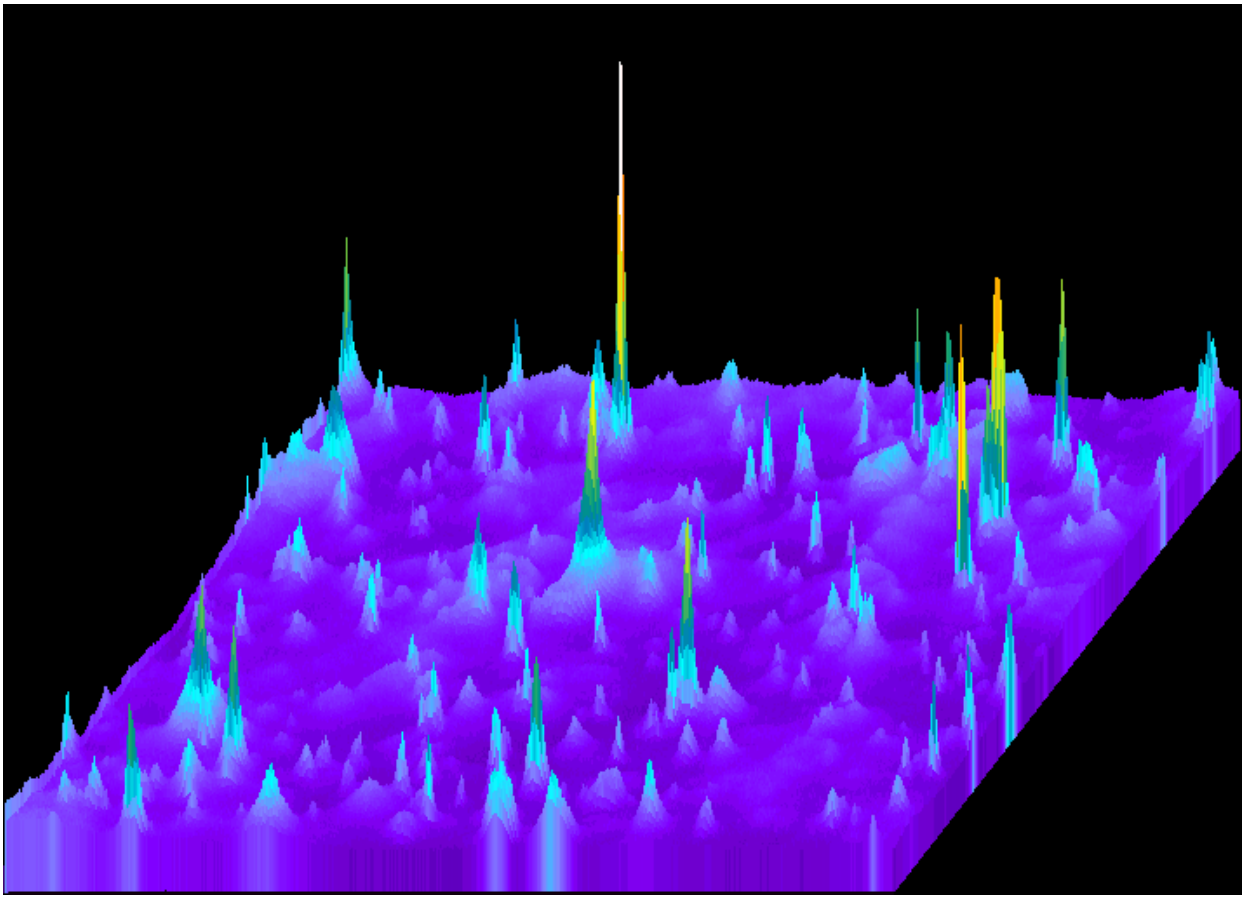
OLD DOMINION UNIVERSITY

DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY

GRADUATE PROGRAMS



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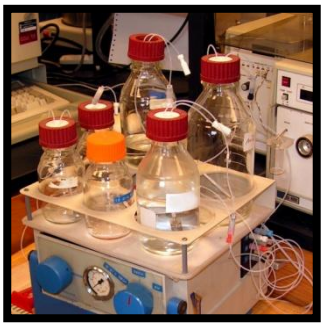

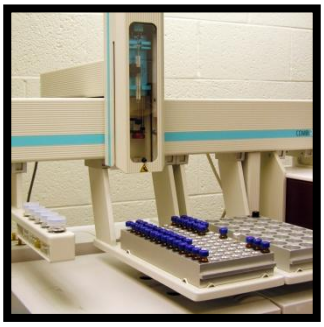

Graduate Program Contact:

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About the University

Old Dominion University is a state-assisted, doctoral research institution located in Norfolk, Va. Norfolk is a metropolitan community and one of the seven major cities that make up Hampton Roads, with a combined population of more than 1.6 million citizens. The main campus is just a short drive from the popular Virginia Beach oceanfront and the historic triangle comprising Colonial Williamsburg, Jamestown and Yorktown.

Old Dominion's campus is situated on more than 188 acres bounded on one side by the Elizabeth River and on another side by the Lafayette River. The northern section of the campus is the oldest portion consisting of shaded brick walkways and stately buildings, while the southern end of the campus features newer academic buildings that line an eight-acre lawn.

On the east side of campus is the University Village, a 75-acre expansion area with classroom buildings, student apartments, the Ted Constant Convocation Center, shops, parking garages, a hotel, a research park, and a three-and-a-half story, 42,000-square-foot bookstore.

Ted Constant Convocation Center

University History

During the risky years of the Great Depression, a small group of scholars with a determined vision launched the school that would become Old Dominion University. In 1930 the university began as a one-building branch of the College of William and Mary, the nation's second oldest institution of higher education. Early classes at the college's Norfolk Division included a two-year program for teachers, and freshman and sophomore engineering classes that prepared students for Virginia Polytechnic Institute, in Blacksburg, Va. (Virginia Tech).

Word of the new branch spread. Enrollment numbers leapt quickly, as did the variety of course offerings. The two-year school evolved into a four-year branch, awarding its first four-year bachelor's degrees in 1956, then gained full independence as a state-supported college in 1962, taking on the name Old Dominion College. Soon the college was greatly expanding its research facilities and preparing to offer doctoral degrees, and in 1969, the Board of Visitors authorized that the name of the institution be changed to Old Dominion University.

Today, the vision that started with a core of education-minded leaders lives a life of its own. Now the institution is a powerhouse for higher education with six colleges: the College of Arts and Letters, the College of Business and Public Administration, Darden College of Education, Frank Batten College of Engineering and Technology, the College of Health Sciences and the College of Sciences. Old Dominion has been offering master's degree programs since 1964 and doctor of philosophy degrees since 1971. Students at Old Dominion currently choose from 68 baccalaureate programs, 60 master's programs, two educational specialist degrees and 35 doctoral programs.

