



Molecular Biology
Structural Biology
Metabolomics

James B. Flanegan
Department Chair

Linda Bloom
Associate Chair

Jörg Bungert
Graduate Coordinator
BMS/BMB
CGRC-361
352-273-8098
jbungert@ufl.edu

Matthew Merritt
Associate Graduate
Coordinator
BMS/BMB
CGRC 392C
352-2948397
matthewmerritt@ufl.edu

<http://biochem.med.ufl.edu/>

<https://biomed.med.ufl.edu/about/biochemistry-and-molecular-biology/>



Biochemistry and Molecular Biology Concentration

Undeclared, Declared, and Fast-Track Students

Entering first-year students who are recruited by BMB but who plan to rotate with faculty in both BMB as well as other concentrations, will enroll in the GMS 6001 core course during the Fall semester of their first year. This will allow “**undeclared students**” to select either a BMB faculty mentor or a mentor in a different concentration after completing their three first-year rotation projects.

Entering first-year students who “**declare**” BMB as their Advanced Concentration, will have the option of taking a menu of BMB graduate courses instead of GMS 6001 during the Fall semester of their first year. This option will also apply to “**declared BMB students**” who are committed to work with a specific BMB faculty mentor (e.g., **Fast Track students**).



Biochemistry and Molecular Biology Concentration

First Year

Fall – “Undeclared” students

- “Core Course” (GMS 6001) – 5 credits
- Lab Rotation (GMS 6090) – 2 credit
- Essentials of Graduate Research & Professional Development (GMS 6003) - 1 credit
- Journal Club (BCH 6936) -1 credit

Fall – “Declared” BMB students

- Eukaryotic Molecular Biology and Genetics (BCH 5413) – 3 credits
- [Graduate Course \(Elective\)](#) 3 credits
- Essentials of Graduate Research & Professional Development (GMS 6003) 1 credit
- Lab Rotations (GMS 6090) – 1 credits
- Journal Club (BCH 6936) – 1 credit

Spring – All BMB Students

- Advanced Courses – 6 credits
 - Lab Rotations (GMS 6090) – 1 credits
 - Responsible Conduct of Biomedical Research (GMS 7003) – 1 credit
 - Journal Club (BCH 6936) – 1 credit
- <https://biomed.med.ufl.edu/about/biochemistry-and-molecular-biology/>



Biochemistry and Molecular Biology Concentration

Requirements After the First Year:

Formal coursework:

1. After completing the courses required in the Fall semester of the first year, a total of 12 credits of graduate courses at the 6000 level and above must be taken.
2. Typically, 6 of those 12 credits are taken in the Spring semester of the first year, and the remaining 6 credits are taken in the second year.
3. At least 4 of the 12 credits must be BMB Advanced Courses (BCH prefix), and at least 3 credits must be from another concentration.

BMB Journal Club (BCH 6936) – 1 credit each Fall and Spring semester

Biochemistry Research Discussion (BCH 6040) – 1 credit each Fall and Spring semester

Qualifying Exam will be taken by November 1st of the third year.

Supervised Research – Successful completion of a Ph.D. degree requires students to carry out an independent research project, write a dissertation describing this work and defend the work in a public presentation.

Supervisory Committee – By the end of the first year, students must form a supervisory committee composed of 5 faculty members including the research mentor who serves as chair of the committee. In addition to the chair/research mentor, the committee must include 2 faculty members from the BMB concentration and an external member from outside the BMB concentration.

Supervisory Committee Meetings – After passing the qualifying exam, students have regular meetings (twice a year) with members of their supervisory committees.



Biochemistry and Molecular Biology Concentration

Three Curriculum Tracks:

1. **Metabolism and Metabolomics**
2. **Molecular Biology**
3. **Structural Biology**

You can design your own course of study by mixing courses from the different tracks



Biochemistry and Molecular Biology Concentration

Metabolism Labs

Dr. Tim Garrett – Clinical applications in mass spectrometry

Dr. Michael Kilberg – Nutrient stress response

Dr. Joanna Long – Membrane structure and function

Dr. Jianrong Lu – Hypoxia and Warburg effect in cancer

Dr. Matthew Merritt – Metabolism, stable isotope tracing, magnetic resonance, and hyperpolarization

