Chemistry

Chemistry is the called the central science because it not only impacts virtually all fields of science and technology but also because it is a central contributor to the modern life that society enjoys.

The PhD Program in Chemistry at the City University of New York (CUNY) provides students with a strong foundation in all areas of chemistry: analytical, biological, inorganic, materials, nano, organic, polymer, and physical.

CUNY prides itself on the diversity of its faculty and students. Each student chooses a research mentor from over 100 members of the CUNY doctoral faculty in Chemistry. These mentors are distributed among seven CUNY campuses and the CUNY Advanced Science Research Center that fosters interdisciplinary interactions. A flexible curriculum allows each student to personalize the coursework to their specific needs. Additional training in professionalism, safety, pedagogy, and career opportunities are provided to ensure your career success.

Research Areas

- Analytical Chemistry
- Biochemistry
- Biophysics
- Chemical Biology
- Computational Chemistry
- Inorganic Chemistry
- Materials Chemistry
- Medicinal Chemistry
- Nanoscience
- Organic Chemistry
- Organometallic Chemistry
- Polymer Chemistry
- Photochemistry
- Physical Chemistry
- Radiochemistry
CUNY Science Scholars

All students admitted to the PhD Program in Chemistry are awarded a CUNY Science Scholarship. This five-year award allows our student to concentrate on their research.

CUNY Science Scholars spend the first year at the CUNY Graduate Center taking courses and learning about the research opportunities available to them. There is no teaching in year one. Students select a mentor and move to their mentors campus by the end of year one.

Years 2-5 are spent at a CUNY campus focused on their dissertation research and perhaps teaching.

Student comments

The chemistry Ph.D program at CUNY has allowed me to pursue my interest. I have greatly benefited from my experience with my mentor, professors and fellow students.

Zhantong Mao (PhD 2015)

CUNY is dense with fantastic faculty, administrators and fellow students that collectively engender a strong likelihood of success.

Douglas Achan (PhD 2015)
CUNY offers students the opportunity to do cutting-edge chemical research in a supportive program that has the feel of a small college while living in one of the world’s most dynamic cities. The PhD Program in Chemistry is unique amongst its peers in that it is a consortium of seven campuses throughout New York City. While all student receive their degree from the CUNY Graduate Center, they do their research at one of the CUNY colleges or the Advanced Science Research Center. The size of CUNY offers the resources to do world-class science while working at a campus with a small college feel.

Participating Colleges

- Brooklyn College
- City College of New York
- College of Staten Island
- Hunter College
- Lehman College
- Queens College
- York College

Research Centers

The jewel in the crown of CUNY’s multi-billion dollar investment in interdisciplinary scientific research is the CUNY Advanced Science Research Center (http://asrc.cuny.edu). Brimming with state-of-the-art instrumentation and expertise in nanoscience, structural biology, photonics, environmental science, and neuroscience, it is open to all CUNY students and faculty. This collaborative resource augments the resources and instrumentation found on each of the CUNY campuses. In addition, students further their research efforts using the CUNY High Performance Computing Center (http://www.csi.cuny.edu/cunyhpc/).
Nanotechnology and Materials Chemistry deals with innovation, design and discovery of materials for specific functions in the size regime, typically < 100 nm, in which physical properties (e.g. optical, electronic) are often significantly affected by size and structure. Nanotechnology has many potential applications, and continues to impact medicine, energy technology and electronics. The Advanced Science Research Center (ASRC) offers access to wide variety of techniques and training, enabling students to acquire a formidable skill set in materials fabrication and characterization.

### Publications


### Research Areas

- Nanotechnology
- Surface chemistry and catalysis
- Quantum nanostructures
- Light harvesting materials
- Materials Science
- Soft Materials and self-assembly
- Energy technology
- Nanobiotechnology and nanomedicine
Dr. Daniel L. Akins

Dr. Akins has been a Professor of Chemistry at The City College of New York since 1981, and director of the CUNY-Center for Analysis of Structure and Interfaces since 1988.

Publications


Research Interests

Keywords:
Syntheses of semiconductor and magnetic oxide nanoparticles and nanorods; spectroscopic and dynamical investigations of spontaneous and nonlinear laser Raman scattering by monomeric and aggregated molecules on surfaces; excited state dynamics and determination of photophysical parameters for cyanine dyes and donor-acceptor Systems; quantum chemical calculations of porphyrins and dye molecules.
Prof. Biscoe is an organic/organometallic chemist interested in the development of new reaction methodologies for application in drug discovery.