The Area: Hampton Roads

Hampton Roads is located in southeastern Virginia and incorporates the cities of Norfolk, Suffolk, Portsmouth, Chesapeake, Virginia Beach, Hampton and Newport News. It is home to one of the largest natural harbors in the world. The area has access to many waterways, including the Elizabeth and James Rivers, the Chesapeake Bay and the Atlantic Ocean, as well as the Great Dismal Swamp. Much of the area's history relies on its proximity to the many local waterways: the nautical term "roads" refers to a location where ships can dock, yet is less protective of the vessels than a harbor. Hampton Roads is the site of the famous battle between the Monitor and the Merrimack, and the area contains some of the largest military bases in the nation.

There are many events and activities to partake in throughout the year in Hampton Roads. The oceanfront in Virginia Beach is only half an hour away from Old Dominion University, and other beach sites on the Chesapeake Bay are even closer. Several cultural and scientific attractions are located within 45 minutes of Old Dominion University: the Virginia Marine Science Museum, the Mariners' Museum, the Virginia Living Museum, Nauticus, the Virginia Zoo, the Harrison Opera House, the Chrysler Museum of Art and Wells Theatre. Local festivals are held year round, including the Virgina Arts Festival (internationally acclaimed artists), the Virginia Beach Boardwalk Art Show and Festival in its fifth decade, Hampton Bay Days, Stockley Gardens Art Festival and Harborfest, which is one of numerous annual events held adjacent to Norfolk's Waterside Festival Marketplace. Outdoor concerts are held seasonally at the Verizon Wireless Virginia Beach Amphitheater and the nTelos Pavilion in Portsmouth. Indoor shows are held all year long in Norfolk's Norva venue.

Virginia Beach resort area

Photo courtesy Selby Schwend

The surrounding areas also have much to offer. The Outer Banks of North Carolina, an hour and a half from Old Dominion University, is another site for beach lovers. To the north is historic Virginia, including Colonial Williamsburg, Jamestown and Yorktown. One can travel down the Colonial Parkway and visit the earliest sites of the nation's history. Williamsburg is also home to two theme parks: Busch Gardens and Water Country USA. To the west are the Appalachian Mountains, and about four hours north is Washington, D.C.

Master of Science: Chemistry
Dr. Craig Bayse, Graduate Program Director

The Department of Chemistry and Biochemistry offers a program of study leading to the degree of Master of Science in chemistry. This program offers a sound academic background of coursework and research to prepare the student for further graduate study or employment in fields requiring an advanced degree. Areas of specialization within the program include analytical chemistry, biochemistry, environmental chemistry, marine chemistry, materials chemistry, organic chemistry, inorganic chemistry and physical chemistry.

Admission

An application (www.admissions.odu.edu), transcripts, two letters of recommendation from former college instructors, a current resume, an essay about career goals, and Graduate Record Examination (GRE) scores (aptitude section) are required for consideration of admission to the program. Admission to regular status requires a grade point average of 3.00 in the major and 2.80 overall (on a 4.00 scale). General university admission requirements also apply. In addition, a Bachelor of Science degree (or equivalent) with a major in chemistry (or another science) is required, although applications from majors in all science disciplines are encouraged. Undergraduate courses in organic chemistry, inorganic chemistry, analytical chemistry (quantitative and instrumental analysis), physical chemistry, and calculus are required for regular admission. Deficiencies in any of these areas will be identified and must be rectified by taking undergraduate coursework.

Requirements

Writing Proficiency Policy: The departmental graduate committee will request a writing sample from each new student. If the graduate committee feels that remedial assistance in writing is needed, the student will be referred to the Writing Center.

Options: Candidates for the master's degree have two options in their program: the Research/Thesis option and the Non-Thesis option.

Courses: A minimum of 30 hours is required for the thesis option, including six hours for research and thesis. A minimum of 33 hours is required for the non-thesis option, including three hours for independent study. Up to 15 hours may be taken in related courses given by other departments provided they are approved by the Graduate Studies Committee of the Department of Chemistry and Biochemistry. At least 60 percent of the credit hours must be from 600-level courses or higher.

Core Courses: There are five core areas. These are analytical chemistry, biochemistry, environmental chemistry, organic chemistry and physical chemistry. Students enrolled in the research/thesis option must take one course from three different core areas; non-thesis option students must take one course from each of the core areas.

Seminar: All students are required to register for seminar CHEM 690 (one credit, pass/fail) and attend departmental seminars for one semester. Failure to attend at least 75 percent of the departmental seminars will result in a grade of incomplete (I), which must be converted to a passing grade by writing a literature research paper on the work of one of the seminar speakers.

During their last semester, students are required to register for seminar class CHEM 691 (two credits, graded) and present a seminar on their research.

Research and Thesis:During their first semester (and not later than the end of their first academic year), students electing the Research/Thesis Option are required to interview the chemistry graduate faculty, choose a graduate faculty research advisor, and develop a research committee. Upon completion of their research, the student must write a formal thesis acceptable to his/her research committee and defend it to his/her research committee.

Non-Thesis Option: Not later than the end of their first academic year, students electing the Non-Thesis Option are required to interview the chemistry graduate faculty and choose a graduate faculty independent study advisor. Non-thesis students and their independent study advisor will then agree upon an independent study project. Upon completion of their independent study project, non-thesis students must write a formal Independent Study Report acceptable to their independent study advisor and the Graduate Studies Committee and pass an oral exam on their project.

Doctor of Philosophy in Chemistry

Admission

An application (www.admissions.odu.edu), transcripts, three letters of recommendation from former college instructors, a current resume, an essay about career goals, and Graduate Record Examination (GRE) scores (aptitude section) are required for consideration of admission to the program. Admission to regular status requires a grade point average of 3.00 in the major and 3.00 overall (based on a 4.00 scale). General university admission requirements apply. In addition, a bachelor's degree (or equivalent) with a major in chemistry (or another science) is required, although applications from majors in all science disciplines are encouraged. Undergraduate courses in inorganic chemistry, organic chemistry, analytical chemistry (quantitative and instrumental analysis), physical chemistry and calculus are required for regular admission. Deficiencies in any of these areas will be identified and must be rectified by taking undergraduate coursework in these areas.

Requirements

Writing Proficiency Policy:The departmental graduate committee will request a writing sample from each new student. If the graduate committee feels that remedial assistance in writing is needed, the student will be referred to the Writing Center.

Courses: A minimum of 78 semester hours beyond the undergraduate degree or 48 hours past the master's degree is required by this program. The broad requirements for granting the Ph.D. are as follows: satisfactory performance in core and elective courses, successful completion of both written and oral portions of the Candidacy Examination, completion of the dissertation prospectus, and completion of a satisfactory dissertation and defense of the dissertation.

Core Courses: Students must choose one course from three different core areas. The core areas are analytical chemistry, biochemistry, environmental chemistry, organic chemistry, inorganic chemistry and physical chemistry. Classes from each area are listed on the following pages.

Elective Courses: Students are required to take nine credit hours of elective courses. The courses are to be chosen upon consultation with their advisor and/or their guidance committee.