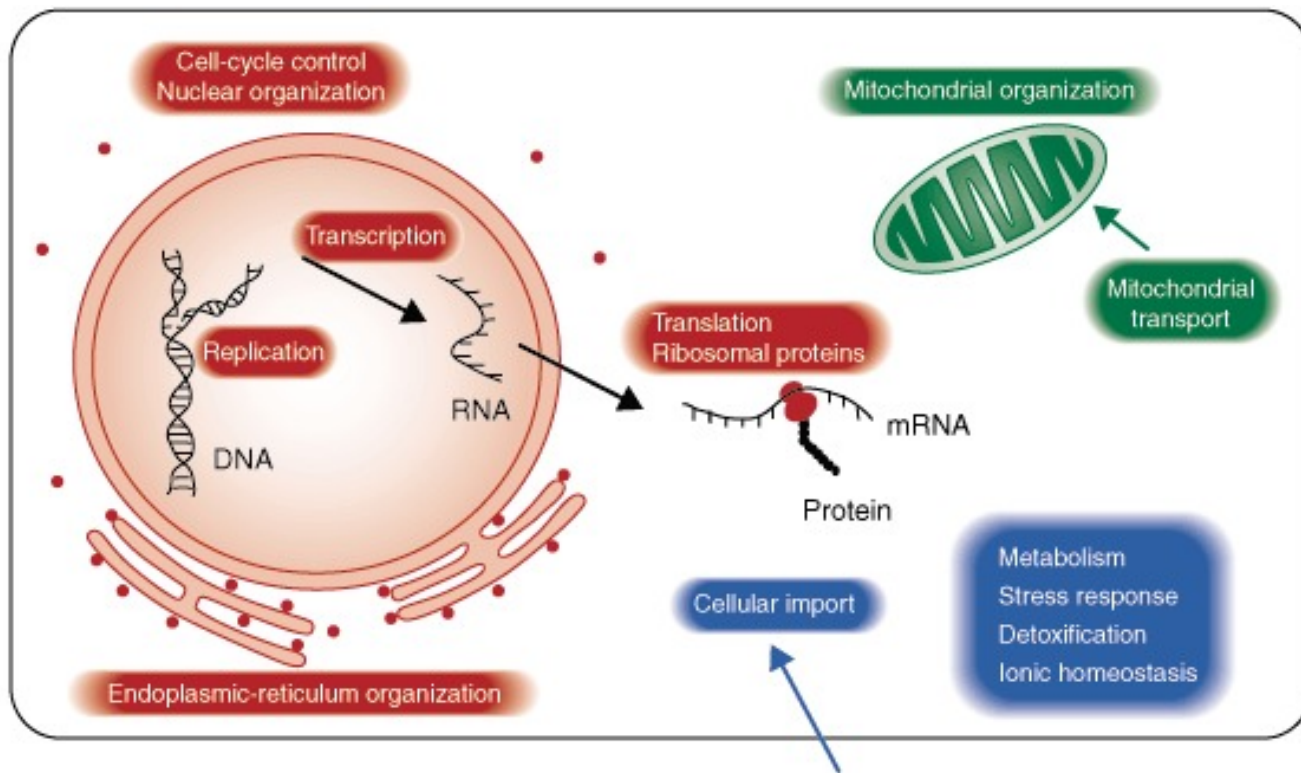
Dr. Charlie Khemtong – Characterization of cellular metabolism

May take students depending on funding situation



Biochemistry and Molecular Biology Concentration

Metabolism Labs





Metabolism Courses offered within the BMB Concentration

- BCH6206** Metabolic Control Analysis, *Fall semester*
- BCH6207** Adv. Metabolism: Role of Membranes in Signal Transduction and Metabolic Control
- BCH6208** Adv. Metabolism: Regulation of Key Reactions in Carbohydrate and Lipid Metabolism
- BCH6209** Adv. Metabolism: Regulation of Key Reactions in Amino Acid and Nucleotide Metabolism
- Others:
- BCH6107** Biophysical Techniques in Proteomics, *Spring semester*
EM(cryo), Metabolomics etc



Biochemistry and Molecular Biology Concentration

Molecular Biology Labs

Dr. Bert Flanegan – RNA virus replication

Dr. Mingyi Xie – Gene expression regulation by non-coding RNAs; microRNA biogenesis

Dr. Melike Caglayan – Genome integrity, DNA damage repair

Dr. Linda Bloom – DNA replication, DNA damage repair

Dr. Michael Kilberg – Nutrient stress response

Dr. Jorg Bungert – Transcriptional regulation during erythropoiesis

Dr. Michael Kladde – Regulation of transcription by chromatin

Dr. Jianrong Lu – Transcriptional and epigenetic control of EMT

Dr. Michelle Gumz – Circadian clock function (kidney)