Mark R. Biscoe
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2009- current Professor, City College of New York
2005-2008 NIH Postdoctoral Fellow, MIT
2000-2005 PhD, Columbia University

Research Interests

Keywords: Transition metal catalysis, Organic synthesis, Asymmetric synthesis

Broadly, research in the Biscoe group focuses on catalysis. The two major types of catalysis in which we are interested are transition metal catalysis and macromolecular catalysis. Our primary goals involve the development of practical and reliable processes for the construction of C–C and C–X (X = heteroatom) bonds. We are particularly interested in the development of new processes for the formation of common structural motifs of importance in medicinal chemistry and drug discovery.

Publications


Dr. Charles Michael Drain

CM Drain is chair of the Department of Chemistry at Hunter College with research in supramolecular materials, photonics, phototherapeutics, and medical photo-diagnostics

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1996-present  Professor, Hunter College CUNY
1990-present   Adj. Faculty, Rockefeller University
1990-1993      Postdoc, Univ. of Strasburg, France
1984-1988      PhD, Tufts University

Research Interests

Keywords: porphyrins, photophysics, phototherapy, nanotechnology, supramolecular

Bottom-up self-organization of functional photonic materials composed of porphyrinoid dyes allows fabrication of next generation sensors, solar energy harvesting, and biomedical devices. Click-chemistry makes the dye commercially viable, and the fundamental photophysical properties of these materials guides development of more efficient dyes. (2) Porphyrinoid dyes are being developed as theranostics (the same compound is used for both therapy and diagnostic) for photodynamic therapy of diseases such as cancer. (3) Biomedical applications of nanoparticles composed of organic and inorganic materials, including radiolabled materials, for imaging and therapy are being developed in collaboration with Researchers at Memorial Sloan Kettering and Rockefeller University.

Publications


**Qiao-Sheng Hu** is Professor and Chair of Chemistry Department at the College of Staten Island. His research is focused on the development of new reactions/processes and catalysts for chemical synthesis including polymer/materials synthesis.

**Research Interests**

Keywords: catalysis, palladium, cross-coupling reaction, polymerization, conjugated polymers

The Hu group are interested in the development of new catalysts including transition metal and organic catalysts for cross-coupling reactions and addition reactions, and novel reactions/processes from readily available and cost-effective small organic molecules. These new reactions/processes and catalysts have potential applications in chemical synthesis and polymer/materials synthesis. The approach is interdisciplinary, ranging from fundamental understanding of reaction mechanisms, reaction methodology development to polymer/materials synthesis.

**Publications**


Jitianu's research is focused on materials chemistry, specifically on sol-gel chemistry with direct applications in anticorrosive, hermetic coatings and nanomaterials for electronic industry.

Dr. Andrei Jitianu
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Publications


Research Interests

Keywords: Sol-gel, Nanocomposites, Hybrids Organic- Inorganic, Coatings,

My studies range from the elucidation of early stages of formation of the hybrid materials by sol-gel process to the design of hybrid nanocomposite materials with magnetic, gas-sensing, electric and optical properties. At Lehman my research was mainly focused to developing a new class of materials called Hybrid Melting Gels for hermetic applications in the microelectronics industry and for optical applications. Beside this, studies of nanoparticles or nanocomposites in different systems have been carried out.
George John is a Professor of Chemistry/the Center for Discovery and Innovation, the City College of New York -CUNY. His research is focused on molecular design of synthetic lipids, membrane mimics, soft nanomaterials, green energy technologies and organic materials chemistry.

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2012- current  Professor of Chemistry, CCNY
2004-2012  Associate Prof. of Chemistry, CCNY
2002-2004  Research Faculty, RPI, NY
1996-2002  JSPS Fellow/Scientist, Japan
1994-1995  Postdoc, University of Twente, NL
1993  PhD Kerala University, India

Publications


Research Interests

Keywords: biobased materials, green chemistry, soft materials, biorefinery, biomimetics, phase selective gels, oil structuring agents (food/cosmetics), antibacterial coatings, battery components/energy storage, green surfactants

John’s research is rooted in the idea that innovation can be inspired by nature to develop economical and sustainable technologies for a greener future. The group has harnessed crop-based precursors such as sugars, fatty acids and plant lipids to design a unique set of multifunctional soft-materials including polymers, gels and green surfactants. His group has successfully developed environmentally benign antibacterial paints, polymer-coatings, molecular gel technologies, oil spill recovery materials, battery components and oil thickening agents. As soft materials research is highly interdisciplinary and collaborative, John’s lab encourages the blending of such diverse elements including organic synthesis, green chemistry, material chemistry, interfacial phenomena, colloid science and biomimetics.
Michal Kruk is a professor in chemistry. His research interest is in design of well-defined nanoporous and nanostructured materials using surfactant micelle templating, nanocasting and controlled surface-initiated polymerization.