Teaching: Students are required to spend at least one semester as a teaching assistant.

Seminar: All students are required to register for seminar CHEM 890 (one credit, graded pass/fail) and attend departmental seminars throughout their graduate career. Failure to attend at least 75 percent of the departmental seminars will result in a grade of incomplete (I), which must be converted to a passing grade by writing a literature research paper on the work of one of the seminar speakers. Twice during their career, students will register for CHEM 891 (two credits) and present a seminar, which will receive a letter grade. In the second year, students will give a background literature talk on their research. They will give their second seminar on their dissertation research just before they graduate.

Research and Thesis: During their first semester (and not later than the end of their first semester), students are required to interview the chemistry graduate faculty (a signed sheet of at least three faculty members is required), choose a graduate faculty research advisor, and develop a guidance committee. The student must write a research proposal describing his/her proposed research project and present it after the candidacy examination has been passed. Upon completion of the research, the student must write a formal thesis acceptable to his/her dissertation committee and defend it.

Candidacy Examination: A student admitted to the Ph.D. program in chemistry becomes a candidate for the Ph.D. degree by passing the Ph.D. Candidacy Examination. This examination consists of a written portion and oral portion. The student is required to submit a written description of a novel research idea in the form of a grant proposal, and then present and defend the idea to his or her guidance committee.

Dissertation: The dissertation is the final and most important part of the work required for the Doctor of Philosophy degree in chemistry. The dissertation must be based on original research and make a contribution to existing knowledge of sufficient interest to warrant publication in a refereed journal. The candidate normally works closely with the research advisor, who is chair of the dissertation committee.

Dissertation Defense: The final examination of the candidate consists of the oral defense of the dissertation. This public examination is conducted by the dissertation committee with the research advisor serving as chair.

Chemistry Graduate Curriculum

Current Course Requirements

At present, the course requirements for the Ph.D. in chemistry involve courses in three categories:

- core courses
- elective courses
- graduate chemistry seminar

The core courses for each area are listed below. In addition, electives in the different areas are also listed. Students must take three core courses, each from a different area and nine credit hours of electives of their choosing, which may include other core courses. All students are required to take CHEM 779 as a core course. Students wishing to take courses from other departments that are not listed below must get prior approval from their guidance committee or the GPD.

Analytical

Core courses: CHEM 701, Advanced Analytical Chemistry; CHEM 702, Advanced Analytical Chemistry-II; CHEM 703, Chromatographic Separations by HPLC and GC

Electives: CHEM 704, HPLC and GC Laboratory; CHEM 716/816, Electrochemical Methods of Analysis; CHEM 741, Stable Isotope Chemistry; CHEM 744 /844, NMR Spectroscopy

Biochemistry

Core courses: CHEM 702, Advanced Analytical Chemistry-II; CHEM 765, Adv. Biochemistry

Electives: CHEM 726, Medicinal Chemistry; CHEM 762/862, Advanced Techniques in Biochemistry; CHEM 769, Nucleic Acids Biochemistry; CHEM 814/815/816, Biomedical Sciences Lab

Environmental

Core courses: CHEM 701, Advanced Analytical Chemistry; CHEM 703, Chromatographic Separations by HPLC and GC; CHEM 743, Organic Geochemistry; CHEM 749, Environmental Chemistry

Electives: CHEM 741, Stable Isotope Chemistry; CHEM 748, Environmental Chemistry Laboratory; OEAS 510, Chemical Oceanography; OEAS 612, Marine Geochemistry

Organic

Core courses: CHEM 723, Modern Synthetic Organic Chemistry; CHEM 725, Physical Organic Chemistry; CHEM 736/836, Intro. To Organic Synthesis; CHEM 743, Organic Geochemistry

Electives: CHEM 726, Medicinal Chemistry; CHEM 734/834, Organic Spectroscopy; CHEM 755, Computational Chemistry; CHEM 765, Advanced Biochemistry

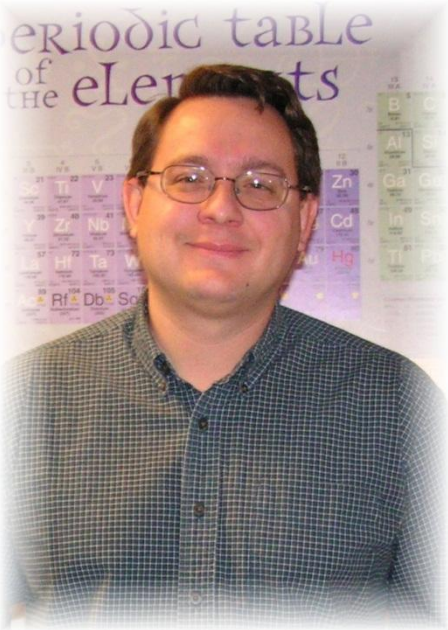
Inorganic

Core courses: CHEM 722, Bonding & Group Theory; CHEM 756, Inorganic Reaction Mechanisms

Electives: CHEM 718, Chemistry of Materials; CHEM 724, Bioinorganic Chemistry

Physical

Core courses: CHEM 755, Computational Chemistry; CHEM 779, Kinetics and Thermodynamics
Electives: CHEM 725, Physical Organic Chemistry; CHEM 775, Physical Biochemistry



Dr. Craig A. Bayse

Associate Professorof Chemistry and Biochemistry and
Graduate Program Director

Education:

Ph.D. in Physical Chemistry,
Texas A&M University, 1998
B.S. in Chemistry, Roanoke College, 1994

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Research:

Dr. Bayse's interests include theoretical studies of structure and dynamics in transition metal complexes, transition-metal-mediated catalysis, and photochemical and biochemical processes involving transition-metal and main-group inorganic centers. His current areas of research involve the biological activity of selenium, a trace element whose antioxidant properties impart protection against cancer, cardiovascular disease and the side effects of stroke, a theoretical analysis of the relationships between the electron structure of molybdenum and tungsten and their selective uptake and utilization by organisms; and the chemotherapeutic roles of ruthenium, palladium and platinum. Other interests include development of new methods for calculating electron correlation and relativistic effects.

Selected Publications:

C.A. Bayse. 'Transition states for cysteine redox processes modeled by DFT and solvent-assisted proton exchange.' *Organic &Biomolecular Chemistry*.**2011**, *9*, 4748-4751.

C.A. Bayse and Erin R. Rafferty. 'Is halogen bonding the basis for iodothyroninedeiodinase activity?' *Inorganic Chemistry*.**2010**, *49*, 5365-5367.

S. Antony and C.A. Bayse. 'Theoretical studies of active site models of the tungstoenzyme acetylene hydratase.' *Organometallics*.**2009**, *28*, 4938-4944.

C.A. Bayse and S. Antony. 'Modeling the oxidation of ebselen and other organoselenium compounds using explicit solvent networks.' *Journal of Physical Chemistry A*. **2009**, *113*, 5780-5785.

