Our long-term goal is to modulate Ca$^{2+}$ signaling in biological systems. To achieve this, we are currently focusing on (1) prediction and structural analysis of calcium binding proteins in biological and chemical systems (2) developing new methods and probes for bioinformatics, chemical biology, and diagnosis and (3) treatment of diseases by protein engineering and design. The first major interest focuses on the mechanisms of molecular recognition, especially the role of calcium in biological and chemical systems. Ca(II) is an essential component in the biomineralization of teeth, bones, and shells. It regulates cellular processes, such as cell division and growth, secretion, ion transport, and muscle contraction, in different compartments through interactions with Ca(II)-binding proteins and temporal and spatial changes in concentration. Many human diseases, including various cardiomyopathies, Alzheimer's disease, and lens cataract formation are known to be associated with altered Ca(II)-binding affinities and altered Ca(II) signaling.

There are two major barriers to understanding the molecular mechanisms of Ca(II)-dependent biological function. First is the lack of established rules relating Ca(II)-binding affinity with specific structural aspects of proteins. This complication is exacerbated by the complexities encountered in cooperative, multi-site systems, and the use of Ca(II)-binding energy to effect conformational changes in proteins. To date, understanding the role of Ca(II) in regulating extracellular Ca(II) signaling is mainly hindered by a lack of knowledge regarding Ca(II) binding sites. A second barrier in understanding the role of Ca(II) in signaling is the lack of sensors to monitor Ca(II) concentration changes in different sub-cellular environments. To overcome these barriers and limitations associated with naturally occurring Ca(II)-binding proteins, we have developed two novel protein engineering approaches (designing and grafting) for creating a single Ca(II)-binding site, allowing the dissection of the key structural factors that control Ca(II)-binding affinity, conformational change and cooperativity. We have also developed protein-based sensors that can be specifically targeted to the cellular compartments to monitor Ca(II) concentration change.
The second research interest focuses on developing new methods and probes for chemical biology and the diagnosis and treatment of diseases. Currently there is an urgent need to predict calcium binding proteins and their biological functions (calcioomics) and to develop research and diagnostic tools for linking our knowledge derived from in vitro studies to living cells and organisms. By applying our expertise in protein engineering and design and structural biology, we wish to develop new tools for monitoring biological processes and diagnosis human diseases in live cells and animals (e.g. fluorescence and magnetic resonance imaging probes).

Additionally, we work closely with collaborators in the departments of Math, Statistics and Computer Science to develop algorithms for the prediction of calcium-binding sites, and the identification of calcium-binding proteins based on sequential data. These programs then provide a means of enhancing our design and engineering projects by facilitating the rapid processing of data, collection of statistical data, identification of potential binding sites as well as locations for insertion of binding sites, and pre-developmental modelling.
OUTLINE OF RESEARCH PROJECTS

Designing Calcium and Metal Binding Sites
The objectives of this project are 1) to develop a general methodology to design metal (e.g. calcium and lanthanides) binding sites with high coordination numbers, 2) understand the mechanism of calcium-regulated biological processes such as ligand-induced conformational changes in cell adhesion, 3) monitor calcium signaling in vivo, and 4) characterize large protein complexes using residual dipolar coupling and lanthanide binding. Various biophysical and chemical tools, including high resolution methods, are used to characterize the Ca(II) binding sites and optimize our methods for the design of calcium/lanthanide binding proteins.

Engineering and Analyzing EF-hand Calcium Binding Proteins
The objective of this project is to understand calcium signaling via trigger proteins such as calmodulin, troponin C and other EF-hand proteins. A grafting approach has been established to understand site-specific metal binding affinity and selectivity of individual calcium binding motifs, and to estimate the contribution of conformational change and cooperativity between paired EF-hand motifs. We are currently investigating the role of CaM regulation of gap junctions in lens cells (in collaboration with Dr. Charles Louis' group), metal binding proteins in viral systems such as rubella (in collaboration with Dr. Teryl Frey), and iron transporters in bacteria by predicted EF-hand proteins (see Calciomics).
OUTLINE OF RESEARCH PROJECTS

Developing Calcium and Proteinase Sensors
The goal of this project is to develop fluorescent sensors for monitoring calcium signaling and proteinase activity in subcellular compartments both *in vivo* and *in vitro*. Without using natural trigger calcium binding proteins or FRET pairs, a novel class of calcium sensors has been created for cell imaging high calcium concentrations. In addition, we have created sensors for several classes of proteinases, such as trypsin, chymotrypsin, thrombin and caspases, for real-time imaging of enzymatic activity in live cells and disease tissues. These developed probes will have wide applicability in studies of human diseases known to be associated with altered Ca(II) signaling and protease activation/inhibition, including various cardiomyopathies, Alzheimer's Disease, cancer, and lens cataract formation.