**Publications**


**Research Interests**

**Keywords:** ordered mesoporous materials, hollow nanoparticles, controlled surface-initiated radical polymerization

- Design of ordered nanoporous materials.
- Application of controlled polymerizations in the synthesis of nanostructured materials, including porous inorganic/polymer nanocomposites.
- Development of methods for accurate characterization of nanoporous materials.
- Synthesis of nanoporous materials with closed pores.
- Synthesis of single-micelle-templated hollow nanoparticles.
Using natural surfaces as inspiration, the Lyons group fabricates nanoscale materials with unique wetting, catalytic, thermal and/or optical properties. We are especially interested in developing a fundamental understanding of reactions and properties at the solid-liquid-gas interface. We work closely with industry with the goal of transitioning our inventions into industrially relevant innovations; active projects include: anti-reflective self-cleaning optically clear coatings to increase the energy efficiency of photovoltaic panels and the isolation and study of single cells within nano/picoliter gel droplet arrays.

Publications


Matsui is a Professor at Hunter College and Weill Medical College of Cornell University. My research areas are Cancer diagnostics/therapeutics, Bionanotechnology, Lab-On-a-Chip, and Nanoparticle Synthesis for Medical Applications.

**Research Interests**

**Keywords:** Cancer Nanotechnology, Cancer Diagnostics/therapeutics, Lab-On-a-Chip, Medical Nanoparticles

1. Study of the effect on cellular structure by cancer metastasis.
2. Analysis of nanoscale vesicles released from cancer cells for diagnostics and therapeutics.
3. Electric silicon chip microfabrication for the detection of cancer and related cells.
4. Synthesis of nanoparticles in complex shapes for medical applications such as MRI contrast agents and drug delivery.

**Publications**


Dr. Aneta Mieszawska

**Aneta Mieszawska** is an Assistant Professor in the Department of Chemistry at Brooklyn College. Her research is focused on **nanomedicine** and application of nanoparticle based systems for cancer detection and treatment.

### Research Interests

**Keywords:** second generation nanoparticles, theranostics, biodegradable polymers, nanocrystals

The Mieszawska group research focuses on nanotechnology and nanomedicine with specific interest in designing and testing the nanoparticle systems for concurrent imaging and therapy of disease. These theranostic nanoparticles are based on slow releasing biodegradable and biocompatible polymers, such as PLGA or PLA, that encapsulate contrast agents and small drug molecules. The primary goal is to target and deliver efficacious therapy directly to cancer cells. This interdisciplinary research involves active collaboration with clinicians from Icahn School of Medicine at Mount Sinai.

**Publications**


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**Dr. Aneta Mieszawska**
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www.cuny.edu/web/academics/faculty

**2013- current** Assistant Professor, Brooklyn College
**2011-2013** Postdoctoral Fellow, Icahn School of Medicine at Mount Sinai
**2007-2010** Postdoctoral Associate, Tufts University
**2002-2007** PhD University of Louisville
Dr. Michael V. Mirkin

Michael V. Mirkin is a professor of chemistry at CUNY-Queens College. His research interests are in the field of electrochemistry and include nano- and bio-electrochemistry, interfacial charge-transfer reactions, electrocatalysis, and scanning electrochemical microscopy (SECM).

**Publications**


**Research Interests**

**Keywords: Electrochemistry/Physical/Analytical/Nano**

We employ nanometer-sized electrochemical probes for molecular level characterization of chemical processes and materials. A wide variety of phenomena are studied including charge-transfer reactions at the solid/liquid and liquid/liquid interfaces, electrocatalysis, bioelectrochemistry, and electrochemical imaging. The main focus is on obtaining quantitative physico-chemical information by combination of experiments with mathematical modeling and computer simulations. We also maintain active interest in development of electrochemical techniques for analytical applications. These include carbon nanoprobes, amperometric nanosensors, and resistive-pulse sensors.
Ralf Peetz is interested in functional materials that could be of use in meeting future energy needs.

