Georgia State University

CHEMISTRY

2018

chemistry.gsu.edu
A message from Dr. Peng George Wang, the chair of the Department of Chemistry of the Georgia State University

February 15, 2016

Welcome to the Department of Chemistry of the Georgia State University! We are a collection of talented graduate students, award-winning faculty, and devoted staffs pursuing cutting edge research on the frontiers of chemistry interfacing with biology, medicine, material, physics, and computational science. Our mission is to serve the citizens of the State of Georgia and the nation as a major hub for chemical research and education. Our contributions to the society are new knowledges of chemistry, and more importantly the confidence and the readiness of our graduates to pursue their independent careers after finishing our program.

We train our students through interdisciplinary programs covering analytical, biological, physical, organic and medicinal chemistry, and chemical education. Our department has been awarded NIH and NSF grants that total more than $7 million for the current fiscal year. Our NIH funding per faculty member tops other chemistry departments in southeast U.S. These funds support our students and faculty to do outstanding work in their fields of study. As a result the Carnegie Foundation lists our department as a U.S. institution with very high research activity. Currently our Ph.D. program is ranked 42nd by phd.org and it has more than 100 students from countries around the world.

Our M.S. program in chemistry is one of the largest in the nation with a current enrollment of more than 70 students. We provide financial supports to M.S. students in forms of teaching and research assistantships and tuition waivers. Many of our M.S. students get job offers after graduation, or are admitted to Ph.D. programs or professional programs in medical, dental or pharmacy schools. We are further expanding our M.S. and Ph.D. programs with new faculty hires and intense efforts in graduate recruiting.

Our department operates superb facilities to support research and teaching. The NMR Facility houses one 600 MHz, one 500 MHz and two 400 MHz NMR spectrometers. The Mass Spectrometry Facility features MALDI, electrospray, LC-MS, GS-MS, and high-resolution capability MS instruments. Our computation laboratory operates two large computer clusters capable of quantum calculation and dynamics simulation. A variety of analytical instruments are available in our Common Core Facility that offers surface plasmon resonance (SPR) and isothermal titration calorimetry (ITC) instruments, fluorimeters, UV/vis and IR spectrometers,
capillary electrophoresis (CE), HPLC, and fluorescence microscopes. We share facilities with the Department of Biology for peptide and oligonucleotide synthesis, and DNA sequencing.

We offer teaching and research assistantships to qualified graduate students. A number of fellowships including the Al Baumstark Award for Minority or Female Students, the Ambrose Pendergrast Fellowship in Medicinal Chemistry and Biochemistry, and the David W Boykin Graduate Fellowship in Medicinal Chemistry, are awarded to outstanding Ph.D. students in the department every year. In addition, there are approximately 10 graduate assistantships in MBD (molecular basis of disease) and BB (brains and behavior) areas. We make a strong effort helping our graduates to pursue job opportunities in academics, industry and government agencies.

Please browse through this booklet for information on faculty research and graduate programs of our department. Please follow us at http://chemistry.gsu.edu/ for new updates. We welcome you to visit our department and the GSU campus in downtown Atlanta. If you wish to meet our students and faculty during your visit, please let us know and we will be happy to arrange it for you.

Please feel free to contact me at pwang11@gsu.edu. If you are interested in our graduate programs, please contact Dr. Donald Hamelberg, our graduate director, at dhamelberg@gsu.edu, or Dr. Jun Yin, our associate graduate director, at junyin@gsu.edu.

Sincerely yours,

Peng George Wang
Faculty Research
The research interests in my group center on heme uptake. This uptake is often key in the virulence of pathogenic bacteria, leading to the possibility that inhibition of this pathway could be an approach to new pharmaceutical agents in the fight against infection. Gram-positive and Gram-negative bacteria have evolved similar strategies for acquiring heme, involving “hand-off” of the heme along a series of proteins. We study heme transfer in *Streptococcus pyogenes* and *Corynebacterium diphtheriae*. Our goals are to characterize the active site of the protein in terms of both structure and stability towards heme transfer.

**Areas of training:** mutagenesis, protein purification, optical, fluorescence and circular dichroism spectroscopies, thermal and chemical denaturation of proteins, kinetics, mass spectrometry

**Recent publications:**


Ning Fang
Analytical Chemistry, Physical Chemistry, Nanoscience, Biophysics
B.S., Xiamen University, 1998; Ph.D., University of British Columbia, 2006;
Postdoc, Ames Laboratory, U.S. Department of Energy and Iowa State University, 2006-2008;
Assistant Professor, Iowa State University, 2008-2015;
Associate Professor, Georgia State University, 2015-present.

The research in the Fang Laboratory aims to open new frontiers in scientific discovery through the development and use of novel optical imaging platforms for visualizing the dynamics of molecular probes and nanomaterials in chemical and biological systems.

- **Optical Imaging Instrumentation:** We are developing a variety of optical microscopy imaging tools to answer biological and chemical questions that were unattainable previously. These are challenging projects for the most creative individuals with a strong desire to learn far beyond chemistry.

- **Single Particle Orientation and Rotational Tracking (SPORT) in Biophysical Studies:** The knowledge of rotational dynamics in and on live cells remains highly limited due to technical limitations. The SPORT technique has been developed for visualizing rotational motions of anisotropic plasmonic gold nanorods under a differential interference contrast (DIC) microscope. The SPORT technique is capable of extracting important information (including rotational rates, modes, and directions) on the characteristic rotational dynamics involved in complex biological processes, such as endocytosis and intracellular transport.

- **Single Molecule Catalysis:** Real time imaging of single catalyst active sites in situ enables mechanistic studies on fundamental reaction steps under actual turnover *operando* conditions; these studies have enormous potential impact in establishing intimate structure-property relationships from which to build better (faster, cleaner, cheaper) catalysts. Our research aims to design catalytic platforms for single molecule imaging and reveal molecular dynamics (including diffusion, adsorption, and chemical conversion, as well as their coupling) on the nanocatalyst surfaces or in the nanoporous structures at the single-molecule level.

**Representative Publications:**

* Nat. Catal. 2018, 10.1038/s41929-017-0021-1.
* Nat. Commun. 2017, 10.1038/s41467-017-01001-9.
* PNAS 2017, 114, 28, E5655.
* Nano Lett., 2013, 13(11), 5414.
* Nano Lett. 2013, 13(3), 1245.
* ACS Nano. 2013, 7(2), 1658.
* Nat. Commun. 2012, 10.1038/ncomms2037.
* Nano Lett. 2012, 12(8), 4282.

**Representative Trainees:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthony Stender</td>
<td>Graduate student, 2008-2013</td>
<td>Assistant Professor, Ohio University</td>
</tr>
<tr>
<td>Yan Gu</td>
<td>Graduate student, 2008-2013</td>
<td>Scientist, Bristol-Myers Squibb</td>
</tr>
<tr>
<td>Gufeng Wang</td>
<td>Postdoc 2009-2011</td>
<td>Assistant Professor, North Carolina State University</td>
</tr>
<tr>
<td>Ji Won Ha</td>
<td>Graduate student, 2011-2014</td>
<td>Associate Professor, University of Ulsan, South Korea</td>
</tr>
</tbody>
</table>
The research interests in my group are in the general area of the mechanistic enzymology of redox enzymes, with a specific interest in flavin-dependent enzymes. The long-term objectives are to understand how enzymes can influence the energetics of reaction intermediates and transition states. These aspects are being studied by steady state kinetics and rapid reaction techniques using pH, viscosity and kinetic isotope effects, as well as mutagenesis, X-ray crystallography and computational approaches.

Areas of study:
- Enzymatic mechanisms of flavin-dependent alcohol and amine oxidases, hydroxylases and reductases.

Areas of training:
Mechanistic enzymology, cloning and mutagenesis, steady-state and stopped-flow kinetics, X-ray crystallography, classical protein purification (without tags), absorption, fluorescence and CD spectroscopy of proteins, etc.