C.A. Bayse, T.P. Brewster, and R.D. Pike. 'Photoluminescence of 1-D copper(I) cyanide chains: A theoretical description.' *Inorganic Chemistry*.**2009**, *48*, 174.

A.I. Anzellotti, C.A. Bayse, and N.P. Farrell. 'Effects of nucleobasemetallation on frontier molecular orbitals: Potential implications for π-stacking interactions with tryptophan.' *Inorganic Chemistry***2008**, *47*, 10425.

Dr. Peter F. Bernath

Professorof Chemistry and Biochemistry and
Department Chair

Education:

Ph.D. in Physical Chemistry, MIT, 1981
B.Sc. in Chemistry (Physics option),
University of Waterloo, 1976

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Research:

Dr. Bernath's interests are in laser and Fourier transform spectroscopy of transient molecules, atmospheric remote sensing and molecular astronomy. High resolution emission spectroscopy is used to study species such as BeH_2 and HBS in the infrared and free radicals such as $CaCH_3$ and BaOH in the visible region. He is mission scientist of the Atmospheric Chemistry Satellite (ACE, http://www.ace.uwaterloo.ca), which records infrared spectra of the Earth's atmosphere. The primary ACE science goal is the study of stratospheric ozone chemistry, but his group is also looking at greenhouse gases relevant to climate change and at organics responsible for air pollution. He also analyzes the spectra of "cool" astronomical objects including the Sun, brown dwarfs and extrasolar planets based on new laboratory measurements.

Selected Publications:

R. J. Hargreaves, G. Li, and P. F. Bernath, 'Hot NH_3 for Astrophysical Applications,' *Astrophysical Journal*.**2011**, 735, 111.

W. J. Randel, M. Park, L. Emmons, D. Kinnison, P. Bernath, K. A. Walker, C. Boone, and H. Pumphrey, 'Asian monsoon transport of pollution to the stratosphere,' *Science***2010**, 328, 611.

G. González Abad, P. F. Bernath,C. D. Boone,S. D. McLeod, G. L. Manney and G. C. Toon, 'Global distribution of upper tropospheric formic acid from the ACE-FTS,' *Atmospheric Chemistry and Physics* **2009**, 9, 8039.

P. F. Bernath, 'Molecular astronomy of cool stars and sub-stellar objects,' *International Review of Physical Chemistry***2009**, 28, 681.

A. Shayesteh, R. D. E. Henderson, R. J. Le Roy and P. F. Bernath, 'The ground state potential energy curve and dissociation energy of MgH,' *Journal of Physical Chemistry A***2007**, 111, 12495.

M. J. Dick, P. M. Sheridan, J.-G. Wang, and P. F. Bernath, 'High Resolution Laser Excitation Spectroscopy of the $\tilde{\mathbf{B}}^2\mathbf{E}$ - $\tilde{\mathbf{X}}^2\mathbf{A_1}$ Transitions of Calcium and Strontium Monoborohydride,' *Journal of Chemical Physics***2007**, 126, 164311.

Dr. Kenneth G. Brown Jr.

Professor of Chemistry and Biochemistry

Education:

Ph.D. in Physical Chemistry,
Brown University, 1971
B.S. in Chemistry, Syracuse University, 1966

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Research:

Dr. Brown's primary interests are in oxidation catalysis, sensor development and polymer characterization.

Selected Publications:

"What is the Purpose of General Chemistry?" Isenhour, T.; Brown, K.G.*The Chemist***2001**, *78*, 1-4.

Brown, K.G.; Burns, K.S.; Ingram, J.; Wood, G.M.; Upchurch, B.T. "Polymerization in Microgravity On-Board STS-57, STS-63, and STS-77" in *Polymer Research in Microgravity: Polymerization and Processing*; Downey, J.; Pojman, J.A., Eds. ACS Symposium Series, Oxford University Press, 2001**,** 793, pp 64-77.

Wood, G.M.; Upchurch, B.T.; Schryer, D.R.; Davis, P.P.; Kielin, E.J.; Brown, K.G.; Schryer, J.L.; Ambrosia, C.M. "Catalyst For Oxidation Of Volatile Compounds," United States Patent #6,132,694, 2000.

"Polymerization in Microgravity Onboard STS-57, STS-63, and STS-77," Brown, K.G.; Burns, K.S.; Ingram, J.; Upchurch, B.T.; Wood, G.M., Jr. *Polymer Preprints***2000**, *41*, 1072-1073.

"Compositional Characterization, by Raman Spectroscopy, of Polymers Synthesized in Microgravity Onboard STS-57, STS-63, STS-77," *Polymer Preprints***2000**, *41*, 1078-1079.

Dr. David J. Burdige

Professor and Eminent Scholar of Oceanography
Joint Professor of Chemistry and Biochemistry

Education:

Ph.D. in Oceanography, Scripps Institution of Oceanography, University of California at San Diego, 1983
B.A. in Chemistry, Swarthmore College, 1978

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Research:

Dr. Burdige studies the biogeochemical processes in estuarine and marine sediments, marine organic geochemistry, manganese and iron redox chemistry, and mathematical modeling of geochemical processes.

Selected Publications:

Burdige, D.J., X. Hu and R.C. Zimmerman.**2008**. Rates of carbonate dissolution in permeable sediments estimated from pore water profiles: the role of seagrasses. Limnol.Oceanogr. 53:549-565.

Chanton, J. P., P. H. Glaser, L. S. Chasar, D. J. Burdige, M. E. Hines, D. I. Siegel, L. B. Tremblay, and W. T. Cooper. **2008**. Radiocarbon evidence for the importance of surface vegetation on fermentation and methanogenesis in contrasting types of boreal peatlands. Global Biogeochem. Cycles, 22, GB4022, doi:10.1029/2008GB003274.

Burdige, D.J.**2006**. Geochemistry of Marine Sediments.Princeton Univ. Press.

Burdige, D.J. **2005**. The burial of terrestrial organic carbon in marine sediments: A re-assessment. Global Biogeochem. Cycles 19:10.1029/2004GB002368.

Johannesson, K.H., J. Tang, J.M. Daniels, W.J. Bounds, and D.J. Burdige. **2004**. Organic geochemistry of rare earth elements in blackwaters of the Great Dismal Swamp, Virginia, USA. Chem. Geol. 209:271-294.

Dr. John B. Cooper

Associate Professor of Chemistry and Biochemistry

Education:

Post-Doctoral:Professor Alan Bond, Melbourne Australia, 1992
Ph.D. in Physical Inorganic Chemistry, North Carolina State University, 1990
B.S in Chemistry, The Citadel, 1986

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Research:

Dr. Cooper's research includes chemometric analysis of complex chemical systems based on multivariate spectroscopic data, development of fiber-optic sensors for remote chemical analysis, STM and AFM analysis of novel semi-conductor materials, electrochemistry using novel diamond microelectrodes, characterization of polymer cure reactions using advanced spectroscopic methods, and novel nanosynthetic techniques from self-assembled monolayers.