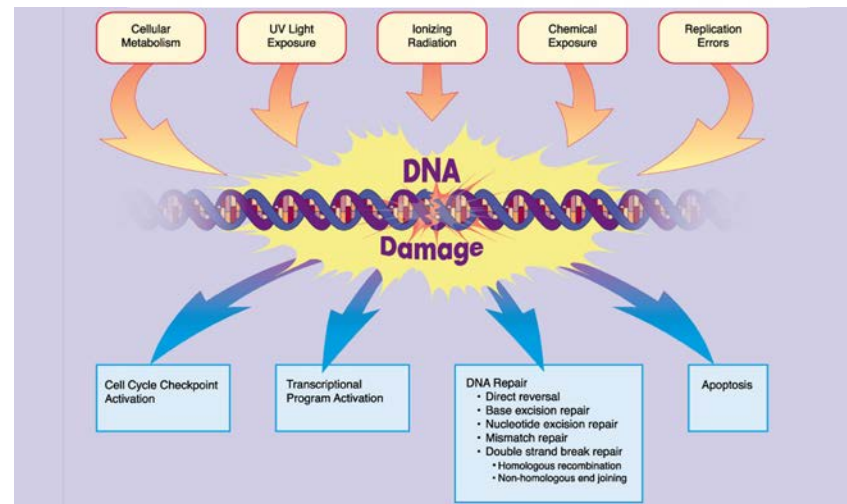
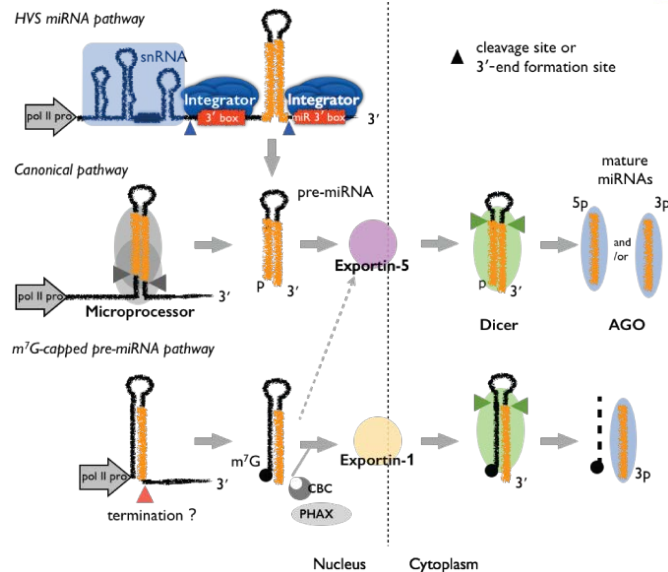
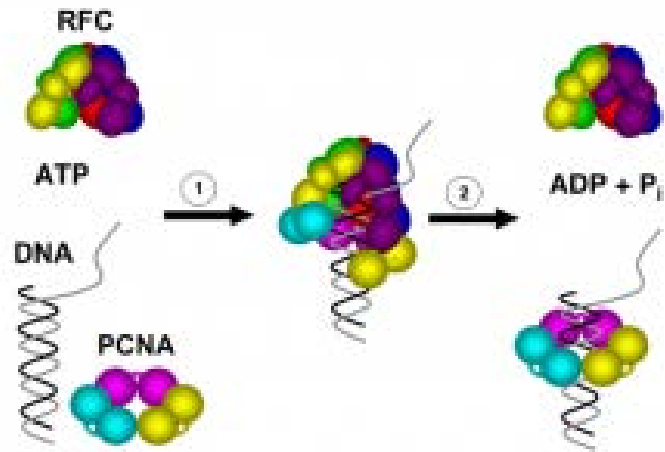
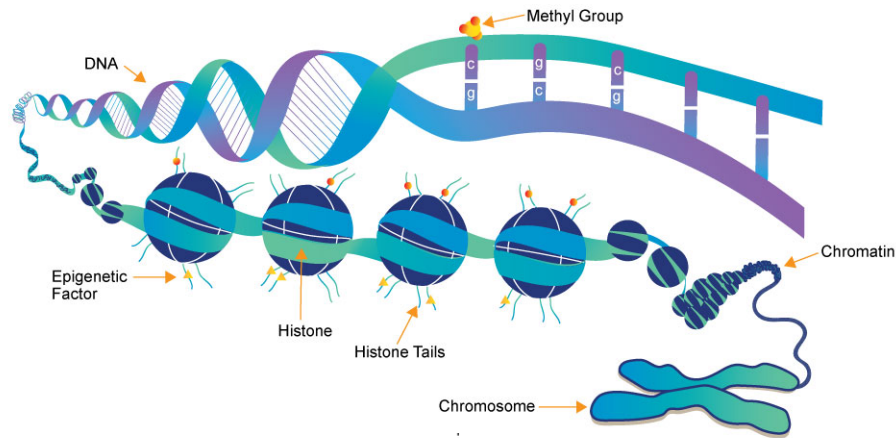
Dr. Jon Licht – Aberrant gene regulation during hematopoiesis