Enzymes currently investigated: Nitrate monooxygenase, D-arginine dehydrogenase, choline oxidase, choline dehydrogenase, NADH-Quinone reductase, glycolate oxidase.

Recent publications (out of 84):

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan Fan</td>
<td>PhD Biology 2001-2005</td>
<td>Biochemist at Amgen, Los Angeles, CA</td>
</tr>
<tr>
<td>Mahmoud Ghanem</td>
<td>PhD Chemistry 2002-2006</td>
<td>Staff Biochemist at Siemens Healthcare, Philadelphia, PA</td>
</tr>
<tr>
<td>Osbourne Quaye</td>
<td>PhD Chemistry 2005-2009</td>
<td>Lecturer, University of Ghana, Legon, Ghana</td>
</tr>
<tr>
<td>Francesca Salvi</td>
<td>PhD Chemistry 2011-2015</td>
<td>Postdoc, EMBL, Heidelberg, Germany</td>
</tr>
<tr>
<td>Crystal Smitherman</td>
<td>PhD Chemistry 2010-2015</td>
<td>Research and Development at Aalto Scientific, Eatonton, GA</td>
</tr>
</tbody>
</table>
Markus W. Germann
Nucleic Acid Structure and Function

Email: mwg@gsu.edu; website http://chemistry.gsu.edu/profile/markus-germann/

M.S. Technikum Winterthur, Switzerland, 1982; Ph.D. University of Calgary, Canada, 1989; NMR Application Specialist, Bruker, Fällanden, Switzerland 1990-1993. Assistant/Associate Professor, Thomas Jefferson University, Philadelphia (1994-2001). Associate Professor/Tenured, Georgia State University, 2001-2007; Full Professor, GSU, 2007-present.

Georgia Cancer Coalition Distinguished Cancer Scientist.


Recent publications (out of 105):


Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stephen Cleaver</td>
<td>Post. Doc</td>
<td>Global Head of Informatics Systems, Novartis, Basel, Switzerland</td>
</tr>
<tr>
<td>Ahmed Khan</td>
<td>M.S.</td>
<td>Technical Account Manager at D.B. Becker, Atlanta, GA.</td>
</tr>
<tr>
<td>Chris Johnson</td>
<td>Ph.D.</td>
<td>Post Doctoral Fellow, Vanderbilt University, Nashville, TN.</td>
</tr>
</tbody>
</table>
Samer Gozem
Modeling Photochemical and Photobiological processes
Email: sgozem@gsu.edu; website: www.gozemlab.com

B.Sc., American University of Beirut, 2008
Ph.D., Bowling Green State University, 2013
Postdoc, University of Southern California, 2014-2017
Assistant Professor, Georgia State University, 2017-present.

Light-responsive proteins have evolved to use light efficiently to drive complex processes ranging from photosynthesis to vision. The versatility, selectivity, and efficiency of these photobiological systems serve as an inspiration for technology, driving efforts to develop light-harvesting systems for solar energy applications, light-driven water splitting catalysts for solar energy storage, fluorescent probes for bioimaging, optogenetics tools, photodynamic therapies, and more. To learn from natural light-responsive proteins, however, we need to develop a fundamental understanding of how such systems operate on a molecular level. This requires investigating the light-induced chemical events that occur upon light excitation. Often, this also requires an understanding of how the nuclei and electrons respond to being excited by light. We develop and employ computer models of chemical and biological systems to understand how they respond to light. These models are usually rooted in quantum mechanical and/or classical theories and methods. Ultimately, one of our main goals is to derive structure-function relations in photoreceptor proteins that can aid in the design of new light-responsive proteins with potential applications in biotechnology. For example, we are investigating light-induced events in flavoproteins like light-oxygen-voltage (LOV) sensing domains.

Interests: photochemistry, biological photoreceptors, QM/MM, flavoproteins, LOV domains, method and software development, photoelectron spectroscopy.

A full list of publications is available on our website. Here are some representative topics:

Kathy Grant
Bio-Inorganic Chemistry, Nucleic Acids, Biochemistry
Email: kbgrant@gsu.edu; website: http://chemistry.gsu.edu/profile/kathryn-grant/

B.A., New York University, 1980; B.S., SUNY at Purchase (N.Y.), 1989; Ph.D., Columbia University, 1994; Postdoc, California Institute of Technology, 1994-1997; Assistant Professor, Georgia State University, 1997-2003; Associate Professor, Georgia State University, 2003-2010; Professor, Georgia State University, 2010-present.

Our research explores the chemical properties of biomolecules by an interdisciplinary approach that extends into the fields of inorganic chemistry, photochemistry, and biochemistry. We are interested in the design of small molecules that target disease-related macromolecules found in biological systems. As a treatment for lipid accumulation in lysosomal storage disease, we have used cerium(IV) complexes to hydrolyze phospholipids at lysosomal pH, with minimal reactivity under normal cytoplasmic conditions. We are also studying the DNA interactions of intercalating dyes with the goal of developing new therapeutic agents for photodynamic cancer therapy. Towards this end, we have utilized acridine, cyanine, naphthalene, phenazene, and phenothiazine ring systems that are triggered by light to photo-cleave DNA. We are particularly interested in cyanine dyes that absorb light within the 600 nm to 900 nm “therapeutic window” of the electromagnetic spectrum. Also under development are 9-aminomethylnapthacene chromophores that function optimally under the conditions of high ionic strength that exist in the cell nucleus where DNA is located. In order to take advantage of the high levels of copper(II) that exist in a broad range of cancer cells, we have designed a hexaazatriphenylene photo-nuclease that can be activated with copper.

Areas of training: Coordination chemistry, biochemistry, molecular cloning, photochemistry, spectroscopic analysis of biomolecular interactions.

Representative publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Khoa The Nguyen</td>
<td>Masters student 2016</td>
<td>QC technician, Anitox Corporation (Georgia)</td>
</tr>
<tr>
<td>Xia Yang</td>
<td>Ph.D. student 1998-2003</td>
<td>Associate Professor, UCLA</td>
</tr>
<tr>
<td>Beth Wilson</td>
<td>Ph.D. student 2001-2006</td>
<td>Chemistry Department Chair, College Lake County</td>
</tr>
<tr>
<td>Carla A. Terry</td>
<td>Ph.D. student 2008-2013</td>
<td>Biochemist, CDC (Atlanta)</td>
</tr>
<tr>
<td>Dominique Williams</td>
<td>Ph.D. student 2009-2014</td>
<td>Postdoctoral Associate, Stony Brook University</td>
</tr>
</tbody>
</table>
Donald Hamelberg
Computational Biophysical Chemistry
Email: dhamelberg@gsu.edu; website: http://hamelberg.gsu.edu

Ph.D., Georgia State University, 2001; Postdoc, University of Illinois, Chicago (2001-2003); Postdoc, University of California, San Diego, 2003-2005; Research Fellow, Howard Hughes Medical Institute (2005-2008); Assistant Professor, Georgia State University (2008-2013); Associate Professor, Georgia State University (2013-Present); Director of Graduate Studies, Department of Chemistry (2015–Present)

Georgia Cancer Coalition Distinguished Cancer Scholar (2008), American Chemical Society (ACS) Hewlett-Packard Outstanding Junior Faculty Award (2009), National Science Foundation (NSF) CAREER Award (2010), Dean’s Early Career Award (2011), Outstanding Junior Faculty Award (2013)

The research in our group focuses on the application and development of theoretical and computational methods with the intent of gaining an in-depth understanding of biomolecular switches. Intricate networks of interacting proteins and RNAs mediate many interactions in cell signaling pathways. Deregulation of these pathways could trigger cellular transformation, oncogenesis, and a host of other diseases. The research in our lab seeks to decipher the underlying principles governing cell signaling mechanisms and biomolecular interactions involving proteins and RNAs. In these endeavors, we use simulation-based approaches, and related statistical mechanics, classical and quantum mechanical methods, as a complementary tool to experiments.