Selected Publications:

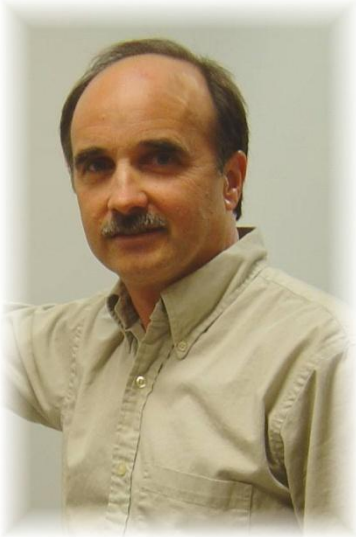
Rapid Analysis of Jet Fuel Using a Handheld Near-Infrared (NIR) Analyzer (Applied Spectroscopy, Vol. 65, **2011**, pp. 187-192) J.B. Cooper, C.M. Larkin, J.Schmitgal, R.E. Morris, and Mo.F. Abd El-kader

Calibration transfer of near-IR partial least squares property models of fuels using virtual standards (Journal of Chemometrics, 19 JUL **2011**, DOI: 10.1002/cem.1395) J.B. Cooper, C.M. Larkin and M.F. Abd El-kader

Virtual standard slope and bias calibration transfer of partial least squares jet fuel property models to multiple near infrared spectroscopy instruments (J.Near-IR Spectroscopy,volume 19, **2011**, pp 139-150) J.B. Cooper,* C.M. Larkin and M.F. Abd El-kader

Chemical Vapor Deposited Diamond Films for Self-Referencing Fiber Optic Raman Probes (New Diamond and Frontier Carbon Technology**2003**, volume 13, pp. 341-351) S. Albin, J. Zheng, B. Xiao, J.B. Cooper, R.B. Jeffers and S. Antony

Dr. Gregory A. Cutter



Professor of Oceanography
Joint Professor of Chemistry and Biochemistry

Education:

Ph.D. in Chemistry, University of California, Santa Cruz, 1982
B.A. in Chemistry, University of California, San Diego, 1977

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Research:

Dr. Cutter's research efforts are centered on revealing the biogeochemical processes affecting trace element speciation and distributions in natural waters and sediments (elements include: As, C, Cd, Cr, Cu, N, P, Pb, S, Sb and Se). His team takes a holistic approach of examining not only the aquatic environment itself but also the air-sea transport and exchange of gases and trace elements. Most recently, his team has been studying processes in the ancient oceans and for this they have been developing paleoceanographic tracers that follow their past work on the development of analytical methods for aquatic chemistry. He complements his research with computer modeling of biogeochemical processes to integrate the findings.

Selected Publications:

Henderson, G., et. al. GEOTRACES – "An international study of the global marine biogeochemical cycles of trace elements and their isotopes". *Chemie der Erde – Geochem.*,**2007,** *67*, 85-131.

"Evaluating the biogeochemistry of selenium in San Francisco Bay through modeling," Meseck, S.C.; Cutter, G.A. *Limnology Oceanography*, **2006**, *51*, 2018-2032.

Ranville, M.A., G.A. Cutter, C.S. Buck, W.M. Landing, L.S. Cutter, J.A. Resing, and A.R. Flegal. 2010. Aeolian contamination of Se and Ag in the North Pacific from Asian fossil fuel combustion. Environ. Sci. Technol., 44: 1587-1593.

Li, X., G.A. Cutter, R.C. Thunell, E. Tappa, Y. Astor, and M.I. Scranton. 2011. Particulate sulfur species in the water column of Cariaco Basin. Geochim.Cosmochim.Acta, 75: 148-163.

"Biogeochemistry: now and into the future," Cutter, G.A. *Palaeogeography, Palaeoclimatology, Palaeoecology***2005**, *219*, 191-198.

Dr. John R. Donat

Associate Professor of Chemistry and Biochemistry
Joint Associate Professor of Oceanography
Director, ODU's Chesapeake Bay Program Water Quality Laboratory

Education:

Ph.D. in Chemistry, University of California, Santa Cruz, 1988
B.S. in Chemical Oceanography, Humboldt State University, 1978

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Research:

Dr. Donat's research interests include the speciation (i.e., chemical forms) and concentrations of trace metals in natural waters and the factors affecting them; the relationship between trace metal speciation and concentrations and metal-phytoplankton interactions; the concentrations and nature of natural organic metal chelators in natural waters; and development and application of analytical methods for trace analysis in aquatic chemistry. Dr. Donat's research has attracted over $7.8 million in grant and contract funding from NSF, ONR, the Virginia Department of Environmental Quality, the Chesapeake Bay Environmental Effects Committee and the New York Sea Grant Program.

Selected Publications:

"Seasonal survey of copper-complexing ligands and thiol compounds in a heavily utilized, urban estuary: Elizabeth River VA," Dryden, C.L.; Gordon, A.S.; Donat, J.R., *Marine Chemistry***2007**, 103, 276-288.

"Interactive regulation of dissolved copper toxicity by an estuarine microbial community," Dryden, C.L.; Gordon, A.S.; Donat, J.R. *Limnology and Oceanography***2004**, *49*, 204-211.

"Interactions between Cd, Cu, and Zn influence particulate phytochelatin concentrations in marine phytoplankton: Laboratory results and preliminary field data," Wei, L.; Donat, J.R.; Fones, G.; Ahner, B.A. *Environmental Science and Technology***2003**, *37*, 3609-3618.

"Physicochemical speciation of iron in the Peconic Estuary: Observations during algal blooms," Gobler, C.J.; Sañudo-Wilhelmy, S.; Donat, J.R.; Consolvo, J.A. III.*Marine Chemistry***2002,***77*, 71-89.

"Elemental Distribution: Transition and Heavy Metal Speciation," Donat, J.R.; Dryden, C.L.in*Encyclopedia of Ocean Sciences*, Steele, J.; Thorpe, S.; Turekian, K., Eds.; Academic Press, Inc.: London, 2001.

Dr. Lesley H. Greene

Assistant Professor of Chemistry and Biochemistry

Education:

Ph.D. in Biochemistry, University of Miami, Florida, 1998
B.S. in Microbiology, University of Miami, Florida, 1991

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Research:

The main goal of Dr. Greene's research is to elucidate the critical determinants governing protein evolution, structure, stability and folding. From an evolutionary perspective, her research group has endeavored to identify and study conserved features which she proposes are keys to resolve the protein folding problem. Her research is hypothesis-driven and her approach has been to combine computational and experimental methodologies in one unified effort. The computational research involves the development and application of bioinformatics, molecular dynamics simulations and network principles. Her experimental approach utilizes modern methods in molecular biology and protein engineering as well as a range of state-of-the-art biophysical techniques including stopped-flow fluorescence, circular dichroism and nuclear magnetic resonance spectroscopy. Other research interests include investigating the relationship between protein misfolding, amyloid fibril formation and human disease as well as the effects of predicted global climate change conditions on the expression and adaption of genes in cyanobacteria. She is committed to fostering creativity and to training our future scientists.