Publications

Sengupta, Arijit; Doshi, Ami; Jaekle, Frieder; Peetz, Ralf M., Journal of Polymer Science Part A (2015), accepted

Zhilin, Denis M.; Peetz, Ralf M., Journal of Chemical Education (2014), 91(1), 119-122

Sengupta, Arijit; Ghosh, Sutapa; Peetz, Ralf M., Synthetic Metals (2010), 160(17-18), 2037-2040

Burrows, Hugh D.; Narwark, Oliver; Peetz, Ralf; Thorn-Csanyi, Emma; Monkman, Andrew P.; Hamblett, Ian; Navaratnam, Suppiah, Photochemical & Photobiological Sciences (2010), 9(7), 942-948.

Mukherjee, Narayan; Peetz, Ralf M., Macromolecules (2008), 41(18), 6677-6685

Research Interests

Keywords: Functional Materials, Conjugated Polymers, Donor Acceptor Systems

We are currently interested in the controlled synthesis of donor-acceptor macromolecules for potential use in organic polymer photovoltaics. Some candidates featuring promising electronic properties and absorbing over a broad range of wavelengths are currently scheduled to be tested in prototype photovoltaic cells.
Krishnaswami Raja is College of Staten Island Chemistry faculty working in the area of Bionanotechnology, Origin of life research and green drug discovery and development.

Publications


Raja, K.S.; Banerjee, P.; Lamoreaux, W.; Shi, W.; Auerbach, A.; “Novel Curcumin and Tetrahydrocurcumin derivatives” US patent number 8487139


Research Interests

Keywords: Origin of life, stigmergy scaffolds, 3D Cell culture, Ayurbiotecnology, Virus Chemistry, Bioconjugation, Green drug development, Polymer-protein hybrids

The Raja group is interested in creating programmable scaffolds for probing the origins of multi-cellular life, synthesis of well defined polymer-bionanoparticle/targeting protein hybrids and green drug discovery and development based on Ayurveda. The research spans the areas of small molecule and polymer synthesis, bioconjugation chemistry and bioengineering.
Dr Chwen-Yang Shew

Research Area: Theoretical Physical Chemistry in Structure of Condensed Matters, Macromolecules, and Biological Cells

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2011- current Professor, CSI
2005-2010 Associate Professor, CSI
1999-2004 Assistant Professor, CSI
1995-1998 Postdoc. UW-Madison
2000-2005 PhD, CUNY

Publications


Research Interests

Keywords: Statistical Mechanics, Thermodynamics, Liquid State Theory and Computer Simulation

Our group develops model, theory and simulation to elucidate the structure of colloids, polymeric materials, confined and crowded cells, and self-assembled nanoparticles.
Aaron is a natural product chemist with interests in renewable fuels and valorization of biomass. Current projects include lignin depolymerization and synthetic conversion to tetraalkylammonium ionic liquids. Other active areas of research include glycerol chemistry and structural analysis of natural products.

Publications


Research Interests

Keywords:

Dr. Ruth E. Stark's biophysics research program focuses on the molecular structure and inter-actions of protective plant biopolymers, nutritionally important fatty acid-binding proteins, and melanin pigments associated with human fungal infections.

**Research Interests**

**Keywords:** molecular biophysics, biopolymers, bioanalytical chemistry, solid- and solution-state NMR

The Stark Laboratory uses structural biology approaches to study plant protective polymers, lipid metabolism, and potentially pathogenic melanized fungal cells. Study of the molecular and mesoscopic architectures underlying the integrity of cuticles in natural and engineered tomatoes and potatoes is undertaken using solid- and solution-state nuclear magnetic resonance (NMR), mass spectrometry, and atomic force microscopy. Ligand recognition and peroxisome proliferator-activated receptor interactions of fatty acid-binding proteins are under investigation by solution-state NMR and isothermal titration calorimetry. The molecular structure and development of melanin pigments within fungal cells are probed using (bio)chemical synthesis and solid-state NMR.

**Publications**


Dr. Maria C. Tamargo

Maria C. Tamargo is Professor of Chemistry at the City College of New York. Her research is in semiconductor materials and nanostructures design, growth by epitaxial growth techniques, characterization methods, and applications.

Publications


Research Interests

Keywords: Molecular Beam Epitaxy, compound semiconductors, II-VI semiconductors, photonic devices, nanomaterials, topological insulators.