Understanding Viral Infection
The objectives of this project are understand the role of Ca2+ in virus assembly, synthesis, replication and infection with a long-term goal of developing new tools/reagents, such as vaccines, to prevent and treat virus-related diseases. In collaboration with Dr. Teryl Frey in the Department of Biology GSU and supported by NIH/NIAID, we have identified a novel metal-binding viral protease in Rubella virus (Liu et al., 2000). We have demonstrated that a single EF-hand Ca2+-binding motif in the nonstructural proteins of rubella virus could bind Ca2+ and that the mutation of essential Ca2+-binding ligand residues in the protein eliminates the Ca2+- binding ability and proteinase activity in cell at 37 °C (Zhou et al,2006, 2007).

**Calcimics** is a specialized area of biochemistry focusing on the study of calcium-binding biological macromolecules and proteins to understand the factors that contribute to calcium-binding affinity and the selectivity of proteins and calcium-dependent conformational change. The objective of this research is to develop bioinformatics methods to predict and identify different classes of calcium binding sites in proteins. We have also constructed a web server containing up-to-date sequences, structural information and current literature concerning calcium binding proteins in biophysical, biomedical, and chemical developments, as well as providing a portal for access to our GG, MAG and pattern search algorithms.
OUTLINE OF RESEARCH PROJECTS

Understanding Both Intracellular and Extracellular Calcium Signaling

Calcium homeostasis controls many biological processes and is mainly regulated by two types of trigger proteins: intracellular trigger proteins and extracellular calcium-sensing proteins (e.g., CaM, CaR, mGluR). We are currently investigating the CaM-mediated regulation of gap junctions in lens cells (in collaboration with Dr. Charles Louis’ group, UC riverside), and of the cardiac Ca(II) release channel – the ryanodine receptor (in collaboration with Dr. Edward Balog, Georgia Tech). We are also investigating the mechanism of Ca^2+ channels and extracellular calcium signaling by calcium sensing receptors in collaboration with Dr. Ed Brown (Brigham and Women’s Hospital, Harvard) and Dr. Aldebaran Hofer (VA Hospital, Harvard Medical school).

Developing MRI Contrast Agent

We have developed MRI contrast agents by designing Gd^{3+} binding sites into stable proteins that exhibit 10-20 fold enhanced MRI relaxivity compared to that of DTPA. Initial MRI imaging studies have shown that this novel class of contrast agent has no acute toxicity, with high metal binding selectivity to Gd^{3+} over excess Ca^{2+} and other biological elements. This is the first class of designed contrast agents with a correlation time that matches the optimal value for current clinical magnetic field strengths.

Furthermore, in collaboration with Dr. Zhi-ren Liu at GSU, we have shown that these protein contrast agents are able to target various types of cancers such as prostate and breast cancer in nude mice xenograft models, providing an excellent opportunity to use molecular imaging to better understand cardiovascular diseases and cancer processes. Currently, we are exploring means to overcome MRI low sensitivity by increasing the proton relaxivity of the contrast agents. These efforts are leading to new discoveries and improvements in the development of protein contrast agents for receptor-targeted diagnostics and chemotherapy, and new applications of MRI technique for diagnosis and monitoring of the treatment of various cancers, especially calcium-related metastasis. Our success in designing metal binding sites into arbitrary proteins will also likely lead to new ways of developing useful diagnostic and chemotherapy reagents (Yang et al., 2008) (R01NIH/NIBIB,Yang, PI, Liu, Co-PI; R21NIH/NCI, Liu PI, Yang Co-PI).
SELECTED RECENT PUBLICATIONS


(57) Yun Huang, Yubin Zhou, Adriana Castiblanco, Wei Yang, Edward M. Brown, and Jenny J. Yang, Multiple Ca2+ binding sites in the extracellular domain of Ca2+-sensing receptor corresponding to cooperative Ca2+ responses, Biochemistry (2008), Dec 22. [Epub ahead of print] 48(2):388-98. PMID: 19102677.


SELECTED RECENT PUBLICATIONS


(31). Liqing Yang, Jenny Yang, Youliang Huang, and Zhi-Ren Liu, Phosphorylation of p68 RNA helicase regulates RNA binding by the C-terminal domain of the protein. *BBRC* (2004), 314(2), 622-630.