Selected Publications:

"Analysis of conservation in the Fas-associated death domain protein and the importance of conserved tryptophans in structure, stability and folding. Li, H., Wojtaszek, J. and Greene, L.H." *BiochimicaetBiophysicaActa***2009** 1794, 583-593.

"Characterization of the molten globule of human serum retinol-binding protein using NMR spectroscopy," Greene, L.H.; Wijesinha-Bettoni, R.; Redfield, C. *Biochemistry***2006***45*, 9475-9484.

"Uncovering network systems within protein structures," Greene, L.H.; Higman, V.A. *Journal of Molecular Biology* **2003***334*, 781-791.

"Conserved signature proposed for folding in the lipocalin superfamily," Greene, L.H.; Hamada, D.; Eyles, S.J.; Brew, K. *FEBS Letters***2003***553*, 39-44.

Dr. Richard V. Gregory

Professor of Chemistry and Biochemistry

Education:

Ph.D. in Physical Chemistry,
Clemson University, 1984
B.S. in Chemistry,
Old Dominion University, 1980

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Research:

Dr. Gregory's primary interests are in the synthesis, characterization, and development of all organic inherently conductive polymers for use in all organic electronic devices, all organic lasers, photonic systems, and fiber-based "smart materials." These devices have wide applications in sensors, biomedical devices, smart materials, and the next generation of all organic optical computing devices.

Selected Publications:

Elliptical micro-ring organic lasers; P.R. Korada, J. Ballato, and R. V. Gregory, *J. Opt. A: Pure Appl. Op*.**2007**, *9*, L9 –L11 (Selected as one of the top papers in 2007by the editorial board).

Studies of solution properties of polyaniline by membrane osmometry; H. Zengin, H. G. Spencer, G. Zengin, and R. V. Gregory, *Synthetic Metals* **2007**,*157*, 147-154.

Integration and Distribution of Carbon Nanotubes in Solution-Processed Polyaniline/Carbon Nanotube Composites, P. C. Ramamurthy, W. R. Harrell, R. V. Gregory, A. M. Rao, *J.Electrochem.Soc.***2007,** *154*, pp. H495- H499**.**

Dr. Patrick G. Hatcher

Batten Endowed Chair in Physical Sciences
Professor of Chemistry and Biochemistry

Education:

Ph.D. in Chemistry, University of Maryland, 1980
M.S. in Marine Chemistry, University of Miami, FL, 1974
B.S. in Chemistry, N.C. State University, 1970

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Research:

The Hatcher Group's research is in the area of environmental chemistry and geochemistry, emphasizing the origin and chemical transformations of plant-derived biopolymers in natural systems such as soils, peats, marine sediments and oceanic waters. Other interests include: studies of the interaction of organic contaminants with natural organic matter in soils, sediments and natural waters; studies of the sequestration of nitrogen in the environment;defining the origin, nature and reactivity of black carbon (soot, charcoal, etc.) in the environment, and the chemistry involved in the conversion of algal biomass to biodiesel and crude oils.

Selected Publications:

Salmon, Elodie, Behar, Francoise, and Hatcher, Patrick G. **2011.**Molecular characterization of Type I kerogen from the Green River Formation using advanced NMR techniques in combination with electrospray ionization/ultrahigh resolution mass spectrometry. Organic Geochemistry, V. 42, pp. 301-315.

McKee, Georgina A; Hatcher, Patrick G.**2010**. Alkyl amides in two organic-rich anoxic sediments: a possible new abiotic route for N sequestration. GeochimicaetCosmochimicaActa, v. 74, pp. 6436-6450.

Sleighter, Rachel L.; Liu, Zhanfei; Xue, Jianhong; Hatcher, Patrick G.**2010**. Multivariate statistical approaches for the characterization of dissolved organic matter analyzed by ultrahigh resolution mass spectrometry. Environmental Science and Technology, V. 44, pp. 7576-7582.

Salmon, E., Behar, F., Lorant, F., Hatcher, P.G., Marquaire.P.-M. **2009**.Thermal decomposition processes in algaenan of *Botryococcusbraunii* race L. Part 1: Experimental data and structural evolution. Organic Geochemistry, V. 40, pp. 400-415.

Sleighter, Rachel L. and Hatcher, Patrick G. **2008.**Molecular characterization of dissolved organic matter (DOM) along a river to ocean transect of the lower Chesapeake Bay by ultrahigh resolution electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry. *Marine Chemistry, V. 110(3-4)*, pp. 140-152.

Geib, S. M., Filley, T. R., Hatcher, P. G., Hoover, K., Carlson, J. E., Jimenez-Gasco, M., Nakagawa-Izumi, A., Sleighter, R. L., Tien, M. **2008**.Lignin degradation in wood-feeding insects.Proceedings of the National Academy of Sciences, V. 105, pp.12932-12937.

Dr. Thomas Isenhour

Professor of Chemistry and Biochemistry

Education:

Graduate, Institute of Educational Management
Harvard University, 1989
Ph.D. in Chemistry,
Major – Analytical Chemistry /Minors – Inorganic Chemistry, Physical Chemistry- Cornell University, 1965
B.S. in Chemistry -University of North Carolina, 1961

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Awards and Honors:

Pioneer in Laboratory Robotics
Sponsored by Zymark Corporation, 1987
American Chemical Society Award in Analytical Chemistry
Sponsored by Fisher Scientific Company, 1983
Outstanding Performance Award
National Science Foundation, 1983
Alfred P. Sloan Research Fellow, 1971
Phi Beta Kappa, 1964

Selected Publications:

"Education Makes the Difference," Thomas L. Isenhour, Richmond Times-Dispatch, **2008**.

"Keep Oil in USA," Thomas L. Isenhour, USA Today, **2008**.

"Norfolk schools deserve praise for aiming high," William H. Graves, III, and Thomas L. Isenhour, The Virginian Pilot, **2006**.

"Collaborative research is the wave of the future," Thomas L. Isenhour and Gerald L. Pepe, The Virginian Pilot, **2006**.

Dr. James W. Lee

Associate Professor ofChemistry and Biochemistry

Education:

Ph.D. in Photosynthesis Research, Physical Chemistry and Biochemistry, Cornell University 1993
M.S. in Plant Physiology and Biochemistry, Cornell University 1988

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Research:

Dr. Lee's current R&D interest is focused on the following two bioenergy science areas with the objective to provide green/clean energy and help control climate change:

(1) Designer photosynthetic organisms for photobiological production of advanced biofuels from water and carbon dioxide. This multidisciplinary R&D involves synthetic biology and genetic transformation of photosynthetic organisms to create designer organisms for photobiological production of advanced biofuels such as hydrogen, biooils/biodiesel,butanol and/or related higher alcohols directly from water and carbon dioxide.