Areas of training:
Physical chemistry, Computational Chemistry, Computational Biophysics, Molecular Simulation Methods, Protein Dynamics and Function

Recent publications:

Trainees:
Dr. Hamelberg has mentored five postdoctoral research fellows, six Doctoral students, eight Masters students and many undergraduate students (Link to former lab members: http://hamelberg.gsu.edu/formergroupmembers.html)
Maged Henary
Organic Chemistry, NIR Fluorophores for in Vivo Imaging, DNA Targeting Agents
Email: mhenary1@gsu.edu; website: http://sites.gsu.edu/henary_laboratory/

B.S., Alexandria University, 1990; M.S., Cairo University, 1996; Ph.D., Georgia State University, 2000; Postdoc, Georgia Institute of Technology, 2001-2004; Visiting Lecturer, Georgia State University, 2005-2006, Lecturer, Georgia State University, 2007-2010, Assistant Professor, Georgia State University, 2011-present.

Our group is interested in the design, synthesis and development of small molecules for biomedical application and other chemical entities suitable for therapeutic use and imaging technology, such fluorophores for in vivo imaging of native and diseased tissues and DNA targeted agents with anticancer activity. We have established several collaborations with biologists, biochemists, and physicians to facilitate the design and developmental process of small molecules with significant biological activity.

Our group has developed near infrared fluorophores for use in medical imaging of healthy tissue (top left), diseased tissue including tumors (bottom left), duplex DNA probes (top right) and antitumor agents which act on G-quadruplex DNA to selectively target cancerous cells (bottom right).

Areas of training:
Organic Synthesis, Heterocyclic Chemistry, UV-Vis and Fluorescence Spectroscopy, NIR Contrast Agents, and Metal Sensors.

Recent publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dr. Eric Owens</td>
<td>Ph.D. student 2011-2015</td>
<td>Scientific Advisor at Haynes and Boone LLP.</td>
</tr>
<tr>
<td>Dr. Andy Levitz</td>
<td>Ph.D. student 2012-2017</td>
<td>Postdoctoral Associate at Cornell University.</td>
</tr>
<tr>
<td>Tyler Dost</td>
<td>Master Student 2015-2017</td>
<td>Chemist at Wolf Laboratories</td>
</tr>
<tr>
<td>Eduardo Soriano</td>
<td>Master Student 2013-2015</td>
<td>Chemist at Solvay</td>
</tr>
<tr>
<td>Dr. Lakshminaryana</td>
<td>Postdoc 2011-2013</td>
<td>Research Chemist at GVK Biosciences</td>
</tr>
<tr>
<td>Dr. Costyl Njoojob</td>
<td>Postdoc 2012-2014</td>
<td>Research Scientist at Aldrich Chemical Company</td>
</tr>
<tr>
<td>Hector Gonzales</td>
<td>Undergraduate 2015-2017</td>
<td>Ph.D. Student at Emory University</td>
</tr>
<tr>
<td>Ariana Laskey</td>
<td>Undergraduate 2015-2017</td>
<td>Lab Tech at Coca Cola Company</td>
</tr>
</tbody>
</table>
Zhen Huang
Selenium Nucleic Acids and Chemical & Structural Biology

Email: huang@gsu.edu; website: http://lithium.gsu.edu/faculty/Huang/

B.S., Sichuan University, 1980; M.S., Peking University, 1987; Ph.D., Swiss Federal Institute of Technology (ETH, Zurich, Switzerland), 1994; Postdoc, Harvard Medical School, 1994-1998; Assistant Professor, Brooklyn College, 1998-2004; Associate Professor, Georgia State University, 2004-2009; Full Professor, GSU, 2009-present.

He has pioneered and developed selenium and tellurium derivatizations of nucleic acids for structure and function studies of nucleic acids, protein-nucleic acid complexes, and nucleic acid-small molecular ligands (such as anticancer drugs). His current research interests are in selenium and tellurium derivatizations of DNAs and RNAs, via organic synthesis, for X-ray crystallographic studies of nucleic acids and protein complexes (especially for Cancer Research), synthesis of analogs of nucleosides and nucleotides for structure, function and anticancer studies, development of RNA microchip technology for direct detection and quantitation of gene expression profile for Cancer Early Detection, nanomaterial-assisted novel RNA microchip, modified nucleic acid-based nano-medicine (potential therapeutics), nucleic acid-based cancer diagnosis, in vitro selection, evolution and characterization of ligand-binding and catalytic RNAs and DNAs. His research has been funded by federal agencies, including NIH, NSF, DOD, and/or CDC, state funding agencies, the distinguished cancer scholar award, and as industry. He has received several US and European patents, and many US and international patent applications are pending.

Areas of Study and Training:

Recent Representative Publications:

Representative Trainees:

<table>
<thead>
<tr>
<th>Time in Laboratory</th>
<th>Current Position</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wen Zhang</strong></td>
<td>Ph.D. student 2006-2011</td>
</tr>
<tr>
<td><strong>Jianhua Gan</strong></td>
<td>Post-doc 2009-2012</td>
</tr>
<tr>
<td><strong>Abdalla Hassan</strong></td>
<td>Post-doc 2005-2009</td>
</tr>
<tr>
<td><strong>Jia Sheng</strong></td>
<td>Ph.D. student 2005-2009</td>
</tr>
<tr>
<td><strong>Nicolas Carrasco</strong></td>
<td>Ph.D. student 1999-2004</td>
</tr>
</tbody>
</table>
DNA replication is a major target for cancer therapies, while efficient DNA repair antagonizes those same therapies. Both replication and repair are critically dependent on the dynamics, coordinated access, and conformational switching of key proteins in the replication machinery. Research in our group is centered on the development and application of integrative or hybrid approaches for computational modeling of biological assemblies involved in these processes. We model and structurally characterize these dynamic assemblies to elucidate their roles in maintaining genome stability. Success of this research could have impact on cancer etiology and interventions. Our computational work feeds back directly to collaborative experimental work, forming strong contextual underpinnings for the multidisciplinary experiments designed to tackle the complex biology of DNA replication and DNA repair.

**Areas of training:** Computational biology and biophysics. Molecular modeling and simulations, Drug design, Computational chemistry. Biological assemblies and mechanisms of genome duplication and maintenance and gene regulation

**Recent publications:**

5. Querol-Audi J; Yan C.; Xu X.; Tsutakawa S.E.; Tsai M.S.; Tainer J.A.; Cooper P.K; Nogales E.; Ivanov I. Repair complexes of FEN1, DNA and Rad9-Hus1-Rad1 are distinguished from their PCNA counterparts by functionally important stability *Proceedings of the National Academy of Sciences U.S.A.* (2012) 109, 8528-8533
The Iyer research group is mainly focused on glycoscience and the application of glycans (or carbohydrates) as integral components of point of care diagnostics. Our long term goals are to develop products that could be used at primary care physician's offices, low resource settings and eventually, homes. We have been developing glycan based diagnostics for the capture and detection of toxins and pathogens such as Shiga toxin, influenza virus, norovirus and malaria. Since our research group’s interests lies at the interface of glycoscience and infectious diseases, students in our group are exposed to different disciplines as all projects span different scientific areas. For example, a typical project involves the design and syntheses of ligands, assay development, detection of pathogens and validation of the results. Developing point of care diagnostics also requires collaborations from experts from different disciplines. We collaborate with scientists at the Centers for Disease Control in Atlanta and faculty at Emory, UGA and other Universities. We are also working with a small business to translate our research to the clinic. These collaborations enrich student’s experience and are very valuable to their professional development. We welcome you to GSU and look forward to hearing from you.

Areas of training: Synthetic Chemistry, Glycoscience, Assay Development, Virology, Point of Care Diagnostics.