Dr. Zhijian Qian – Cancer Epigenetics

May take students depending on funding situation

Biochemistry and Molecular Biology Concentration

Molecular Biology Labs





Molecular Biology Courses offered within the BMB Concentration

- BCH5413** Eukaryotic Molecular Biology and Genetics
- BCH6415** Advanced Molecular and Cell Biology
- BCH7410** Advanced Gene Regulation
- BCH7412** Epigenetics of Human Disease and Development
- BCH7414** Advanced Chromatin Structure



Biochemistry and Molecular Biology Concentration

Structural Biology Labs

Dr. Mavis Agbandje-McKenna – ssDNA viruses

Dr. Linda Bloom – DNA repair/replication

Dr. Joanna Long – Membrane proteins

Dr. Thomas Mareci – Mapping central nervous system

Dr. Robert McKenna – Proteins/enzyme structures

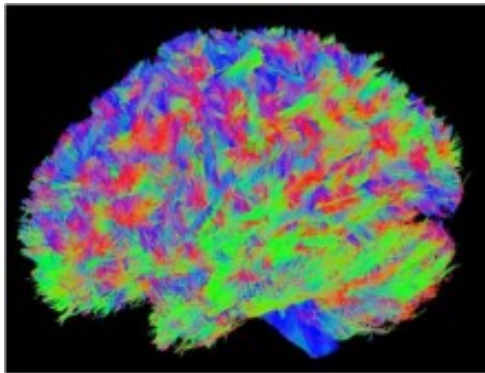
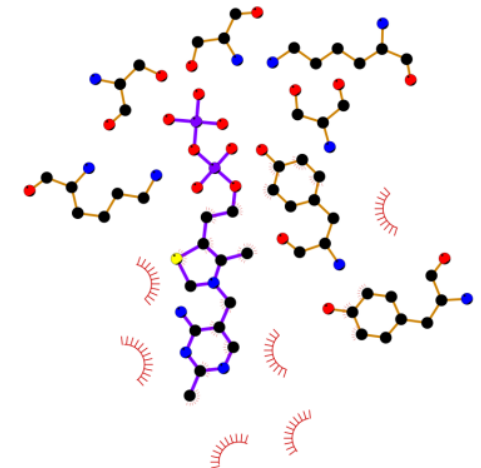
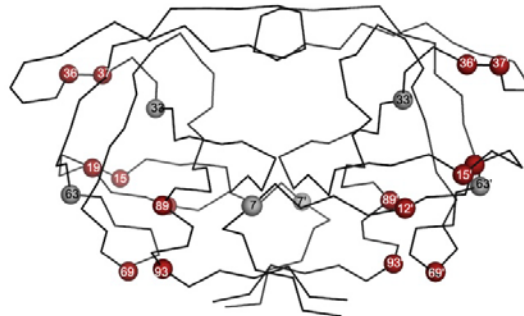
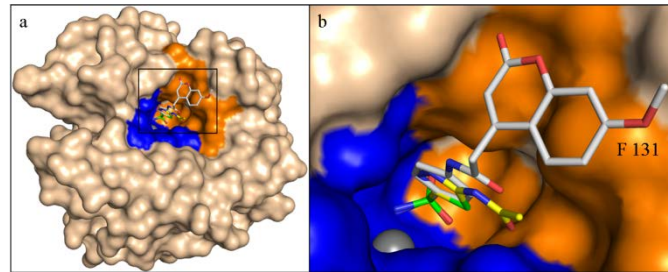
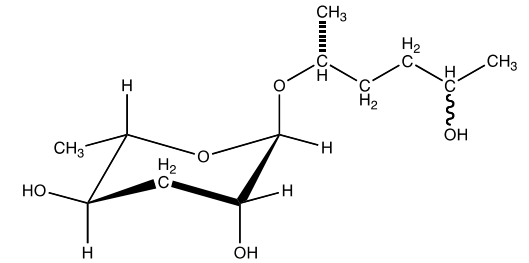
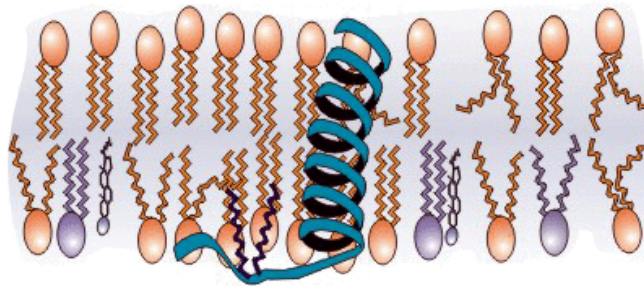
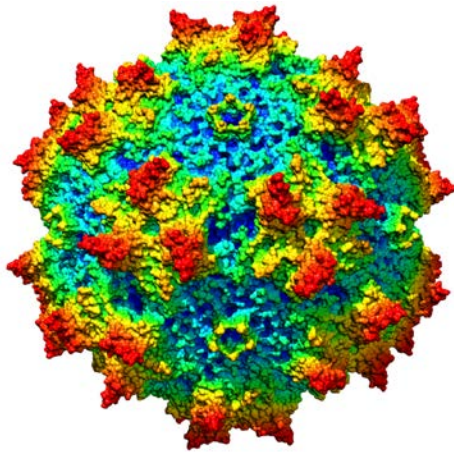
Collaborative studies