(2) Smokeless(emission-free, clean, and efficient) biomass pyrolysis for advanced biofuels production and global biochar carbon sequestration. This "carbon-negative" biomass-pyrolysis energy-production concept applies biochar as a soil amendment and carbon sequestration agent. The key concept here is to use a smokeless biomass-pyrolysis process to produce certain biofuels andto "lock" some of the unstable biomass carbon such as dead leaves, waste woods, cornstovers and rice straws into a stable form of carbon—biochar. The envisioned use of biochar as a soil amendment could improve soil fertility and at the same time, serve as a carbon sequestration agent to help control climate change and keep the environment cleaner.

Selected Publications& Inventions:

Lee, JW (**2011**) Designer proton-channel transgenic algae for photobiological hydrogen production. US Patent No. 7,932,437 B2.

Lee, JW (**2011**) Designer organisms for photosynthetic production of ethanol from carbon dioxide and water. US Patent No. 7,973,214 B2.

Lee,JW, Hawkins, B, Day, DM, Reicosky, DC (**2010**) Sustainability: The capacity of smokeless biomass pyrolysis for energy production, global carbon capture and sequestration. Energy Environ. Sci. 3 (11): 1609–1812.

Lee,JW, Kidder, M, Evans, BR, Paik, S, Buchanan, AC, Garten, C, Brown, R (**2010**) Characterization of biochars produced from cornstover for soil amendment. Environ. Sci. Technol. 44: 7970–7974.

Lee, JW (**2009**) Designer organisms for photobiologicalbutanol production from carbon dioxide and water. PCT International Patent Application Publication Number: WO 2009/105733 A2.

Lee, JW and Foote, RS (**2009**) Micro and Nano Technologies in Bioanalysis: Methods and Protocols, a special book (668 pages; ISBN-10: 1934115401) series: Methods in Molecular Biology, Springer/Humana Press, Dordrecht, Heidelberg, London, and New York.

Dr. Jingdong Mao

Assistant Professor of Chemistry and Biochemistry

Education:

Ph.D. in Soil Chemistry, University of Massachusetts, Amherst, 2000
M.S. in Environmental Chemistry, Nanjing Agricultural University, China, 1992
B.S. in Soil Science and Agricultural Chemistry, Nanjing Agricultural University, China, 1989

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Research:

Dr. Mao studies the characterization of natural organic matter in soils, water, sediments and meteorites; interactions of natural organic matter with organic and inorganic contaminants; structures of animal manure; properties of soils suitable for the growth of rare plants; structures of well-preserved dinosaur bones; and development and applications of advanced solid-state NMR techniques for investigations of natural organic matter.

Selected Publications:

Cao, X., D. C. Olk, M. Chappell, C. A. Cambardella, L. F. Miller, and J.-D. Mao.**2011**.Integrated physical and chemical extraction for soil organic matter fractions: Advanced solid-state NMR analysis for chemical nature. *Soil Science Society of America Journal.*75:1374-1384.

Cao, X. , K.S. Ro, M. Chappell,Y. Li, and J.-D. Mao. **2011**. Chemical structures of swine-manure chars produced under different carbonization conditions investigated by advanced solid-state ^{13}C NMR spectroscopy. *Energy & Fuels* 25: 388-397.

Mao, J.-D**.**, N. Chen, and X. Cao.**2011**. Characterization of humic substances by advancedsolid-state NMR spectroscopy: Demonstration of a systematic protocol. *Organic Geochemistry*. 42: 891-902.

Mao, J.-D**.**, K.M. Holtman, and D. Franqui-Villanueva.**2010**. Chemical structures of cornstover and its residue after dilute acid prehydrolysis and enzymatic hydrolysis: Insight into factors limiting enzymatic hydrolysis. *Journal of Agricultural and Food Chemistry* 58:11680-11687.

Mao, J.-D., X. Fang, Y. Lan, A. Schimmelmann, M. Mastalerz, L. Xu and K. Schmidt-Rohr.**2010**. Chemical and nanometer-scale structures of kerogen and their changes during thermal maturation investigated by advanced solid-state NMR spectroscopy.*GeochimicaetCosmochimicaActa.* 74: 2110-2127.

Dr. Kenneth Mopper

Professor of Chemistry and Biochemistry
Joint Professor of Oceanography

Education:

Ph.D. in Oceanography, WHOI-MIT, 1973
M.S. in Marine Chemistry, MIT, 1971
B.S. in Chemistry, Queens College, CUNY, 1968

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Research:

Dr. Mopper's current research areas include the impact of CO_2 and CO photo-chemical production on oceanic and global carbon cycling, the impact of photochemical degradation of DOM and microbial uptake of degradation products on oceanic and global carbon cycling, measurement of transient and stable species and studies of reaction mechanisms, which involves the characterization of humic substances in natural waters, mechanisms for the formation of OH radicals, H_2O_2, carbonyl compounds, organic acids and photo-redox reactions of trace metals, the production of surface active polysaccharides by algae and bacteria and their role in surface microlayer and particle formation in natural waters, and the development/adaptation of analytical techniques for trace organics and photochemically formed species in natural waters.

Selected Publications:

"Absorbance spectral slopes and slope ratios as indicators of molecular weight and sources of chromophoric dissolved organic matter." Helms, J.R., A. Stubbins, J.D. Ritchie, E.C. Minor, D.J. Kieber and K. Mopper.*Limnol.Oceanogr*.**2008,***53,* 955-969.

"Relating carbon monoxide photoproduction to dissolved organic matter functionality." Stubbins, A., V. Hubbard, G. Uher ,C.S. Law, R.C. Upstill-Goddard, G.R. Aiken, and K. Mopper. *Environ. Sci Technol.* **2008,** *42,* 3271–3276.

Advanced instrumental approaches for characterization of marine dissolved organic matter: Extraction techniques, MS and NMR spectroscopy. K. Mopper, A. Stubbins, J.D. Ritchie, H.M. Bialk, and P.G. Hatcher. *Chemical Reviews* **2007**, *107,* 419-442.

Dr. Patricia A. Pleban

Assistant Chair and Associate Professor
of Chemistry and Biochemistry

Education:

Ph.D. in Chemistry, Cleveland State University, 1979
M.S. in Chemistry, Cleveland State University, 1975
B.S. in Chemistry, Kent State University, 1965

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Research:

Dr. Pleban conducted clinical research in the area of human trace element metabolism for nearly 30 years. Her main focus was investigation of the reaction products of oxidized selenium species and speciation of this essential trace element in human tissues. She now devotes her time to the department's undergraduate program and also serves as the department's assistant chair.

Selected Publications:

"Experimental and theoretical evidence for cyclic selenurane formation during selenomethionine oxidation," Ritchey, J.A.; Davis, B.M.; Pleban, P.A.; Bayse, C.A. *Organic and Biomolecular Chemistry***2005**, *3*, 4337-4342.

"Change in Hen Sciatic Nerve Calcium after a Single Oral Dose of Tri-o-Tolyl Phosphate," Luttrell, W.; Olajos, E.; Pleban, P. *Environ. Res.***1993**, *60*, 290-294. Also published in *Neurobehavioral Methods and Effects in Occupational and Environmental Health* Araki, S., Ed.; Academic Press: New York, 1994; pp 931-936.