SELECTED RECENT PUBLICATIONS


Research Scientists and Postdoctoral Research Associate

Dr. Hing-Wong, *Postdoctoral Research Scientist*
Research: NMR Protein Studies
Email: chehw@langate.gsu.edu

Dr. Xue Wang, *Postdoctoral Research Scientist*
(Joint with Dr. Guantao Chen, Math)
Research: Calcium-binding Structure Prediction, Algorithm Design
Email: chexw@langate.gsu.edu

Research Associate

Castiblanco Adriana, *Research Technician*
Research: Protein Expression and Purification
Email: cheapc@langate.gsu.edu
Ph.D. Students

JingJuan (Jina) Qiao
Shen (Ada) Tang
Jie (Jasmine) Jiang
Yanyi (Johnny) Chen
Yusheng (Jason) Jiang
Michael Kirberger
Shenghui (David) Xue
Alice Cheng Zhang
Xue (Shirley) Wang
(*joint with Dr. Guantao Chen, Math*)
Kun Zhao
(*joint with Dr. Guantao Chen, Math*)
Lixia Wei
(*joint with Dr. Zhi-Ren Liu, Biology*)
Yin Lu
(*joint with Dr. Zhi-Ren Liu, Biology*)

Master Students

Kendra Hubbard
Malcom Delgado

Undergraduate Students

Natalie Maor
1. Title: Design of Protein-Based MRI Contrast Agents with High Relaxivity
Source: National Institutes of Health/NIBIB 1R01EB007268-01
Period: 08/06/07- 4/30/11
PI: Dr. Jenny J. Yang
Co-PI: Dr. Zhi-ren Liu
Collaborators: Drs. Xiaoping Hu, Hui Mao (Emory)
Award: $1,380,500

2. Title: Supplemental Grant to Design of Protein-Based MRI Contrast Agents with High Relaxivity
Source: National Institutes of Health/NIBIB 1R01EB007268-01s
Instrumental support for MRI Relaxometer
Period: 04/06/08 - 12/31/08
PI: Natalie Moar (Yang sponsor)
Award: $5,000

3. Title: Structural Biology of receptor-mediated extracellular calcium signaling
Source: NIH/GM 1R01GM081749-01
Co-PI: Dr. Ed. Brown (The Brigham and Women’s Hospital, Harvard University)
Period: 09/01/07 - 08/31/11
Award: $1,129,044

4. Title: Supplemental Grant to Structural Biology of Receptor-Mediated Extracellular calcium signaling
Source: NIH/GM 1R01GM081749-01s
To Minority graduate student Adriana Castiblanc
Period: 09/01/09 - 08/31/11
Award: $78,000

5. Title: Regulation of Lens Gap Junctions
Source: National Institute of Health/Eye Institute 5R01AI021389
PI: Dr. Charles Louis
Co-PI: Dr. Jenny J. Yang
Period: 09/01/04- 08/31/09
Direct costs: $1,250,000

6. Title: Molecular Biology of Rubella Virus
Source: NIH/NIAID 5R01AI021389
PI: Dr. Teryl K. Frey
Co-PI: Dr. Jenny J. Yang
Period: 04/01/03 - 03/31/10
Direct costs: $1,150,000

7. Title: Functional role of p68 tyrosine phosphorylation in cancer metastasis
Source: National Institutes of Health/NCI
Period: 07/01/07 - 06/30/12
PI: Dr. Zhi-ren Liu
Co-PI: Dr. Jenny J. Yang
Direct costs: $1,000,000

8. Title: Molecular MR Imaging by Targeting Cancer Biomarkers
Source: National Institutes of Health/NCI 1R21CA120181-01A1
Period: 05/01/07- 04/30/09
PI: Dr. Zhi-ren Liu
Co-PI: Dr. Jenny J. Yang
Direct costs: $275,000

9. Title: Supplemental Award for Minority Graduate Student Research
Source: NIH/GM 1R01GM081749-01s
To Minority graduate student Kendra Harbard
Period: 09/01/09 - 08/31/11
Award: $78,000

10. Title: Instrument for Design of Protein-Based MRI Contrast Agents with High Relaxivity
Source: National Institutes of Health/NIBIB 1R01EB007268-01 S1
Period: 08/06/07- 4/30/11
PI: Dr. Jenny J. Yang
Co-PI: Dr. Zhi-ren Liu
Award: $80,000

11. Title: Towards Large scale Production of Designed Protein with Medical Applications
Source: GalaxoSmithKline (GSK)
Period: 04/06/08- 12/31/08
PI: Natalie Moar (Yang sponsor)
Award: $5,000