May take students depending on funding situation

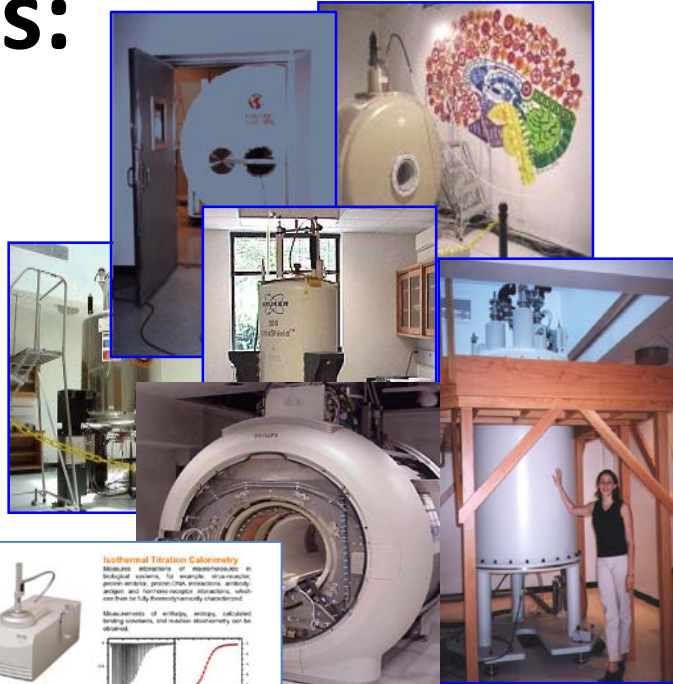


Biochemistry and Molecular Biology Concentration

Structural Biology Labs



X-ray, EM, CRYO-EMNMR, BIC, and National Facilities:



B College of Medicine
Department of Biochemistry
& Molecular Biology
Contact: Dr. Maria Aguilera-Molina (mariaguilera@ufl.edu)
Dr. Robert McKenna (rmckenna@ufl.edu)
ROOM R3-231

Biophysical

I Instrumentation

C Core

Automated Liquid Handling
Allows for the accurate dispensing of complex pH, salt, gradients etc. required for accurate and consistent crystallization screens and liposomal assays.

Crystallization Robot
The automated syringe based dispenser can load 96, 384, and 1536 well crystallization screens. It has 2 pipettes to prepare each plate with as little as 200 µl of sample.

Isothermal Titration Calorimetry
Measures interactions of macromolecules in biological systems. For example, ion-exchange, protein-protein, protein-ligand, protein-DNA interactions, antibody-antigen and protein-membrane interactions, which can be fully thermodynamically characterized. Measurements of enthalpy, entropy, calculated binding constants, and reaction stoichiometry can be obtained.

Circular Dichroism
Provides the determination of the secondary structural elements of a protein and permits the optimization of protein and DNA stability under a large number of solvent conditions, varying temperature, pH, salinity and the presence of various cofactors.

Differential Scanning Calorimetry
Provides accurate transition midpoint (T_m) determinations, allowing for a complete thermodynamic profile to be measured to understand the factors that affect conformational and stability transitions of macromolecules in biological systems.