Materials growth, properties and applications of semiconductor multi-layered structures grown by molecular beam epitaxy (MBE). Areas of research activity include III-V compounds, strained-layer and short-period superlattices, surface and interface chemistry, visible light emitters, optoelectronic devices, wide bandgap II-VI compounds, II-V/III-V heteroepitaxy, low dimensional nanostructures, selective area epitaxy, intersubband devices, quantum cascade lasers, VECSELs, topological insulators.

1993 - present  The City College of New York and The Graduate Center - CUNY
1984-1992  Bellcore
1978-1984  AT&T Bell Labs
1972-1978  PhD (Johns Hopkins University)
1968-1972  BS (University of Puerto Rico)
Dr. Rein V Ulijn

Rein Ulijn is founding director of the nanoscience initiative at the Advanced Science Research Centre at CUNY and Professor of Nanochemistry at Hunter College. His research is focused on minimalistic molecular materials and adaptive systems that are inspired by biology.

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2014- current
Director of Nanoscience, ASRC

2008-2014
Professor of Nanochemistry, University of Strathclyde, Glasgow, UK

2003-2008
Associate Prof., U. of Manchester, UK

2001-2003
Postdoc. University of Edinburgh, UK

1998-2001
PhD University of Strathclyde, UK

1992-1998
MSc Wageningen University, NL.

Publications


Research Interests

Keywords: molecular systems, bionanotechnology, hydrogels, peptides, biocatalysis, adaptive materials

The Ulijn group are interested in the development of materials and systems that mimic biology’s adaptive properties but are much simpler. These materials (including gels, emulsions, structured surfaces and nanotubes) have potential applications in health care, cosmetics, lifestyle products, food science. These applications are sought in active collaboration with researchers and companies across the globe. The approach is cross-disciplinary and covers the entire range from fundamental understanding to eventual applications and societal benefit.
Dr. Michele Vittadello

Dr. Vittadello’s research is focused on the areas of nanotechnology and materials science, inorganic and physical chemistry.

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2015- current Associate Professor
2008-2015 Assistant Professor
2005-2008 Postdoc (Rutgers University)
2003-2005 Postdoc (Hunter College)
2000-2003 PhD (University of Padua)

Research Interests

Keywords: Energy Nanotechnology and Materials, Biohybrid Photosynthetic/Mitochondrial Systems, Polymer Electrolytes, Lithium/Magnesium Batteries, Supercapacitors, Fuel Cells, Photovoltaic Devices, Bionanotechnology, Environmental Elemental Analysis, Radioremediation.

Investigation of fundamental physical-chemical properties of nanomaterials, materials and biomaterials with potential applications in the field of energy storage/generation and biotechnology; Design and assembly of new devices; High quality publications and patents.

Publications


Dr. Nan–Loh Yang

Nan-Loh Yang is a Professor of Chemistry at College of Staten Island. His research areas include: antimicrobial polymer nanoparticle; polymers with well-defined structure; and materials for nanoelectronics - giant dielectric constant element, fast conduction switch, 4-stage memory and room temperature magnetoelectric coupling.

Publications


Research Interests

Keywords: Nanoelectronics, Superbugs killers, Photopolymers, Novel Polyacetals, Supercapacitor Fast Switch, Amphiphilic Polyelectrolytes, Micelles

Professor Yang’s research group is involved in developing amphiphilic non-hemolytic and antibacterial nanoparticle based structural tuning with optimizing hydrophobic – hydrophilic molecular topography. The nanoelectronics research exploits the characteristic of micell reactors and interfacial polymerization.
Dr. Shuiqin Zhou is a Professor of Chemistry at CUNY College of Staten Island. Her research is focused on responsive polymer-nanoparticle (including carbon dots) hybrid nanogels, inorganic-carbon composite nanoparticles, and complex assembly of nanoparticles for sensing, imaging, drug delivery, and environmental remediation.

Keywords: responsive polymers, hybrid nanogels, nanoparticles, carbon dots, assembly, biosensing, drug delivery, cell imaging, environmental remediation

The Zhou group is interested in the development of (1) glucose-responsive hybrid nanoparticles (NPs) for glucose sensing and self-regulated insulin delivery; (2) multifunctional nanomaterials from the combination of optically active NPs with responsive polymers for sensing, imaging, and therapy; and (3) composite nanomaterials from the complex assembly of carbon-based NPs, inorganic NPs, and other amphiphiles in the confinement of (bio)polymers and colloids for sensing, catalysis, and environmental remediation.

Publications