12. Title: Rational Design and Analysis of Calcium Binding Proteins
Source: National Institute of Health/GM 1RO1GM62999-01
PI: Dr. Jenny J. Yang
Period: 07/01/01 – 06/30/08
Direct costs: $1,272,500

13. Title: Identification of Calcium-Binding Sites in Calcium-sensing Receptors
Source: American Heart Association
PI: Dr. Jenny J Yang
Period: 07/01/06 - 06/30/08
Award: $154,000

14. Title: Molecular Imaging of Cancers
Source: ELSA U Pardee Foundation
Period: 09/01/04- 08/31/09
Direct costs: $1,250,000

15. Title: Design of Calcium Sensors to Monitor Calcium Signaling in the ER
Source: National Institutes of Health/GM 1R21GM070555-01
PI: Dr Jenny J Yang
Period: 06/01/04 - 5/31/07
Award: $300,000

16. Title: Key Determinants of Calcium-Binding Affinity of EF-hand Proteins
Source: National Science Foundation MCB0092486
PI: Dr. Jenny J. Yang
Period: 04/01/01 - 03/31/05
Award: $300,000

17. Title: Molecular Recognition of the TNF Receptor Encoded by Variola Virus
Source: The Southeastern Center for Emerging Biological Threats
Period: 9/1/03– 8/31/05
PI: Dr. Jenny J. Yang
Direct costs: $50,000
ABBREVIATED CURRICULUM VITAE

Jenny J Yang

POSITIONS HELD

2006-Present  Professor of Biochemistry and Biophysics, Department of Chemistry and Centers for Drug Design and Advanced Biotechnology, Georgia State University, Atlanta, GA

2002-2006  Associate Professor Biochemistry, Georgia State University, Department of Chemistry and Centers for Drug Design and Biotechnology, Atlanta, GA

1997-2001  Assistant Professor of Biochemistry, Georgia State University, Department of Chemistry and Centers for Drug Design and Biotechnology, Atlanta, GA

1985-1987  Faculty of Analytical Chemistry, Xiangtan University, Department of Chemistry, Hunan, China

EDUCATION

1995-1997  Postdoctoral Research Fellow, Yale University, Department of Molecular Biophysics & Biochemistry with New Haven Hardford Fellowship
Advisors: Professor Lynne Regan

1993-1995  Postdoctoral Research Fellow, University of Oxford, UK with Oxford Center for Molecular Sciences (OCMS) Fellowship
Advisors: Professors Chris M. Dobson (FRS) and Sheena E. Radford

1992-1993  Postdoctoral Research Fellow, Syntex Discovery Research (Roche Biosciences), Institute of Biochemistry and Cell Biology, Palo Alto, CA
Advisor: Professor Harold E. Van Wart

1992  Ph.D.  Biochemistry (Distinguished), Florida State University, Tallahassee, FL
Graduate Research Advisor: Dr. Harold Van Wart
Dissertation Title: Kinetic Studies of the Catalytic Pathway of Thermolysin

1985  M.S.  Analytical Chemistry (Honors), Xiangtan University, Xiangtan, Hunan, China
Graduate Research Advisor: Professor Shiling Tang
Thesis Title: Electro-analysis of Trace Zinc and Copper

1982  B.S.  Chemistry with High Honors, Xiangtan University, Xiangtan, Hunan, China
Undergraduate Research Advisor: Professor Weikuan Yao
Research Project: Detection and Analysis of Biological Elements

AWARDS AND HONORS

2004-2005  Medical Research Award from NIH, Southeast Research Center for Emerging Diseases and Biodefense (SERCEB)

2004  Speaker at the Gordon Conference of Biomineralization

2003  Outstanding Faculty Achievement Award, Georgia State University

2003  Featuring Recognition for Outstanding Contribution to McNair Minority Undergraduate Research Program

2001  Outstanding Junior Faculty Award, Georgia State University, Arts & Sciences

1996  Donahue Foundation Research Award

1995–1996  Hartford Research Award

1993–1995  Oxford Center for Molecular Sciences Fellowship

1992  Distinguished Graduate Student at Florida State University

1992  Best Presentation at the Florida American Chemistry Society meeting

1992  Sigma Xi

1986  Outstanding Instruction Award, Xiangtan University

1985  Outstanding Graduate Student Award, Xiangtan University

1982  Outstanding Undergraduate Student Award, Xiangtan University
ABBREVIATED CURRICULUM VITAE

PROFESSIONAL AFFILIATIONS
Biomolecular Computing Resources (BIMCORE). Emory University, Atlanta, GA
Center for Drug Design and Advanced Biotechnology, Georgia State University, Atlanta, GA
Program of Brains and Behavior Neuron Science
Program of Molecular Bases of Diseases, Georgia State University
Neuroscience Institute, Georgia State University
Center for Behavioral Neuroscience
European Calcium Society
The Royal Society of Chemistry
The American Chemical Society
The American Peptide Society
The Biophysical Society
The Chinese Americans in Academia Society
The Atlanta Calcium Club (Organizer)