Structural Biology Courses offered within the BMB Concentration

- BCH6740** Structural Biochemistry, *Spring semester*
- BCH6744** Molecular Structure Determination by X-Ray Crystallography
- BCH6741** Magnetic Resonance Imaging in Living Systems
- BCH6745** Molecular Structure and Dynamics by NMR Spectroscopy

Others:

- BCH6749** Numerical Methods in Structural Biology, *Summer semester*
- BCH6107** Biophysical Techniques in Proteomics, *Spring semester*
EM(cryo), Metabolomics etc

Center of Structural Biology Seminar Series

Crystallography and cryo-electron microscopy Journal Club



Courses offered within the BMB Concentration

Biochemistry Journal Club

(Tues 11:45am) – research and current literature – student invited speaker

Faculty Research Presentations

(Wed 4:00pm) – B&MB and invited Faculty

Qualifying exam

Proposal – in the form of an NRSA predoctoral fellowship application (6 pages).

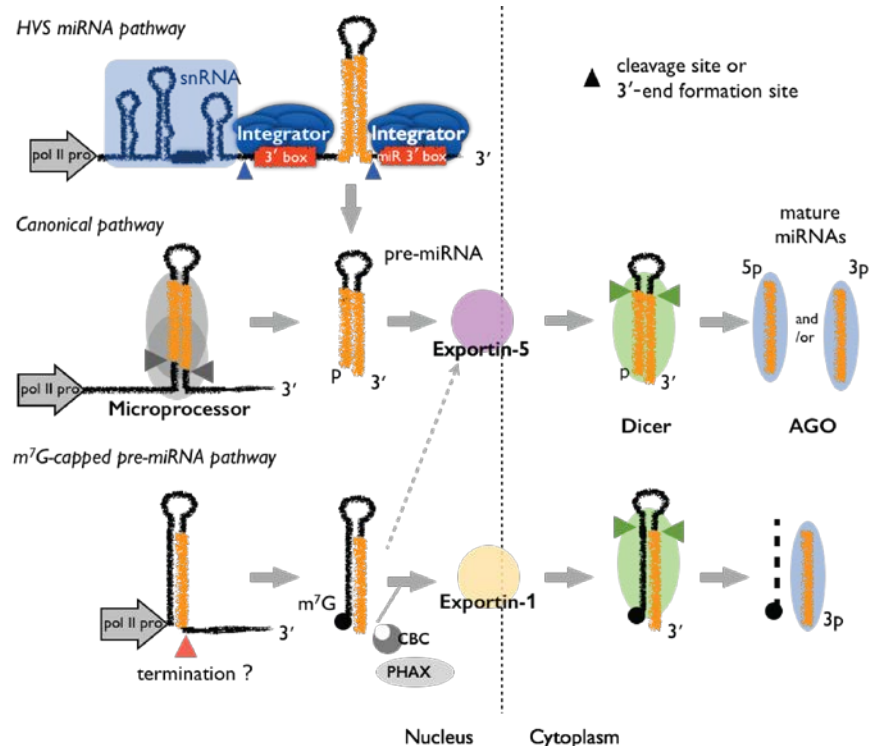
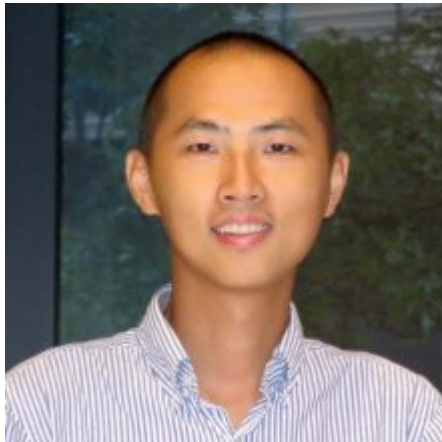
Several of our students have successfully obtained competitive external fellowships (NIH, NSF, AHA and private foundations). Proposal writing course – Dr. Bloom.



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

Mingyi Xie, PhD
Assistant Professor



Dicer cleaves 5'-extended **microRNA** precursors originating from RNA polymerase II transcription start sites.