Recent publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>David Siler</td>
<td>B.S. 2008-2010</td>
<td>Ph.D., Princeton University and currently a scientist at Gilead.</td>
</tr>
<tr>
<td>Duane Hatch</td>
<td>PhD student 2004-2009</td>
<td>Assistant Professor, Belmont University.</td>
</tr>
<tr>
<td>Ashish Kulkarni</td>
<td>PhD student 2004-2010</td>
<td>Instructor, Harvard School of Medicine</td>
</tr>
<tr>
<td>Hieu Dinh</td>
<td>Ph.D. student 2012-2015</td>
<td>Assistant Professor, Atlanta Metropolitan College</td>
</tr>
<tr>
<td>Yang Yang</td>
<td>Postdoc 2010-2013</td>
<td>Associate Professor, Tianjin University of Science &amp; Technology, China</td>
</tr>
</tbody>
</table>
“Role of CD98 Glycoprotein in Intestinal and hepatic Inflammation“

Email: hlaroui@gsu.edu, location: PSC522.

Master of physical chemistry, University Henri Poincare, Nancy, France, 2002; Ph.D., University Henri Poincare, Nancy, France, 2008; Postdoc, Emory University, 2008-2011; Research Assistant Professor in Biology, Georgia State University, 2011-2013; Assistant Professor in Chemistry, Georgia State University, 2013-Present.

In my research, my 2 Ph.D. students and I are in the process of characterizing the role of the CD98 receptor in non-alcoholic fatty liver induced by a highly fatty diet. To accomplish this we use our group’s expertise (improvement of nanovesicles from fruits) to load siRNA and other bioactive compounds for delivery to the liver or to the colon.

In my current projects, funded by a K01 grant entitled, “Role of CD98 Glycoprotein in Intestinal Inflammation”, I am assessing the functional role of CD98 during experimental colitis in mice induced by dextran sodium sulfate (DSS). Results from these studies suggest that attenuation/downregulation of CD98 expression ameliorates experimental colitis through reduced inflammatory transduction process.

During the study, we observed that hepatocyte and Kupffer cells were over expressing CD98 during this mild inflammation. Thus, I decided to pursue and consolidate this line of investigation to provide a basis for his eventual R01 application. I am directly supervising an in vitro study utilizing intestinal and hepatic epithelial cells. I have already generated a transgenic mouse line and the “hepatic CD98-targeted” KO mice (using albumin Cre system) that will be the control in this project.

Areas of training:
Cellular and tissue biology, pharmacology, nanotechnology, liposomes and macrovesicle modifications

Representative publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poonam Rakhya (2011-2013)</td>
<td>M.S.</td>
</tr>
<tr>
<td>Leena Manzoor (2014-2015)</td>
<td>B.S.</td>
</tr>
<tr>
<td>Qiang Ma (2013-2015)</td>
<td>M.S.</td>
</tr>
</tbody>
</table>
Ming Luo
Virus Structures and Antivirals
Email: mluo@gsu.edu

B.S. in Chemistry, Wuhan University, 1982; Ph.D., Purdue University, 1987; Professor, University of Alabama at Birmingham, 1987-2014; Professor, Georgia State University, 2014-present.

Influenza virus (IFV) continues to be a major health problem around the world. The underlying reason that IFV continues to be a major health threat is directly related to its structure. We are working on IFV proteins, including the matrix protein M1 and the ribonucleoprotein NP, to delineate the role of these proteins in re-assortment and virulence. Moreover, we are also using structure-aided approaches to design novel antiviral drugs to treat IFV infection in humans.

On a larger scale, the replication mechanism of negative strand RNA viruses (NSVs) is unique among all biological systems. NSVs include a number of important viral pathogens, such as respiratory syncytial virus (RSV), parainfluenza virus (PIV), and Ebola virus (EBV). The one factor that separates NSVs from others is that the template for viral RNA synthesis is not the genomic RNA alone, but the nucleocapsid that is formed by encapsidation of viral genomic RNA with the nucleocapsid protein. During the viral RNA synthesis, the virus-coded RNA polymerase must recognize the nucleocapsid and gain access to the sequestered RNA sequence inside the nucleocapsid in order to use it as the template for copying the RNA sequence. We have solved the structure of a large number of viral proteins and developed the new paradigm for viral RNA synthesis of NSVs. Our efforts continue to unveil the molecular mechanism of NSV replication, with an emphasis on the structure of the large subunit L in the viral polymerase. VSV may also be modified as an oncolytic drug for cancer treatment.

Areas of training:
- Virus Structure
- Biochemistry of Viral Replication
- Drug Design
- Cancer Treatment

Publications:
Constantinides AE, Severin CC, Gumpper RH, Zheng X and Luo M. Characterization of the PB2 cap binding domain accelerates inhibitor design. Crystals, 2018, 8(2), 62

Representative trainees:

<table>
<thead>
<tr>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Audrey Harris</td>
<td>Ph.D. student 1996-2001 Chief, Structural Informatics Unit, NIAID</td>
</tr>
<tr>
<td>Todd Green</td>
<td>Ph.D. student 1996-2002 Assistant Professor, University of Alabama at Birmingham</td>
</tr>
<tr>
<td>Robert Cox</td>
<td>Ph.D. student 2009-2014 Senior Associate, Georgia State University</td>
</tr>
</tbody>
</table>
Suazette Reid Mooring
Chemistry Education Research and Organic/Medicinal Chemistry
Email: smooring@gsu.edu; website: www.chemedatgsu.webs.com

B.S. Morgan State University, 2000; M.S. Georgia Institute of Technology, 2004; Ph.D. Georgia State University, 2010; FIRST Postdoctoral Research Fellow, Emory University, 2010-2012; Assistant Professor, Georgia State University, 2012 - present

Chemistry Education Research
Our group focusses on barriers to the student success in undergraduate chemistry and the implementation of pedagogical and curriculum interventions that address those barriers. We are primarily interested in examining fundamental conceptual understanding of students enrolled in undergraduate courses across general chemistry, organic chemistry, and biochemistry courses. To this end, we are also assessing the implementation of research-based pedagogy in large enrollment courses for an increasingly diverse student body. Both quantitative and qualitative methods are being used to examine these questions.

Medicinal/Organic Chemistry Research
Our group is also interested in the design and synthesis of small molecules that are therapeutic agents for cancer and inflammatory diseases. Our current research focuses on the synthesis of small molecule antagonists of a chemokine receptor, CXCR4. CXCR4 is implicated in HIV, cancer metastasis and inflammatory diseases.

Areas of training: qualitative and quantitative education research methods, organic synthesis and drug design

Recent Publications:


Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nikita Burrows</td>
<td>Ph.D. student 2012-2017</td>
<td>Assistant Professor, Monmouth University</td>
</tr>
<tr>
<td>Theresa Gaines</td>
<td>Ph.D. student 2012-2017</td>
<td>Postdoctoral Fellow, Dixie State University</td>
</tr>
<tr>
<td>Callie Stern</td>
<td>Undergraduate student 2015-2016</td>
<td>Ph.D. student, Louisiana State University</td>
</tr>
</tbody>
</table>
ETS-family transcription factors, which regulate the self-renewal and differentiation of hematopoietic and neural stem cells, exemplify the long-standing, and as-yet unsolved problem of how structurally conserved transcription factors with overlapping DNA sequence preferences achieve target gene specificity. Our interest is to understand the biophysical mechanism by which these structurally homologous transcription factors discriminate DNA target sites, and to establish chemical control of clinically significant ETS-dependent genes. Our work has revealed a high level of mechanistic heterogeneity in ETS/DNA recognition, including previously unrecognized differences in coupling of hydration and conformation dynamics to site recognition. We are now translating this knowledge to search for compounds that selectively target one or a small subset of ETS/DNA complexes, with a view of finding targeted transcriptional activators. In addition, we are engaged in major collaborative efforts to design inhibitors of specific ETS/DNA complexes in vivo, and are conducting collaborative preclinical studies to evaluate their therapeutic potential in acute myeloid leukemia, systemic sclerosis and melanoma in model disease systems.