PROFESSIONAL SERVICE
Editorial appointments:
Journal of Protein & Peptide Letters (PPL)-Editorial Board Member, 2004-present
Journal of Calcium Binding Protein -Associate Editor. 2005-present
Current Proteomics Editorial Board Member, 2008-present
Reviewer for journals:

Study Section:
NIH, Biochemistry and Biophysics of Membranes (BBM), 2008-present
NIH/NCI, STTR/SBIR SBMI Medical Imaging Technologies, 2005-2007
NIH, Postdoctoral Fellowship of Biophysics and Biochemistry, 2005-2006
NIH, Skeletal Muscle Development Diseases (SKDD) 2004
NIH, Predoctoral Fellowship (F31), 2002-2005
National Science Foundation (NSF-MCB), 2001-2004

Georgia State University Service:
Director of Collaborative Research and Education Program for GSU-HuBei University, 2008-
Director of Collaborative Research and Education Program for GSU-NanKai University, 2008-
Director of Collaborative Research and Education Program for GSU-Third Military Medical University 2008-
University Research Senate Committee, 2008- present
University Student Life Development Senate Committee, 2007- present
University Admission and Standard Senate Committee, 2007- 2008
Asian American Studies Research Center Committee, 2002- present
University Senate Committee, 2007- present
Internal Grants Review Committee, 2001- present
University Biosafety Committee, 2001-2008
P & T Committee for College of Arts and Science, 2008 -
Departmental Executive Committee Chemistry, 2006- present
Coordinator of Biochemistry Qualifying Exam, 2007-present
Biochemistry Ph.D. Qualifying Examination Committee 1997-
Ph.D. Dissertation Committees, 1997-
B.S. Honors and Awards Committee, 1999- present
PROFESSIONAL SERVICE Cont.
M.S. Graduate Admission Committee, 1999- 2003
Curriculum Committee, 2004 - 2006
Faculty Search Committee, 2003- present
Atlanta NMR Facility Committee, 1997- present

INVITED TALKS

Seminars:
2009 Institute of Molecular Medicine, Peking University; Beijing Medical University; Lanzhou University; University of Washington,
2008 UC Berkley; Metabolix; CDC Viral Division; Department of Biology, GSU; College of Medicine, Upstate Medical University; Department of Radiology and Oncology, Johns Hopkins University; Department of Pharmacology, Upstate Medical University; College of Life Science, Hubei University; Institute of Combinatory Radiation Recovery, The Third Military Medical University; Department of Radiology, Emory University,
2007 Department of Experimental Diagnostic Imaging, UT M. D. Anderson Cancer Center; Department of Molecular Physiology & Biophysics, Baylor College of Medicine; Berry College; Invitrogen (Molecular Probes); Department of Biology, Georgia State University; Department of Cellular Biology and Anatomy, Medical College of Georgia; Wuhan Institute of Physics and Mathematics The Chinese Academy of Sciences; Huazhong Science and Technology University; The Medical School, the Florida State University; Institute of Medical Biotechnology, Chinese Academy of Medical Science & Peking Union Medical College; Institute of Materia Medica, Chinese Academy of Medical Science & Peking Union Medical College; National Analytical Research Center of Electrochemistry and spectroscopy, Changchun Institute of Applied Chemistry Chinese Academy of Sciences (CIAC)
2006 Biology Department, Brookhaven National Laboratory; Department of Chemistry, University of Akron; Department of Urology, Emory University; Computer and Life Science, Emory University; The Brigham and Women’s Hospital, Department of Endocrinology, Harvard Medical School; Biochemistry Department, University of Tennessee; Winship Cancer Institute, Emory University.
2005 Department of Chemistry, University of Georgia; Department of Biology, Institute of Georgia Technology; Pox Virus Branch, Centers for Disease Control and Prevention; Department of Chemistry, University of Illinois.
2004 Department of Pharmacology, John Hopkins University; Department of Chemistry, Syracuse University; Harvard Medical School, VA Hospital.
2003 Department of Pharmacology and Toxicology, Medical College of Georgia; Department of Pharmacology, Emory University; Department of Biochemistry, University of Virginia Technology, Blackburg VA, Oct., 2003
2002 Department of Chemistry and Biochemistry, Florida State University; Institute of Biophysics, Chinese Academy of Sciences, Beijing; Institute of Cell Biology and Development, Chinese Academy of Sciences, Beijing; Institute of Neuron Science, Chinese Academy of Sciences, Shanghai; Department of Chemistry, TsingHua University; Interdisciplinary Research Center, K.U. Leuven Compus Kortrijk, Kortrijk, B-8500, Belgium, June 18, 2002
2001 Department of Chemistry, University of Urbana-Champaign; Department of Chemistry, Northwestern University; Department of Chemistry, University of Illinois; Institute of Biochemistry, Science Academy in China, Shanghai; University of Chinese Science and Technology, College of Life Sciences, Hebei; National Conference of Biochemistry and Biophysics, Shanghai; Institute of Biophysics, Science Academy in China; Department of Chemistry, Peking University; University of California at Santa Barbara.

