

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

24 graduate students and 26 postdoctoral scientists

Funding

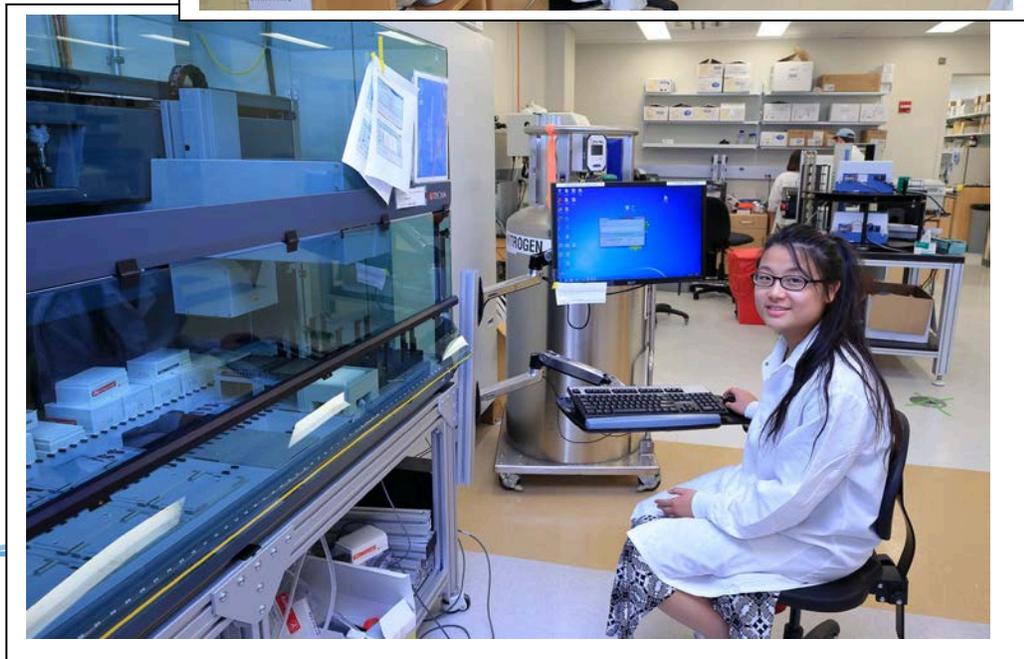
\$12 million in research funding per year over the last four years

Innovation

\$100 million funding for the new Eshelman Institute of Innovation

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.

New Opportunities

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 newly minted 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.

CBMC offers two fellowships to support exceptional graduate students during their first year. The fellowships are offered to outstanding applicants who demonstrate an impressive record of achievement in their undergraduate education, research and life experiences and show the highest academic potential. CBMC also offers travel awards for our graduate students to present their research at national meetings.





About Our Research

Uniquely Positioned to Bridge the Chemical and Biological Worlds

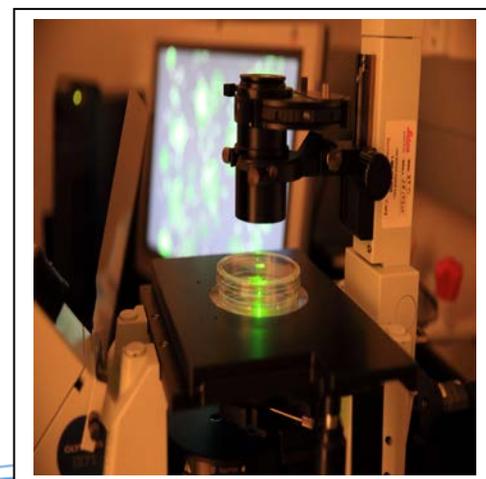
Research in the Division of Chemical Biology and Medicinal Chemistry at the UNC Eshelman School of Pharmacy spans activities in contemporary chemical biology and drug discovery and blends the principles and experimental techniques of chemistry and biology with computational science. While maintaining 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.

Highlighting CBMC's efforts is the award of 148 grants worth more than \$48 million over the past four years. This trend is part of the larger success story of the UNC Eshelman School of Pharmacy, which 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*.



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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; Alex Tropsha, PhD and K. H. Lee, 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. Lee, the recipient of the American Association of Colleges of Pharmacy's Volwiler Research Achievement Award, has published more than 800 research articles and leads a team that has discovered thousands of bioactive natural products. Also on our senior faculty is Professor Drew Lee, Director of Graduate Admissions, 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; Scott Singleton, PhD; Qisheng Zhang, PhD and Rihe Liu, PhD. Jarstfer, Associate Professor and Director of Graduate Studies, is the frequent recipient of annual teaching awards and was recently named PY2 Instructor of the Year. Singleton, Vice Chair of CBMC, has served as a member of the Curriculum Transformation Committee, head of the Curriculum 2015 Foundational Year Working Group, a co-developer of the PIPS and the Molecular Foundations of Drug Action courses. Associate Professor Zhang 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.

Scientists who have recently joined CBMC include Assistant Professors Albert Bowers, PhD, and Nate Hathaway, PhD. Bowers has interests in the total and combinatorial (bio)synthesis of natural products and is a recipient of the Beckman Young Investigator Award. Hathaway's research focuses on developing new chemical tools and approaches to investigate the complex biological processes responsible for regulating expression of the mammalian genome. Another new addition to our group is Rob McGinty, PhD. As a core member of CICBDD, McGinty provides scientific leadership as Associate Director of Structural Biology.

We are further enhanced by faculty with industrial experience. With the formation of the UNC Structural Genomics Consortium Kinome Hub, we welcome the addition of Tim Willson, PhD, Center Director and Chief Scientist, along with Bill Zuercher, PhD, Alison Axtman, PhD and David Drewry, PhD, who each bring a wealth of industrial experience to complement their forays into academia.