Areas of training:
Biophysical chemistry, protein engineering, phage display, biophysical development

Representative publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles Linde</td>
<td>Undergraduate 2012-2013</td>
<td>Graduate student at Stanford University</td>
</tr>
<tr>
<td>Erin Boland</td>
<td>Undergraduate 2012-2013</td>
<td>Medical student, University of Washington</td>
</tr>
<tr>
<td>Crystal Van Dyken</td>
<td>Undergraduate 2011-2012</td>
<td>Research Assistant at Oregon Health &amp; Science University</td>
</tr>
</tbody>
</table>
Shahab A. Shamsi

Nano-Micelles, Monoliths and Nanoparticles as Separation Media for Capillary Electrophoresis-Mass Spectrometry (CE-MS). Email: sshamsi@gsu.edu;
M.S., Eastern Illinois University, 1990; Ph.D., Miami University, Oxford, OH, 1995; Postdoc, Louisiana State University, 1995-1998; Assistant Professor, Georgia State University, 1998-1999; 2000-2005; Associate Professor, Georgia State University, 2005-2010; Professor, Georgia State University, 2010- Present. Miami U. Gamma Theta Phi Award-1993; R01-NIH Awardee 2002-2014; Runner-Up For ACS Young Investigator Award in Sep Science-2005.

Key areas of research in our group includes: (a) Designing novel chiral and achiral stationary phases for different modes of CE-MS using glycolipids, amino acid lipids and glycopeptide nanomicelles, (b) Developing Monolithic, Open tubular and Packed columns for CEC-MS for Metabolomics; (c) Development of Chip-HPLC-MS for analysis of glycan library markers; (d) Studying enantioselective drug-drug Interactions by CE-MS.

Exhibit I: Glycopeptide Nanomicelles

Exhibit II: Fabrication of Monolithic Column for Separation of Cancer Metabolome Markers in Human Prostrate Tissue

Areas of training:
Chemical separations, capillary electrophoresis and liquid chromatography coupled to mass spectrometry, Chip HPLC-MS; column engineering and fabrication, chiral organic synthesis of nanomicelles and ionic liquids.

Recent publications:

Representative trainees:
<table>
<thead>
<tr>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Syed A. Rizvi</td>
<td>PhD student 2001-2006</td>
</tr>
<tr>
<td>Jie Zhang</td>
<td>PhD student 2002-2006</td>
</tr>
<tr>
<td>Cevdet Akbay</td>
<td>Postdoc 2002-2004</td>
</tr>
</tbody>
</table>
Binghe Wang

Drug design, drug delivery, fluorescent sensing, molecular recognition

Email: wang@gsu.edu; website: http://lithium.gsu.edu/Groups/Bing_Wang/default.html

B.S., Beijing Medical College, 1982; Ph.D., University of Kansas, 1991
Postdoc, University of Arizona, 1992, University of Kansas, 1993
Assistant Professor, University of Oklahoma College of Pharmacy, 1994-1996, North Carolina State University, 1996-2000; Associate Professor, North Carolina State University, 2000-2003; Professor and Georgia Research Alliance Eminent Scholar, Georgia State University, 2003-2013; Chair, Department of Chemistry, Georgia State University, 2011-2013; Regents Professor, Georgia Research Alliance Eminent Scholar, and Associate Dean, Georgia State University, 2014-present

Work in Dr. Binghe Wang’s lab cover drug design (cancer, infectious diseases, inflammation, etc), drug delivery (delivering gasotransmitters, prodrugs, receptor-mediated drug delivery, click chemistry-mediated drug delivery, etc.), fluorescent sensing and new diagnostics (carbohydrate biomarkers, anions, peroxides, sulfides, etc.), click chemistry (DNA modifications, new click chemistry, click chemistry in drug delivery), boronic acid chemistry, and carbohydrate recognition.

Areas of training:
Drug design, organic synthesis, drug delivery, computational chemistry, drug screening, instrument analysis, cell culture, biochemistry, enzyme inhibition, fluorescent sensing, click chemistry, etc.

Recent publications:

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yueqin Zheng</td>
<td>2012-2017, PhD student</td>
<td>Postdoctoral fellow, Harvard Medical School</td>
</tr>
<tr>
<td>Jalisa Ferguson</td>
<td>2012-2017, PhD student</td>
<td>Postdoctoral Fellow, University of North Carolina, Ashville</td>
</tr>
<tr>
<td>Alex Draganov</td>
<td>2011-2016, PhD student</td>
<td>Scientist, Wolfe Laboratories, Inc</td>
</tr>
<tr>
<td>Ke Wang</td>
<td>2010-2015, PhD student</td>
<td>Scientist, Frontage Laboratories, Inc.</td>
</tr>
<tr>
<td>Danzhu Wang</td>
<td>2009-2014, PhD student</td>
<td>Lecturer of Chemistry, Georgia State University</td>
</tr>
<tr>
<td>Arpana Chaudhary</td>
<td>2009-2013, PhD student</td>
<td>Patent Agent, Monsanto Company</td>
</tr>
<tr>
<td>Sarah Boroughs</td>
<td>2009-2013, PhD student</td>
<td>Assistant Professor of Chemistry, Georgia Southern University</td>
</tr>
<tr>
<td>Suzette Mooring</td>
<td>2005-2010, PhD student</td>
<td>Associate Professor of Chemistry, Georgia State University</td>
</tr>
</tbody>
</table>
Gangli Wang

Analytical and Physical Chemistry at Nanoscale, Biosensors, Energy and Biomedical Technology
Email: glwang@gsu.edu; website: http://lithium.gsu.edu/Groups/Gangli_Wang/

B.S., Peking University, 1996; M.S., Peking University, 1999; Ph.D., University of North Carolina at Chapel Hill, 2004; Postdoc, University of Utah, 2004-2007; Assistant Professor, Georgia State University, 2007-2013; Associate Professor, Georgia State University, 2013-present.

The main research thrust in GWang’s group is nanoelectrochemistry. We thrive to gain fundamental insights for better biomedical and energy applications. Electrochemistry is an interfacial science that studies charge transport behaviors. We study two types of charge behaviors at nanoscale interfaces: electron activities in noble metal clusters with few nanometer dimension; and ion transport (inorganic ions, metal clusters as nanomolecules, proteins and biomacromolecular complexes) at substrate-solution interfaces.

Areas of training:
Electrochemistry, nanomaterials, nanotechnology, sensors, energy storage and conversion, water desalination.

Recent publications (RED indicates the trainees started as undergraduate students):


Representative trainees (Four PhDs, eight MSs and ten BSs graduated):

<table>
<thead>
<tr>
<th></th>
<th>Time in lab</th>
<th>Positions after departing GWang lab (last known)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PhDs</td>
<td>About 5 years</td>
<td>South China University of Technology; Duke, CUNY, Reckitt &amp; Benckiser Co.</td>
</tr>
<tr>
<td>MSs</td>
<td>About 2 years</td>
<td>University of Texas Austin, Georgia Tech, industry</td>
</tr>
<tr>
<td>BSs</td>
<td>Undergraduate research</td>
<td>Graduate school (Chemistry, Chem. Eng.) Med/Pharm, industry</td>
</tr>
</tbody>
</table>
Peng George Wang  
Organic, Medicinal & Bio- Chemistry, and Glycobiology  
Email: pwang11@gsu.edu; website: http://lithium.gsu.edu/faculty/PWang/index.html

B.S., Nankai University, 1984; Ph.D., University of California at Berkeley, 1990;  
Postdoc, University of California at Berkeley, 1991-1992; Postdoc, Scripps Research Institute, 1992-1994; Assistant Professor, University of Miami, 1994-1997;  
Associate Professor/Tenured, Wayne State University, 1997-2001. Professor, Wayne State University, 2001-2003. Professor and Ohio Eminent Scholar, Ohio State University, 2003-2011. Professor and Georgia Research Alliance Eminent Scholar, Georgia State University, 2011-Present; Chair, Department of Chemistry, Georgia State University, 2015-Present;  
Camille Dreyfus Teacher-Scholar Award (1999), Horace S. Isbell Award (2002),  
Grand Challenges Exploration Award (2009), The American Association for the Advancement of Science fellow (2012)

The main research focus in the Wang laboratory is glycoscience with emphasis on glycan synthesis & analysis, chemical biology of glycoconjugates and new drug development to combat infections, diabetes and cancers.