Conference speaker:
2008 Biophysical Society Meeting on Calmodulin Modulation of Ion Channel; South East NMR Conference; Brian and Behavior Retreat, Georgia State University, Atlanta, GA; Gordon Conference Metals in Medicine (short talk), NH
2007 Janelia Conference of Fluorescence Proteins and Biosensors, Howard Hughes medical Institute; Molecular Bases of Diseases symposium, Atlanta; International Nanobiotechnology Conference, China
2006 The 9th Meeting of the European Calcium Society, Strasbourg, France; The NMR User Group, University of Georgia
2005 Symposium of Southeast NMR (Section chair and speaker); Regional Center for Biodefense and Emerging Infectious Diseases Research; Metallloproteins and Protein Design Conference (Section chair and speaker); Second Annual Meeting of Regional Center for Biodefense and Emerging Infectious Diseases Research; Suddath Symposium of Fluorescence Imaging of Cell Biology (Organizer and Speaker); Atlanta Calcium Signaling Symposium (Organizer and Speaker)
2004 Gordon Conference on Biomineralization; Symposium of Infectious and Emerging Diseases
2003 Symposium Chair of Calcium Signaling at American Chemistry Society Southeastern Regional Meeting; The National American Chemical Society; The Biophysical Society 47th Annual Meeting;
2002 3rd International Conference on High Resolution Sector Field ICPMS; 7th International peptide Symposium.
2001 American Chemistry Society Southeastern Regional Meeting (2); 2nd International peptide Symposium and 17th American Peptide Symposium.
1999 American Chemistry Society Southeastern Regional Meeting (2)
1998 American Chemistry Society Southeastern Regional Meeting
1995 14th American Peptide Symposium.
1994 3rd International Symposium of Perspectives on Protein Engineering.
Major Equipment Inventory

Atlanta High Field NMR Facility

Varian Inova 600 MHz
1H{15N-31P} PFG indirect detection triple resonance 5 mm probe.
1H{13C/15N} PFG triple resonance 5 mm probe.

Varian Inova 500 MHz (NSF BIR-9214443)
1H{13C/15N} PFG triple resonance 5 mm probe.
15N-31P (50-202 MHz) broadband 5 mm probe.
1H 5 mm probe.

Varian Unity+ 300 MHz
1H/19F/13C/31P quadruple tuned 5 mm probe.
Varian VRX400 (1986) with a Sun workstation; software matches that of the Unity+ series
1H/19F 5 mm probe.
15N - 13C broadband 10 mm probe.
(15N - 13C) switchable 5 mm probe.

Optical Spectrometers

Cary 2200, 3E and 4 ultraviolet-visible spectrometers.
Shimadzu 3101PC ultraviolet-visible-near infrared spectrophotometer.
One Shimadzu 2401PC and three Shimadzu 1601PC ultraviolet-visible spectrophotometers.
Perkin-Elmer SpectrumONE, 2000 and Paragon 1000 PC Fourier-transform infrared spectrophotometers.
Hitachi-Perkin Elmer MPF44a and SLM-8000C spectrofluorimeters.
Photon Technology International QM1 fluorescence spectrophotometer.
JASCO J-600 and J-710 circular dichroism spectrophotometers.

Microscopy Facility

Leica s420, LEO 1450vp SEMS, and LEO 906e TEM electron microscopes.
Zeiss 510 Laser Scanning Microscope with Ti-Sapphire laser for multiphoton excitation.
Zeiss 510 Laser Scanning Microscope with ultraviolet laser.