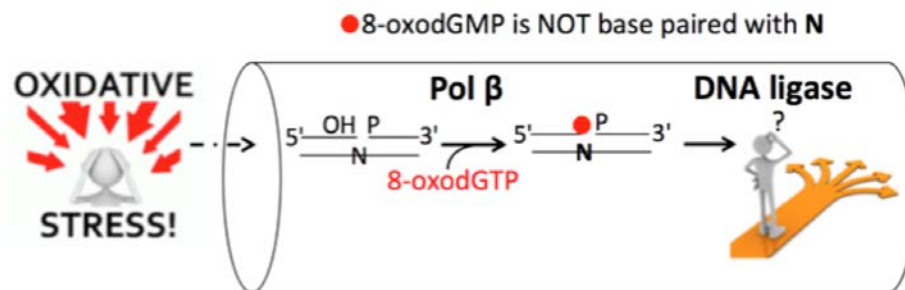
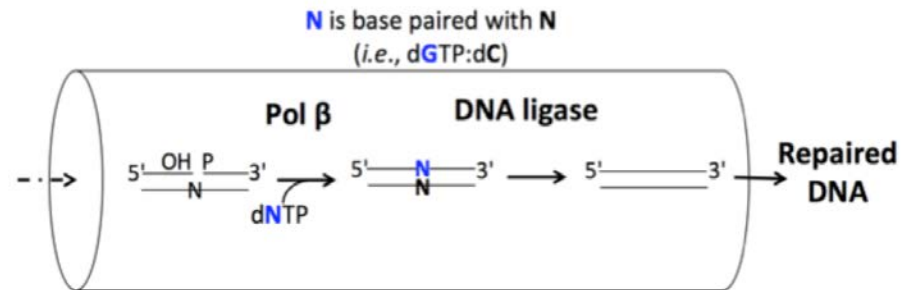
Sheng P, Fields C, Aadland K, Wei T, Kolaczowski O, Gu T, Kolaczowski B, Xie M.
Nucleic Acids Res. 2018 Jun 20;46(11):5737-5752. doi: 10.1093/nar/gky306.



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

Melike Caglayan, PhD
Assistant Professor



[Oxidized nucleotide insertion by pol β confounds ligation during base excision repair.](#)

Çağlayan M, Horton JK, Dai DP, Stefanick DF, Wilson SH.

Nat Commun. 2017 Jan 9;8:14045. doi: 10.1038/ncomms14045



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

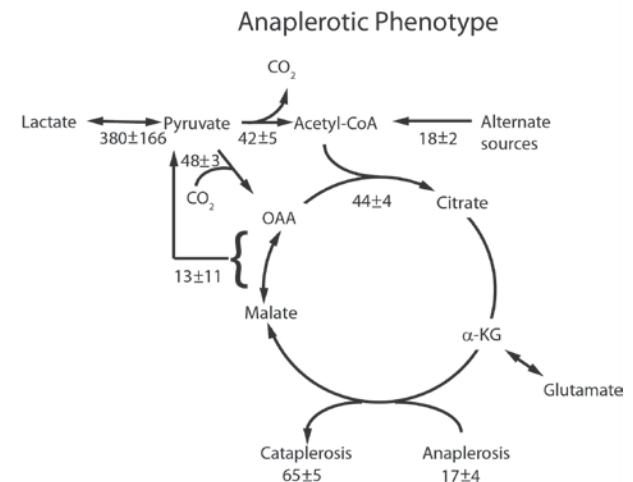
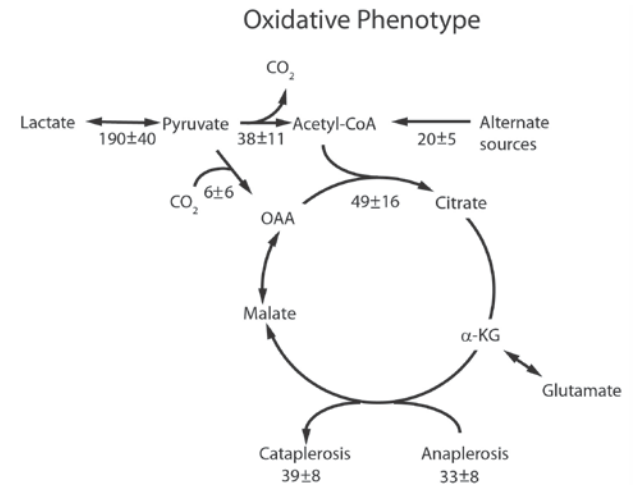
Matthew Merritt, PhD
Associate Professor



[A novel inhibitor of pyruvate dehydrogenase kinase stimulates myocardial carbohydrate oxidation in diet-induced obesity.](#)

Wu CY, Satapati S, Gui W, Wynn RM, Sharma G, Lou M, Qi X, Burgess SC, Malloy C, Khemtong C, Sherry AD, Chuang DT, **Merritt ME.**

J Biol Chem. 2018 Jun 22;293(25):9604-9613. doi: 10.1074/jbc.RA118.002838. Epub 2018 May 8