Areas of study:
- Organic, chemoenzymatic synthesis of glycans, glycolipids, glycoproteins and lipopolisaccharides
- Glycoanalysis and glycoproteomics using state-of-the-art tools and instruments such as MALDI (Flextreme), LC-MSMS (Orbitrap Elite)
- Chemical biology of glycosylation and protein posttranslational modification
- Biochemistry of glycosyltransferases & glycosidases
- Carbohydrate-based vaccines to prevent infections
- Sugar-based immunotherapy to overcome diabetes and cancers

Areas of training:
Organic synthesis; peptide & glycopeptide synthesis; conjugation chemistry for sugar-protein & sugar-drug synthesis; protein cloning, expression & purification; glycoanalysis; proteomics.

Recent publications (out of 284):
Li, Lei; Wang, Peng George; et al “Efficient Chemoenzymatic Synthesis of an N-glycan Isomer Library” Chemical Science 2015, 6 (10), 5652-5661.

Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maohui Wei</td>
<td>PhD student 2011-2016</td>
<td>Postdoc at Harvard University</td>
</tr>
<tr>
<td>Robert Woodward</td>
<td>PhD student 2006-2011</td>
<td>Assistant Professor at University of Mount Union</td>
</tr>
<tr>
<td>Wen Yi</td>
<td>PhD student 2003-2008</td>
<td>Professor at Zhejiang University, China</td>
</tr>
<tr>
<td>Ming Xian</td>
<td>PhD student 1999-2003</td>
<td>Professor at Washington State University</td>
</tr>
<tr>
<td>Peter Andreana</td>
<td>PhD student 1997-2002</td>
<td>Associate Professor at University of Toledo</td>
</tr>
<tr>
<td>Xi Chen</td>
<td>PhD student 1995-2000</td>
<td>Professor at UC Davis</td>
</tr>
</tbody>
</table>
Dr. Weber is conducting research on drug resistance in HIV and structure-guided design of new protease inhibitors for AIDS. The viral-encoded protease is an important drug target for HIV/AIDS therapy. We are studying how novel inhibitors bind to HIV protease, determining the molecular basis for drug resistance by X-ray crystallography and other biophysical and biochemical assays, and developing algorithms to predict resistance from genotype sequence data. In addition, her group carries out bioinformatics, crystallographic and biochemical studies of key proteins implicated in obesity, cancer, and infectious diseases.

**Areas of training:**
Protein crystallography, enzyme structures, drug design, bioinformatics.

**Recent publications:**

**Representative trainees:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xiaxia Yu</td>
<td>Master student 2007-2009</td>
<td>Research Assistant Professor at Stony Brook University, Stony Brook, NY.</td>
</tr>
<tr>
<td>Chen-Hsiang Shen</td>
<td>PhD student 2008-2014</td>
<td>Scientist at NIH</td>
</tr>
<tr>
<td>Yungfeng Tie</td>
<td>PhD student 2001-2006</td>
<td>Scientist, Centers for Disease Control &amp; Prevention, Atlanta, GA.</td>
</tr>
<tr>
<td>Hongmei Zhang</td>
<td>PhD student 2010-2013</td>
<td>Lecturer, Georgia State University, Atlanta, GA.</td>
</tr>
</tbody>
</table>
All of the projects in my laboratory focus on the structure, interaction and properties of nucleic acids. We are investigating and developing a range of compounds that interact with different sequences and structures of DNA. We are particularly interested in the design drugs that can inhibit specific organisms by forming complexes in the DNA minor groove at unique sequences and structures of DNA or RNA. We have designed biologically active compounds that target unusual DNA structures and important protein-DNA complexes for control of gene expression. A range of solution and molecular modeling experiments are being conducted on complexes of compounds that interact with DNA oligomer sequences that mimic selected sequences from the organism to be targeted. These studies provide information for a molecular model of the complex as a computer model, and logical variations of the drug structure to enhance the DNA interactions can be proposed and initially tested in the computer. We have recently solved the NMR structure of a new compound that recognizes mixed sequences of DNA with a water mediated H-bond. Such compounds have the ability to simultaneously recognize both strands of DNA to significantly enhance interaction strength and specificity. We are establishing rules for the specific interaction of heterocyclic compounds with DNA and we have new designs that can recognize a number of DNA sequences and structures with high specificity.

**Areas of training:**
Biophysical Chemistry; interaction of small molecules with nucleic acids and nucleic acid molecular recognition; thermodynamic analysis of nucleic acid complexes; structure-activity relationships; binding, kinetic, and conformational analyses of drug, peptide and protein complexes with DNA and RNA; experimental and molecular modeling methods in nucleic acid conformational analysis and drug design. We use spectroscopy, NRR, mass spectrometry, biosensor surface plasmon resonance, ITC and others.

**Recent publications:** A few examples out of a total of over 400 publications:
"DNA Microstructure Influences Selective Binding of Small Molecules Designed to Target Mixed-site DNA Sequences." Laughlin-Toth, Sarah; Carter, E. Kathleen; Ivanov, Iveylo; Wilson, W. David, Nucleic Acids Res. 45, 1297-1306 (2017).
Hao Xu

Organic and Inorganic Chemistry; Synthetic Chemistry and Chemical Biology.

Email: hxu@gsu.edu; website: http://sites.gsu.edu/hxu/

B.S., Peking University, 2001; Ph.D., The Scripps Research Institute, 2006; Dreyfus Postdoctoral Fellow, Harvard University, 2006–2010; Assistant Professor of Chemistry, Georgia State University, 2010–2016; Associate Professor of Chemistry, 2016–present.

Alfred P. Sloan Research Fellowship (2015), CAPA Biomatik Distinguished Junior Faculty Award (2015), Dean’s Early Career Award (Georgia State University, 2015), National Science Foundation CAREER Award (declined, 2014), Thieme Chemistry Journal Award (2014), Camille and Henry Dreyfus Postdoctoral Fellowship (2006), Bristol–Myers Squibb Graduate Fellowship in Synthetic Organic Chemistry (2005), Lesly Starr Shelton Award for Excellence in Chemistry Graduate Studies (2005), Skaggs Research Predoctoral Fellowship (2003).

Hao Xu went to Peking University (Beijing) for college in 1997. He enrolled in the Chemistry Graduate Program at Scripps Research Institute (La Jolla, CA) in 2001 and carried out his Ph.D. research with Professor K. C. Nicolaou for complex-molecule synthesis. In 2006, he joined Professor Eric Jacobsen’s lab at Harvard University (Cambridge, MA) as a Dreyfus Postdoctoral Fellow. In Jacobsen’s lab, Hao discovered several highly enantioselective strong acid-chiral urea/thiourea co-catalyzed reactions for the greener synthesis of nitrogen-containing complex molecules.

Hao joined the faculty of Georgia State University (Atlanta, GA) in Fall 2010 and his passion of incorporation of nitrogen atoms into complex molecules has continued. At Georgia State, he has established a unique synthetic chemistry program that focuses on the Iron-Catalyzed Nitrogen Atom Transfer for Selective Olefin Difunctionalization. Along with his students, Hao has discovered a range of iron-catalyzed selective atom transfer reactions in which a nitrogen atom and a hetero-atom-based group are selectively transferred to olefins. These catalytic reactions readily transform commodity chemicals to highly functionalized building blocks valuable to medicinal chemistry and pharmaceutical research.