Other Analytical

Microcal Inc. batch and scanning microcalorimeters.
Perkin-Elmer 2400 Series II C,H,N organic elemental analyzer.
Preparative Biology

Three Beckman L8-80 ultracentrifuges with rotors (Type 35, 45Ti, two 70Ti, 80Ti, VTi50, two VTi80, SW25-1, three SW28, SW50 and SW41).

DNA and Protein Facility

DNA

Applied Biosystems 381A DNA Synthesizer, single column, 0.2 mmole.
Applied Biosystems 392 DNA Synthesizer, dual column, 40 nmole.
MilliGen/Biosearch Cyclone+ DNA Synthesizer.
Beckman DNA Synthesizer Oligo 1000M.
LKB-Pharmacia Gene Assembler+ DNA Synthesizer with an LKB FPLC.
Li-COR 400L DNA Sequencer.
Applied Biosystems 373A DNA Sequencer.
FUGI Phosphorimager.
Photodyne shortwave UV automatic X-ray film developer.
ABI Catalyst 800 Molecular Biology Lab Station.

Peptides/Proteins

Applied Biosystems 431A and 432A Peptide Synthesizers.
Beckman LF3200 Protein Sequencer single cart with a Beckman HPLC 125S solvent molecule and 166 UV detector and an IBM P/ACE 5500 Series Capillary Electrophoresis.
Biosys 2000 Protein Purification System.
Beckman Amino Acid Analyzer with a Beckman HPLC 125S solvent module and a 166 detector.

Fermentation Facility

130-1 Brunswick fermentator.
New Brunswick Scientific Mobile Plant Fermentator with a NESLAB Coolflow CFT-7S Refrigerated Recirculator continuous centrifuge.
The Center for Metalloenzyme Studies fermentation plant at the University of Georgia is also available.
Research Scientists, Postdoctoral Fellows, Research Associates

Dr. Jin Zou 2002 – present Research Scientist
Dr. Hing Wong 2007 – present Research Scientist
Ling Wei 2007 – present Research Associate
Dr. Shunyi Li 2004 – 2009 Research Scientist
Dr. Hsiau-wei Lee 2007 – 2007
Dr. Wei Yang 2001 – 2007 Research Scientist
Dr. Jianhua Yang 2004 – 2008
Dr. Yiming Ye 2001 – 2004 Research Scientist
Dr. Mingshen Wang 2002 – 2003

Jinjuan Qiao 2006 – present Ph.D. Candidate Biochemistry
Jie Jiang 2007 – present Ph.D. Candidate Biochemistry
Shen Tang 2006 – present Ph.D. Candidate Biochemistry
Yanyi Chen 2006 – present Ph.D. Candidate Biochemistry
Shenghui Xue 2007 – present Ph.D. Student Biology
Yusheng Jiang 2007 – present Ph.D. Student Biochemistry
Michael Kirberger 2008 – present Ph.D. Student Biochemistry, MBD Predoctoral Fellowship
Xiaojun Xu 2008 – present Ph.D. Student Biochemistry
Alice Cheng Zhang 2008 – present Ph.D. Student Biochemistry
Xue Wang 2005 – present Ph.D. Candidate Computer Science
Kun Zhao 2007 – present Ph.D. Student Math and Statistics
Lixia Wei 2005 – present Ph.D. Student Biology
Yin Lu 2005 – present Ph.D. Student Biology

Former Ph.D. Graduate Students
Yun Huang 2004 – 2009 Ph.D. Biochemistry, currently Post-Doctoral Researcher, Harvard University
Ning Chen 2004 – 2008 Ph.D. Biochemistry, MBD Predoctoral Fellowship
Susan Fu 2004 Ph.D. Computer Science, P20 Fellowship
Hai Deng 2004 – 2007 Ph.D. Computer Science
Hsiau-wei Lee 2001 – 2007 Ph.D. Structural Biology, MBD Predoctoral Fellowship
April Ellis 2000 – 2006 Ph.D. Biochemistry, AHA Predoctoral Fellowship
Lisa Jones 2001 – 2006 Ph.D. Biochemistry, GANN Predoctoral Fellowship
Anna Wilkins 1999 – 2005 Ph.D. Biochemistry, NIH Predoctoral Fellowship
Wei Yang 1997 – 2001 Ph.D. Biology
Michelle Pu 1998 – 1999

