1016/j.yexcr.2019.111563)
2. **Graduate Research:** During my rotation with the Dr. Merritt lab I worked closely with the post-doc Daniel P. Downes on the development of an NMR guided GC-MS methodology that incorporated mouse liver metabolomics and continued this project when I joined the Merritt Lab in March of 2019. In the process of continuing my work on developing an NMR-guided GC-MS methodology for liver metabolomics and quantification I developed R scripts to rapidly acquire, analyze and produce figures from both the NMR and MS peak integrated spectra. From this study I submitted an abstract to the 2020 Experimental Biology Conference and am in the process of writing a manuscript of my results. Additionally, during my time in the Dr. Merritt lab I have performed confirmatory analysis of ex-vivo perfused mouse liver metabolism after the introduction of 2-<sup>13</sup>C labeled dihydroxyacetone using both colorimetric enzymatic assays and GC-MS for a combined effort abstract submission to the 2020 experimental biology conference. Furthermore, I have generated mathematical models in the freely available matlab based simulation program Isotopomer Network Compartment Analysis (INCA) for metabolic flux analysis in mouse liver isolated mitochondria for a second author publication.
- a. **McLeod, M.A.**, Ravagan, M., Downes, D. and Merritt, M.E. (2020), Characterization of Liver Metabolism By NMR-Guided GC-MS Methodology. *The FASEB Journal*, 34: 1-1. doi:[10.1096/fasebj.2020.34.s1.09759](https://doi.org/10.1096/fasebj.2020.34.s1.09759)
  - b. Giacalone, A.G., Ragavan, M., Downes, D., **McLeod, M.**, Carter, A., Michel, K., Bankson, J.A. and Merritt, M.E. (2020), Real Time Direct Detection of  $\beta$  – hydroxybutyrate Production in Perfused Mice Livers Using HP DHA. *The FASEB Journal*, 34: 1-1. doi:[10.1096/fasebj.2020.34.s1.09768](https://doi.org/10.1096/fasebj.2020.34.s1.09768)
  - c. Muyyarikkandy, M.K., **McLeod, M.**, Maguire, M., Mahar, R., Kattapuram, N., Zhang, C., Surugihalli, C., Muralidaran, V., Vavilikolanu, K., Mathews, C.E., Merritt, M.E., Sunny, N.E. 2020. Branched chain amino acids and carbohydrate restriction exacerbate ketogenesis and hepatic mitochondrial oxidative dysfunction during NAFLD. *FASEB*. DOI: 10.1096/fj.202001495R

### **Scholastic Performance**

YEAR	COURSE TITLE	GRADE
<b>University of North Florida</b>		
2014	General Biology I	A
2014	Rhetoric and Narrative	A-
2014	Colloquium-Sport Coaches	A-
2014	Calculus II	A
2015	General Biology II	A
2015	Organic Chemistry I	A
2015	Organic Chemistry Laboratory	A
2015	Intro to Philosophy	A-
2015	Calculus-Based Physics I	A

2015	Calculus-Based Physics I Laboratory	A
2015	General Biology III	B+
2015	Organic Chemistry II	A
2015	Organic Chemistry II Laboratory	A
2015	Quantitative Analytical Chemistry	A
2015	Calculus III	A
2016	Inorganic Chemistry	A
2016	Molecular and Cellular Biology	B+
2016	Principles of Ecology	A-
2016	Calculus-Based Physics II	A
2016	Calculus Based Physics II Laboratory	A
2016	Ordinary Differential equations	A
2016	Microbial Biology	A
2016	Genetics	A
2016	Biology Sophomore Seminar	A-
2016	Physical Chemistry I	B-
2016	Molecular Basis of Inheritance	A
2016	Modern Physics	B
2016	Modern Physics Laboratory	B+
2016	Mathematical Physics	A-
2017	Experiential Learning	P
2017	Inorganic Chemistry Laboratory	A-
2017	Physical Chemistry II	B-
2017	Physical Chemistry II Laboratory	B
2017	Electronics for Scientists	B
2017	Solid State Physics	B
2017	Physiology	B
2017	Biochemistry I	B+
2017	Biochemistry Laboratory I	A
2017	Modern Analytical Chemistry	B
2017	Modern Analytical Chemistry Laboratory	A
2017	Nano Science and Nano Technology	A
2017	Developmental Biology	A
2018	Biochemistry II	A-
2018	Biochemistry II Laboratory	A
2018	Senior Seminar Practicum (Biology)	A
2018	Problem Solving in Organic Chemistry	A-
2018	Senior Seminar in Chemistry	A
2018	Directed Independent Study	A
	<b>University of Florida</b>	
2018	Advanced Metabolism	B+
2018	Mammalian Molecular Biology and Genetics	A
2018	Research/Professional Development	S
2018	BMS Research Rotation #1	S
2018	BMS Research Rotation #2	S

2019	BMS Research Rotation#3	S
2019	Advanced Physical Biochemistry	A
2019	Advanced Molecular and Cellular Biology	A
2019	Journal Club	S
2019	Responsible Conduct in Biomedical Research	A
2019	Advanced Research	S
2019	Research Discussion Biochemistry	S
2019	Molecular Structure and Dynamics of NMR	A
2019	Molecular Structure and Dynamics of NMR (Lab)	A
2019	Big Data for the Biologist	A
2019	Biochemistry Seminar	A
2019	Advanced Research	S
2020	Fundamentals of Cancer Biology	A
2020	Research Discussion Biochemistry	S
2020	Biochemistry Seminar	A
2020	Advanced Research	S
2020	Biochemistry Grant Writing	A
2020	Advanced Research	S

Grades are designated as B- 80-83% B 83-87% B+ 88-89.9% A- 90-93% A 93-100% or P or S for pass and satisfactory respectively in classes where a formal grade is not given and satisfactory participation is achieved for credit. Classes marked as – mean they are currently in progress.