Recent selected publications:


Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jeffrey Sears</td>
<td>Master student 2014–2015</td>
<td>PhD student at University of Rochester</td>
</tr>
<tr>
<td>Yongan Yuan</td>
<td>PhD student 2012–2016</td>
<td>PhD research scientist at Georgia Pacific, Atlanta</td>
</tr>
</tbody>
</table>
Jenny J. Yang

Protein Design: From Modulating Calcium Signaling to Molecular Diagnosis and Therapy

Email: jenny@gsu.edu; website: http://www.gsuyanglab.com

B.S., Xiangtan University, 1982; M.S., Xiangtan University, 1985; Ph.D., Florida State University, 1992; Postdoc, Syntex Research 1992; University of Oxford, UK 1992-1995; Yale University, 1996 Assistant Professor, Georgia State University, 1997-2001; Associate Professor, Georgia State University, 2002-2006; Professor Georgia State University 2006-Present.

Distinguished University Professor Georgia State University (2013-Present); Honor Guest Professorship at the Central South University; China (2013-present); The Alumni Distinguished Professor Award of Georgia State University (2011); Outstanding Faculty Achievement Award, Georgia State University (2003); Outstanding Junior Faculty Award, Georgia State University, Arts & Sciences (2001)

Jenny Yang lab applies various methodologies including bioinformatics, spectroscopy, protein and coordination chemistry, imaging, cell biology and animal models to address following hot research topics.

1) We develop computational and biochemical approaches to identify Ca\(^{2+}\) binding proteins and visualize calcium signaling pathways, to dissect key determinants for metal affinity, selectivity, & regulation, and to establish molecular basis of metal toxicity (we called calciomics). 2) We investigate the molecular basis of various human diseases associated to Ca\(^{2+}\) signaling. We work on structural, regulation and function of several key proteins in integrating extracellular with intracellular Ca\(^{2+}\) signaling & cell-cell communication. 3) We develop biosensors such as Ca\(^{2+}\) and protease sensors to monitor rapid subcellular events with preclinical applications. 4) We strive to create MRI contrast agents to diagnose and cure human diseases with unprecedented sensitivity and accuracy. 5) We design protein drugs with improved therapeutic effects to against cancer, diabetes and virus infection.

Recent publications:


Representative trainees:

<table>
<thead>
<tr>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lisa M Jones</td>
<td>Graduate student 2001-2006</td>
</tr>
<tr>
<td>Yubin Zhou</td>
<td>Graduate student 2003-2007</td>
</tr>
<tr>
<td>Julian Johnson</td>
<td>Under and MS student 2005-2007</td>
</tr>
<tr>
<td>Amy Carroll</td>
<td>Under and MS student 1998-2001</td>
</tr>
<tr>
<td>Yun Huang</td>
<td>Graduate student 2004-2009</td>
</tr>
</tbody>
</table>
Protein modification by ubiquitin (UB) controls diverse cellular processes. UB is conjugated to cellular proteins by sequential transfer through an E1-E2-E3 enzymatic cascade. The cross-activities of 2 E1s, 50 E2s and hundreds of E3s encoded make it difficult to identify the cellular targets of a specific E3 to map it on a cell signaling network. To solve this problem, we used phage and yeast cell surface display to engineer orthogonal UB-E1, E1-E2 and E2-E3 pairs so that the engineered UB (xUB) can be exclusively used by a specific E3 to label its substrate proteins. We have constructed stable cell lines to express the engineered xE1-xE2-xE3 cascade for orthogonal UB transfer (OUT). We carried out tandem purification and proteomic profiling to identify the downstream targets of important E3s including E6AP, Rsp5, UBE4B, CHIP, Mdm2, Traf6, and BRCA1. We also study the mechanism of UB chain assembly by unnatural amino acid incorporation, structural biology, and enzyme mechanistic analysis.

**Areas of training:**
Protein engineering, phage display, yeast cell surface display, proteomics, protein posttranslational modification, cell signaling.

**Recent publications:**


**Representative trainees:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Time in lab</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karan Bhuripanyo</td>
<td>PhD student 2010-2016</td>
<td>Team leader at Qiagen, Thailand.</td>
</tr>
<tr>
<td>Yiyang Wang</td>
<td>Postdoc fellow 2013-2016</td>
<td>Postdoc fellow at the Scripps Research Institute.</td>
</tr>
<tr>
<td>Patrick Major</td>
<td>Master student 2013-2014</td>
<td>PharmD candidate at University of Georgia, Athens.</td>
</tr>
<tr>
<td>Keya Zhang</td>
<td>PhD student 2006-2012</td>
<td>Team leader at DuPont Research &amp; Development Center, China.</td>
</tr>
<tr>
<td>Bo Zhao</td>
<td>Postdoc 2010-2013</td>
<td>Assistant professor at Shanghai Jiao Tong University, China.</td>
</tr>
</tbody>
</table>
Stuart Allison
Physical Chemistry

Email: sallison@gsu.edu;
website: http://chemistry.gsu.edu/profile/allison/

B.A., University of Montana. 1973; M.S., University of California, Berkeley, 1976; Ph.D, University of Washington, 1980; Postdoctoral Fellow, University of Oregon, 1980-1982; Postdoctoral Fellow, University of Houston, 1982-1984; Assistant Professor, Georgia State University, 1984-1990; Associate Professor, 1990-2000; Professor, 2000-2016; Associate Chair, Department of Chemistry, Georgia State University, 2011-2016.

Presidential Young Investigator Award, 1985-1990.

The research of the Allison group has focused on the theory of biomolecular transport that has included diffusion, diffusion controlled reactions, viscosity, electrophoresis, and electrical conductance. Coarse grained computer modeling (Brownian dynamics, analytical and numerical solution of continuum transport equations) has played a major role in this research. In recent years, the focus of this research has been modeling the electrophoresis and electrical conductance of model “nano-ions” in free solution as well as congested media such as a gel. A good example is the electrophoresis of a “soft” particle in a charged or uncharged gel (references 5, 8, and 9 below). This model is particularly relevant, for example, in drug delivery in congested media such as tissue or cells.

A high priority in the Allison laboratory has been to involve undergraduate as well graduate students in research at a level that stands a good chance of resulting in a publication in an internationally recognized peer reviewed journal. This is achieved through weekly group meetings and having the undergraduates work closely as a team with myself and possibly graduate students. Students highlighted in the publication list below are GSU undergraduate or graduate students.

Recent Publications (partial list):

Al Baumstark

Methodology of Organic Synthesis

Email: abaumstark@gsu.edu;
website: http://chemistry.gsu.edu/profile/abaumstark/

B.A., University of California, Riverside, 1970; A.M., Harvard University, 1972; Ph.D. Harvard University, 1974; Postdoctoral Fellow, Harvard University, 1974-1976; Assistant Professor, Georgia State University, 1976; Associate Professor, 1982; Professor, 1989; Chair, Department of Chemistry, Georgia State University, 1993-2011.


Research in my group centers on the chemistry of oxygen-containing compounds with an emphasis on that of organic peroxides. We have focused on the mechanisms of oxygen atom transfer reactions of unusual hydroperoxides and peroxides, especially under mild conditions. We have extended the frontiers in oxygen chemistry by synthesis and characterization of exotic, novel organic peroxides. The ultimate goal of our investigations is to understand the limiting factors that control reactivity and selectivity in oxygen containing systems.

We have developed the chemistry of cyclic and acyclic alpha-azo hydroperoxides and 3-hydroperoxy-1,2-dioxolanes. These unusual hydroperoxides are of high reactivity and selectivity in electrophilic oxygen-atom transfer reactions. We have discovered new synthetic routes to these reactive compounds. Our work on the synthesis and thermolysis of 1,2-dioxetanes (4-membered cyclic peroxides) was extremely productive. We have studied the effects of substituents on the activation parameters of thermolysis. We have measured the chemiexcitation yields for a large number of compounds. These studies provided insights into the mechanism of excited state formation in chemiluminescent and bioluminescent processes.