Non-Degree/postgraduates
Annie Lin 2000
Amy Gawthrop 2002
Sangeeta Dave 2002

Technicians
Xiu-qin Zhou 2001
Qian Li 2002
M.S. Graduate Students
Kendra Hubbard 2008 - present
Adriana Castiblanco 2007 – 2009 M.S.
Hanh Nguyen 2007 – 2007
Julian Johnson 2006 – 2007 M.S.
Michael Kirberger 2004 – 2007 M.S.
Angela Holder 2004 – 2006 M.S.
Ning Chen 2003 – 2005 M.S.
Medina S. Jackson 2004 – 2005 M.S.
Aayala Gayatri 2003 – 2004 M.S.
Meredith Pyle 2003 – 2004 M.S.
Sarah Shealy 2000 – 2003 M.S.
Amy Carroll 2000 – 2001 M.S.
Leanne Isley 2000 – 2001 M.S.
Anna Wilkins 1998 – 1999 M.S. (Awarded for best poster presentation)
EL-Hadjji Sarr 1998 – 1999 M.S.
Haidong Yang 1996 – 1998 M.S.
Curt Coman 2000 – 2001
Tom Tsai 1997 – 1998
Gordon Bivens 1999 – 2000

Undergraduate Students
Natalie Maor 2007 – present
Adriana Castiblanco 2006 – 2007 (Distinction in Research)
David Mpofu 2006 – 2007 (Distinction in Research)
Julian Johnson 2004 – 2005 (Minority Student supported by the Bridge Program)
Daniel Spratt 2004 – 2005 (Instruction Award)
Kendra Hubbard 2004 – 2005 (University Fellowship, minority)
Alice Luo 2004 – 2005 (AURA Fellow, Institute of Georgia Technology)
Dorinda Nelson 2003 (Minority Student supported by the Bridge Program)
Thanh K. Quach 2004 (Minority Student supported by the Bridge Program)
Cedrick Daphney 2003 – 2004
Roy Ayiteyfio 2002 – 2003 (McNair Fellowship for minority student)
Shirley Bassey 2002 – 2003 (McNair Fellowship for minority student from UGA)
Michael Kirberger 001 – 2003
Angela Holder 2001 – 2003
Shane Johnson 2001 – 2003
Onome Swader 2001 – 2003 (McNair Fellowship for minority student)
Timethia Bonner 2001 (NSF-sponsored minority research for Tuskegee Univ.)
Amy Carroll 1998 – 2000 (honors and distinction in research, 2nd Prize awarded for oral presentation at Regional ACS meeting)
Annie Lin 1998 – 2000
April Ellis 1999 – 2000 (distinction in research)
Payal Shah 1999 – 2000
Hsiau-wei Lee 1998 – 1999 (distinction in research)
Mark Kats 1997 – 1998 (Georgia Institute of Technology)
Christina Nguyen 1997 – 1998 (honors and distinction in research)
Anna Wilkins 1998
Chris Morley 1998
Trung Tran 1997
**RECENT NEWS**

**Dr. Huang Goes to Harvard**

In March 2009, Dr. Yun Huang left the Yang lab to begin Post-Doctoral training at Harvard University, where she will be working with her husband Dr. Yubin Zhou who also completed his Ph.D. studies with Dr. Yang.

![Dr. Yun Huang observing installation of new fluorescence microscope.](image)

**New Students/Post-Docs**

Dr. Yang will be adding a new student to her lab this year, Fan Pu. Fan has a BSc in Biotechnology and an MS degree in Cell Biology, both from Lanzhou University, China.

Dr. Shanchun Guo will be joining Dr. Zhiren Liu’s lab as a Post-Doctoral researcher to assist in the development of cancer diagnostics and therapeutics. Dr. Guo has an extensive background in molecular biology, biochemistry and pathology, and hold both M.D. and Ph.D. degrees.

Dr. Shunyi Li recently completed his Post-Doctoral studies with Dr. Yang, and has returned to China to fulfill teaching obligations.

Adrianna Castiblanco (pictured below with Dr. Yun Huang) recently completed her MS degree and is currently preparing herself for entry into dental school.

**Qualifying Exams**

Shen Tang, Jingjuan Qiao, Jie Jiang and Yanyi Chen all recently passed their oral qualifying exams in Biochemistry as part of their Ph.D. requirements since our last publication. Congratulations!

**New Relaxometer**

A new Bruker Relaxometer was acquired to support ongoing MRI research being conducted in our laboratory related to the development of protein-based contrast agents. Additionally, Dr. Yang has submitted proposals for additional funding aimed towards updating our NMR facility.