



# Chemical Biology & Medicinal Chemistry

## Fast Facts

### Faculty

Comprising the creators of three FDA-approved drugs, NIH study section members, entrepreneurs, editorial board members and authors of hundreds of scholarly works

### Instrumentation

Outstanding shared instruments; state-of-the-art University cores

### Research Space

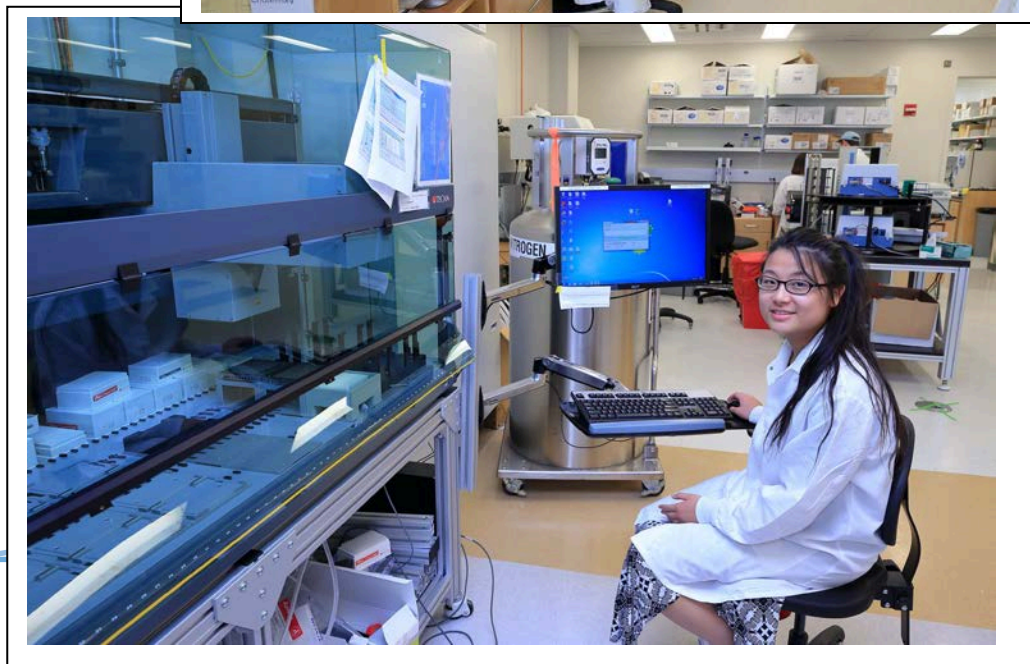
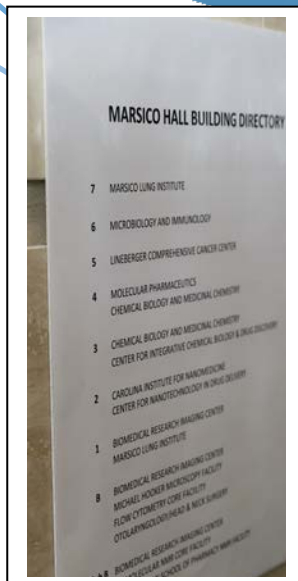
Laboratory space in two newly constructed buildings

### Students

37 graduate students and 17 postdoctoral scientists

### Reputation

Interdisciplinary research collaborations spanning many disciplines at an internationally known research university with a major teaching hospital



Exceptional Research at a Premier Institution

## Facilities and Infrastructure for Cutting-Edge Research



With over 275,000 square feet of space, the UNC Eshelman School of Pharmacy is the largest school of pharmacy in the US. It is renowned for promoting collaborative research in an environment with colleagues in medicine and giving the School a strong presence at the heart of Carolina's health sciences campus.

# Chemical Biology and Medicinal Chemistry at Carolina and Beyond...

## Combining Chemistry & Biology to Improve Human Health

Chemical Biology and Medicinal Chemistry is a dynamic, multifaceted graduate program in the UNC Eshelman School of Pharmacy at the University of North Carolina at Chapel Hill. CBMC is dedicated to improving human health through research leading to new concepts for the design and development of therapeutic and diagnostic agents.

The CBMC graduate program seamlessly blends chemistry and biology, which distinguishes it from traditional graduate programs. We develop and exploit novel chemical tools relevant to the fields of biochemistry, biology, pharmacology, and medicine. Research in CBMC is directed toward biomedical and pharmaceutical discovery by applying both chemical and biological principles to interactions between molecular structure and biological activity.

## Learning for the Future

Our program's degree recipients are well prepared for scientific careers in academia, industry, government, and research institutes. All of our graduates have been successful in finding desirable positions. Historically, the majority of our graduates have taken positions in the pharmaceutical industry. In recent years, as the pharmaceutical industry has changed and biotech and biopharma companies have emerged, there has been a growing demand for our graduates in the latter. In addition, our graduates are increasingly considering careers in academia.

## Eshelman Institute for Innovation

The Eshelman Institute for Innovation – created by a historic \$100 million gift to the School of Pharmacy – aims to inspire a culture of innovation where imagination and creative solutions accelerate change in education and health care. Students are eligible to seek funding for bold ideas where creativity, entrepreneurial development and collaboration are fostered and commercialization of intellectual property is encouraged.

In addition to being eligible for awards from national funding agencies, graduate students will benefit from the PharmAlliance initiative where research collaborations between Eshelman's School of Pharmacy, Monash University in Australia and University College in London, England will provide opportunities for short research stints in those nations' institutions.