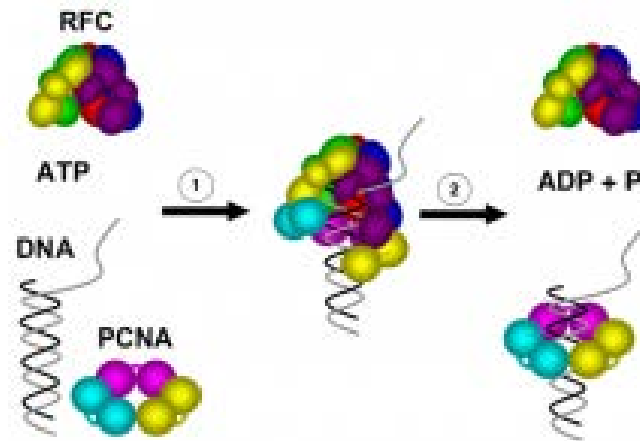




Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

Linda Bloom, PhD
Professor and Associate Chair



[Mechanism of opening a sliding clamp.](#)

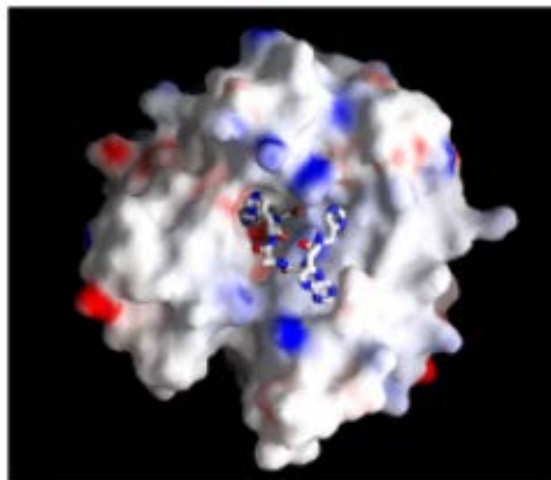
Douma, L.G., Yu, K.K., England, J.K., Levitus, M. and
Bloom, L.B. (2017) Nucleic Acids Res. 45, 10178-10189.



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

Robert McKenna, PhD
Professor



["To Be or Not to Be" Protonated: Atomic Details of Human Carbonic Anhydrase-Clinical Drug Complexes by Neutron Crystallography and Simulation](#)

Kovalevsky, A, Aggarwal, M, Velazquez, H., Cuneo, M.J.,
Blakeley, M.P., Weiss, K.L., Smith, J.C., Fisher, S.Z., **McKenna, R.**
(March 2018) Structure 26, 383–390



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year



Chalermchai (Charly) Khemtong, PhD
Associate Professor
Department of Medicine

[Real-time hyperpolarized \$^{13}\text{C}\$ magnetic resonance detects increased pyruvate oxidation in pyruvate dehydrogenase kinase 2/4-double knockout mouse livers.](#) Sharma G, Wu CY, Wynn RM, Gui W, Malloy CR, Sherry AD, Chuang DT, **Khemtong C.** Sci Rep. 2019 Nov 11;9(1):16480. doi: 10.1038/s41598-019-52952-6



Biochemistry and Molecular Biology Concentration

BMB faculty who might take students next year

Joanna Long, PhD
Professor



[Entropic Anomaly Observed in Lipid Polymorphisms Induced by Surfactant Peptide SP-B\(1–25\)](#)

Tran, N., Kurian, J., Bhatt, A., McKenna, R. and **Long, J.R.**
(Sept 2017) J. Phys. Chem. B, 2017, 121 (39), pp 9102–9112



Biochemistry and Molecular Biology Concentration

Previous Students



Kristen Solocinski, Post-doctoral Fellow at the National Cancer Institute



Brian Mahon, Post-doctoral Fellow at Princeton University



Shweta Kailasan, Integrated Biotherapeutics



Biochemistry and Molecular Biology Concentration

Previous Students



**Mayank Agarwal, Research Scientist at
Oak Ridge National Laboratories**



**Joeva Barrow, Assistant Professor, College of Human Ecology
Cornell University, Ithaca, NY**



**South District Woman-
Owned Small Business
Person of The Year 2018**

Dr. Karen Vieira

**CEO of
The Med Writers
& Make A
Supplement**



Karen Vieira, CEO of The Med Writers



Molecular Biology
Structural Biology
Metabolomics

James B. Flanagan
Department Chair

Linda Bloom
Associate Chair

Jörg Bungert
Graduate Coordinator
BMS/BMB
CGRC-361
352-273-8098
jbungert@ufl.edu

Matthew Merritt
Associate Graduate
Coordinator
BMS/BMB
CGRC 392C
352-2948397
matthewmerritt@ufl.edu

<http://biochem.med.ufl.edu/>

<https://biomed.med.ufl.edu/about/biochemistry-and-molecular-biology/>