We have developed $^{17}$O NMR spectroscopic methods for the investigation of structure in oxygen-containing compounds. $^{17}$O NMR studies were successful in predicting: (a) torsion angle relationships; (b) in-plane van der Waals repulsions; and (c) hydrogen-bonding phenomena. The results of our studies were useful in applying $^{17}$O NMR methods to structural and labeling studies.

We are investigating the oxygen-atom transfer chemistry of dioxiranes, 3-membered cyclic peroxides. Our research on electrophilic epoxidation led to postulation of a mechanism with a spiro transition state, which has become the accepted explanation. Recent investigations have centered on epoxidation of electron poor systems, computational modeling of epoxidation, and heteroatom oxidation. We have completed studies of the epoxidation of cyclic dienes by dimethyldioxirane. We are using DFT calculations to model the epoxidation of selected alkenes.

Areas of training: Organic synthesis, reaction mechanism, spectroscopy, methodology development.
Recent Publications of 135


Representative trainees:

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Current position</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davita McTush-Camp</td>
<td>PhD student</td>
<td>Postdoc, Baylor University</td>
</tr>
<tr>
<td>Luiz Catalani</td>
<td>PhD student</td>
<td>First Brazil student awarded Ph.D. in chemistry. Prof. Chemistry Institute, U. São Paulo, Brazil</td>
</tr>
<tr>
<td>Hsin-Hung Chen</td>
<td>PhD student</td>
<td>Toxicologist, Institute of Forensic Science, Texas.</td>
</tr>
<tr>
<td>Brain Crow</td>
<td>PhD student</td>
<td>ORSIE Fellow, Center for Disease Control and Prevention, Atlanta, GA</td>
</tr>
<tr>
<td>Mark Cunningham</td>
<td>PhD student</td>
<td>Vice President for Institutional Effectiveness, Atlanta Metropolitan University, Atlanta, GA</td>
</tr>
<tr>
<td>Denise Curi</td>
<td>PhD student</td>
<td>Professor, Department of Chemistry, Colegio Bandeirantes, São Paulo, Rio de Janeiro</td>
</tr>
<tr>
<td>Pamela Leggett-Robinson</td>
<td>PhD student</td>
<td>Professor and Chair, Department of Chemistry, Georgia Perimeter College, Clarkston, GA</td>
</tr>
<tr>
<td>Elba Michelena-Baez</td>
<td>PhD student</td>
<td>Professor, department of Chemistry, Universidad del Zulia, Maracaibo, Venezuela</td>
</tr>
<tr>
<td>Angela Navarro-Eisenstein</td>
<td>PhD student</td>
<td>Senior Lecturer, Department of Chemistry, Georgia State University</td>
</tr>
<tr>
<td>Robert Pilcher</td>
<td>PhD student</td>
<td>Orthopedic Surgeon, Albany Arthritis &amp; Orthopedic Center, Albany, GA</td>
</tr>
<tr>
<td>W. Rucks Winkeljohn</td>
<td>PhD student</td>
<td>ORSIE Fellow, Center for Disease Control and Prevention, Atlanta, GA</td>
</tr>
</tbody>
</table>
Facilities

The department operates a general core facility, a computational facility, a NMR facility, and a MS facility. The general core facility offers spectrophotometers for UV/vis, infrared, fluorescence and circular dichroism, stopped flow instrumentation, Biacore instruments for surface plasmon resonance (SPR), quartz crystal microbalance (QCM-D), bead sorter for combinatorial chemistry, ITC and DSC instruments. The core facility also supports purification of small molecules and proteins by HPLC, FPLC, ultracentrifugation, and capillary electrophoresis. The department shares the core facility of the Department of Biology for peptide and oligonucleotide synthesis, and DNA sequencing.

Computational Facility

A solid cyberinfrastructure for research computing thrives at Georgia State University and includes high performance computing, grid computing, data storage and visualization. With a growing body of academic and scientific researchers, including faculty and Ph.D. students, from many disciplines as well as from other universities, Georgia State continues to build a diverse and powerful supercomputing grid. The Chemistry Department has a robust history of leveraging computational methods to conduct research. Commonly used tools include Gaussian for molecular orbital investigations and Sybyl and Amber for molecular modeling and molecular dynamic studies of biological macromolecules.
NMR Facility

The NMR Facility provides support for compound and biomolecule characterization by NMR to the research community of GSU. The facility operates a Bruker 600MHz AV-III HD, a Bruker AV-III 400MHz, and a Bruker AV 400MHz spectrometer. The Bruker 600MHz spectrometer has gradient and triple resonance capabilities. The Bruker AV-III 400MHz NMR is equipped with a BBFO probe that can observe frequencies from $^{109}$Ag to $^{19}$F. The Bruker AV 400MHz NMR is equipped with a BBO probe that can observe frequencies from $^{109}$Ag to $^{31}$P.

Mass Facility

The MS Facility provides service for the analysis of chemical and biological samples with state-of-the-art mass spectrometers. The facility operates five instruments including a Thermo Scientific Orbitrap Elite MS connected with a Dionex LC, a Waters Q-TOF micro (ESI-Q-TOF) connected with HPLC, an ABSciex 4800 MALDI TOF-TOF analyzer, a Shimadzu QP5050A GC-EIMS, an ABSciex API 3200 (ESI(APCI)-Triple Quadruple) connected with HPLC, and an Agilent 1100 series II LC-CE-MSD.
Ph.D. and M.S. degrees are offered in chemistry in the following core areas:

- Analytical
- Biological/Biochemical
- Biophysical/Computational
- Organic/Medicinal
- Chemical Education
- Geochemistry

The Department of Chemistry has active research programs in each core area and a bioinformatics option is available in each. Applications to the graduate programs in chemistry are reviewed on a rolling admission basis each semester. The graduate program admits students each academic semester provided a complete application and all supporting documents are received by the final deadline:

**Fall Admission:** Application Review Period: January 15th – June 1st
**Spring Admission:** Application Review Period: September 1st – December 1st
**Summer Admission:** Application Review Period: January 15th – April 1st
Application requirements

- Applicants must hold a baccalaureate or a master degree in Chemistry, Biology or a closely related field.
- Applicants must submit transcripts of their past academic performance, a statement of their career goals and research interest, and scores on the general Graduate Record Examination (GRE). International applicants should also submit scores on the Test of English as a Foreign Language (TOEFL).
- Applicants for the Ph.D. program must submit three letters of recommendation.
- Applications should be submitted online at http://chemistry.gsu.edu/graduate/admissions/how-to-apply-graduate/
- Supporting materials should be mailed to the Office of Graduate Studies.

If you have questions about our graduate program, please contact:
Dr. Donald Hamelberg, Graduate Director, dhamelberg@gsu.edu
Dr. Jun Yin, Associate Graduate Director, junyin@gsu.edu
Ms. Kedayne King, Graduate Coordinator, kking44@gsu.edu, 404-4135497

Assistantships and Fellowships

All full-time students in the Ph.D. program who remain in good academic standing and maintain satisfactory progress towards the degree currently receive teaching and research assistantships and waived tuition. Premiums for health insurance are subsidized by the College of Arts and Sciences and the department.

Over 60 prestigious fellowships and assistantships are awarded by the department to outstanding Ph.D. students. They include:

- Al Baumstark Award for Minority or Female Students
- Ambrose Pendergrast Fellowship in Medicinal Chemistry and Biochemistry
- David Withers Boykin Graduate Fellowship in Medicinal Chemistry

In addition graduate assistantships are offered in Molecular Basis of Disease (MBD) and Brains and Behavior (BB) research areas and include a stipend of at least $22,000 annually, waived tuition, and subsidized health insurance.

Students in the M.S. program can apply for teaching and research assistantships and waived tuition.