## About Our Research

### Uniquely Positioned to Bridge the Chemical and Biological Worlds

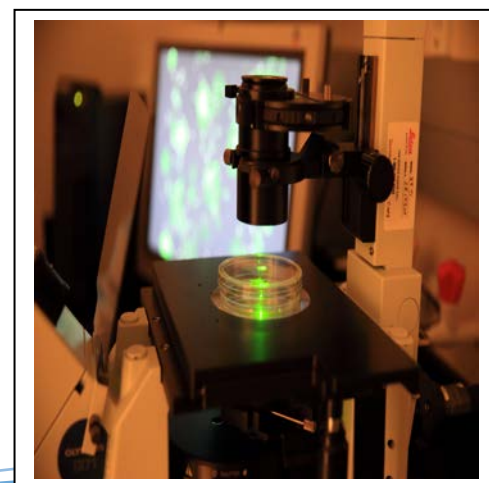
Research in the Division of Chemical Biology and Medicinal Chemistry at the UNC Eshelman School of Pharmacy spans activities in contemporary chemical biology and drug discovery and blends the principles and experimental techniques of chemistry and biology with computational science. While maintaining a traditional emphasis on the drug candidate, we integrate contemporary biological methods to merge small molecule and target biomolecule research. This approach allows for elucidation of disease pathways and mechanisms of drug action. Our program encompasses nearly all aspects of drug discovery, including bioactive natural products, organic chemistry, computational drug design, assay development, high throughput screening of chemical libraries, and studies in living cells.

With modern, sophisticated instrumentation in place to support a robust research program, CBMC researchers focus on:

- synthesis and structure-activity characterization of pharmaceutically relevant small molecules and natural products;
- chemical biology studies of the properties of designed small-molecule ligands and their cognate drug targets, including proteins, nucleic acids, and glycoconjugates;
- combinatorial biochemistry and proteomics for the identification of novel signaling pathways and drug targets;
- structural biology and biomolecular dynamics of drug-protein interactions;
- chemo- and bioinformatics; and
- molecular modeling.

Division members work closely with biotech and pharmaceutical companies in North Carolina's Research Triangle, and they are campus-wide leaders in new scientific inventions. Discoveries made by CBMC investigators have led to three FDA-approved drugs, six spin-off companies, and several compounds in advanced phases of clinical trials for cancer and infectious diseases. Spurred in large part by the success of our exceptional cadre of scientists, CBMC's research funding continues to grow.

The UNC Eshelman School of Pharmacy is ranked nationally in federal research funding and has the #1 ranked Doctor of Pharmacy program in the nation, according to *U.S. News & World Report*.



Apply to our PhD Program  
<https://pharmacy.unc.edu/division/s/cbmc/phd-program/>

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## Our Growing Faculty

With its balanced mix of youth and experience, our program has emerged as a worldwide leader on the forefront of chemical biology and academic drug discovery. Amongst our distinguished professors are Bryan Roth, PhD; David Lawrence, PhD; Stephen Frye, PhD; Jian Liu, PhD; Jeff Aubé, PhD; and Alex Tropsha, PhD. Roth is the principal investigator for the internationally recognized Psychoactive Drug Screening Program. Lawrence's work focuses on controlling aberrant and normal cell behavior with light. As the former worldwide head of discovery medicinal chemistry at GlaxoSmithKline, Frye directs the School's Center for Integrative Chemical Biology and Drug Discovery and provides leadership of the North Carolina Comprehensive Chemical Biology Center. Liu's research team focuses on glycobiology and its therapeutics applications. Aubé's focus in organic chemistry encompasses organic synthesis methodology especially focusing on alkaloids. Tropsha is an expert in the fields of computational chemistry, cheminformatics and structural bioinformatics and develops new methodologies and software tools for computer-assisted drug design. Also on our senior faculty is Professor Drew Lee who contributes to both the professional and graduate teaching mission, while his research focuses on enhancing understanding of protein function from the perspective of physical structural biology.

Mid-career tenure track faculty include Mike Jarstfer, PhD; Albert Bowers, PhD; Scott Singleton, PhD; Qisheng Zhang, PhD, Rihe Liu, PhD and Nate Hathaway, PhD. Professor Bowers has interests in the total combination(bio) synthesis of natural products and is a recipient of the Beckman Young Investigator Award. Jarstfer, Associate Dean of Graduate Education, is the frequent recipient of annual teaching awards. Singleton, Vice Chair of CBMC, is a co-developer of the PIPS and the Molecular Foundations of Drug Action courses. Zhang, Associate Professor and Director of Graduate Studies studies lipid signaling pathways involved in development and diseases by developing novel chemical probes and technologies. Associate Professor Liu has formed his own start-up company and is focused on developing novel cancer biomarker-binding theranostic molecules that are based on the single domain antibodies or their mimics with human origins using sophisticated protein display technologies. Hathaway, Director of Graduate Admissions, research focuses on developing new chemical tools and approaches to investigate the complex biological processes responsible for regulating expression of the mammalian genome.

Our Assistant Professors include, Lindsey Ingerman James, PhD and Robert McGinty, PhD. James' research involves modulating the activity of chromatin reader proteins with small-molecule ligands, specifically potent and selective chemical probes, in order to open new avenues of research in the field of chromatin biology and potentially translate to compounds of therapeutic value. McGinty is a core member of CICBDD, and provides scientific leadership as Associate Director of Structural Biology.

We are further enhanced by faculty with industrial experience which includes: Tim Willson, PhD, Center Director and Chief Scientist, Alison Axtman, PhD and David Drewry, PhD, who each bring a wealth of industrial experience to complement their forays into academia.