"Magnesium, Zinc and Copper Levels in Plasma and Blood Cellular Components in Children with IDDM," Rohn, R.; Pleban, P.A.; Jenkins, L. *ClinicaChimicaActa***1993**, *215*, 21-28.

"Residential Exposure to Chromium Waste - Urine Biological Monitoring in Conjunction with Environmental Monitoring," Stern, A.H.; Freeman, N.C.G.; Pleban, P.; Boesch, R.R.; Wainman, T.; Korn, L.R.; Howell, T.; Shupack, S.; Johnson, B.B.; Lioy, P.J. *Environmental Research***1992**, *58*, 147-162.

"Evaluation and Preparation of Spermatozoa for In Vitro Fertilization. D. Biochemistry Acrosin," Zaneveld, L.J.D.; Jeyendran, R.; Kaminski, J.; Pleban, P. in *Human Spermatozoa in Assisted Reproduction* Acosta, A.A.; Swanson, R.J.; Ackerman, S.B., Eds.; Williams & Wilkins: Philadelphia, 1990; pp 189-194.

Dr. Jennifer L. Poutsma

Associate Professor of Chemistry and Biochemistry

Education:

Ph.D. in Organic Chemistry, UCLA, 1997
B.S. in Chemistry, University of Chicago, 1991

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Research:

Dr. Poutsma's research focuses on the application of computational methods to aspects of biochemistry and organic chemistry which cannot be studied experimentally. Specific projects are studying the mechanisms of Schmidt reactions between ketones/aldehydes and azides;; determining how different ligands affect the conformation of the M20 loop in dihydrofolatereductase; understanding how R67 dihydrofolatereductase influences the binding cooperativity between its ligands; and investigating how modifications affect the binding of protein nucleic acids to DNA.

Selected Publications:

"Non-Bonded, Attractive Cation–π Interactions in Azide-Mediated Asymmetric Ring Expansion Reactions", Katz,C. E.; Ribelin, T; Withrow,D.; Basseri, Y.; Manukyan, A. K.; Bermudez, A.; Smith,S.; Nuera, C. G.; Day, V. W.; Powell, D. R.; Poutsma, J. L.; Aubé, J., *J. Org. Chem*., (Featured Article), **2008**, *73*, 3318-3327.

"Highly Stereoselective Ring Expansion Reactions Mediated by Attractive, Non-Bonded Cation-Interactions", Ribelin, T.; Katz, C. E.; English, D.; Smith, S.; Manukyan, A. K.; Day, V. W.; Neuenswander, B.; Poutsma, J. L.; Aubé, J., *Angew. Chem. Int. Ed.*, **2008**, 47, 6233-6235.

"Reactions of CyclopropanoneAcetals with Alkyl Azides: Carbonyl Addition versus Ring-Opening Pathways", Grecian, S.; Desai, P.; Mossman, C.; Poutsma, J. L.; Aubé, J., *J. Org. Chem.***2007**, *72*, 9439-9447.

"Theoretical and Experimental Investigation of the Energetics of Cis-Trans Proline Isomerization in Peptide Models," Schroeder, O.E.; Carper, E.; Wind, J.J.; Poutsma, J.L.; Etzkorn, F.; Poutsma, J.C. *Journal of Physical Chemistry A***2006**, *110*, 6522-6530.

"Levels of Theory: Another Poor Performance of the B3LYP Method for B-N Dative Bonds," LeTourneau, H.; Birsch, R.; Korbeck, G.; Radkiewicz-Poutsma, J.L. *Journal of Physical Chemistry A* **2005**, *109*, 12014-12019.

Dr. BalaRamjee

Assistant Professor of Chemistry and Biochemistry

Education:

Ph.D. in Organic Chemistry, Indian Institute of Science, Bangalore, India, 2001
M.S. in Chemical Sciences, Indian Institute of Science, Bangalore, India, 1997
B.Sc. in Chemistry, Loyola College, Madras, India, 1994

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Research:

We are broadly interested in the interfacial area of nanomaterials and organic synthesis. For a number of chemical and biological applications the surface characteristics of nanoparticles need to be modified by appropriate ligand engineering. Also the nanoparticles stability and catalytic ability primarily depends on the nature of their passivating groups. We are interested in probing ligand effects in the synthesis and dynamics of nanoparticles towards fundamental studies and applications in catalysis and sensing. Immediate projects will focus on the synthesis and studies of nanoparticle cored dendrimers and shape selective nanoparticles.

Selected Publications:

"Resorcinarene amine stabilized nanodiamond dispersions in organic solvents: applications in diamond film growth", V. P. Sheela, W. Xiao, S. Han, X. Zhou, S. Albin, R. Balasubramanian, *J. Mater. Chem.*, **2011**, *21*, 6395-6400.

"Solvent dependent morphologies in thiol-enephotopolymerization: A facile route to the synthesis of resorcinarenenanocapsules", R. Balasubramanian, Z.M. Kalaitzis, W.Cao, *J. Mater. Chem.*, **2010**, *20*, 6539 - 6543.

"Reactivity of $[Au_{25}(SCH_2CH_2Ph)_{18}]^{1-}$ Nanoparticles with Metal Ions", J.-P. Choi, C. A. Fields-Zinna, R. L. Stiles, R. Balasubramanian, A. D. Douglas, M. C. Crowe, R. W. Murray, *J. Phys. Chem. C*, **2010**, *114*, 15890 -15896.

"Template-free Synthesis and in situ Functionalization of Nanocapsules", R. Balasubramanian, Z.M.Kalaitzis, Ed R. Nagarajan, in ACS Symposium Series tentatively titled "Amphiphiles: Molecular Assembly and Applications", **2011**. (*Invited, peer-reviewed article, status - accepted*)

"Electron Transport and Counterion Relaxation Dynamics in Neat FerrocenatedImidazolium Ionic Liquids", W. Wang, R. Balasubramanian, R. W. Murray, *J. Phys. Chem.C***2008**, *112*, 18207.

"Anion-Induced Adsorption of Ferrocenated Nanoparticles", R.L. Wolfe, R. Balasubramanian, S.W. Feldberg, R.W. Murray,*J. Am. Chem. Soc*. **2008**, *130*, 1856.

Dr. X. Nancy Xu

Professor of Chemistry and Biochemistry
Biological Chemistry Track Director of the
Biomedical Sciences Ph.D. Program

Education:

Ph.D. in Analytical Chemistry,
University of Mississippi, 1992
B.S. in Physical Chemistry, Xiamen University, 1985

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Research:

The central theme of Dr. Xu's research program is the development and application of cutting-edge bio- and nanotechnologies and ultrasensitive analytical methodologies to address fundamental and practical questions in chemical, biochemical and biomedical research. The primary goal of her research program is to study chemical and biological mechanisms in real-time at the single-molecule level. The research targets the most challenging questions in biology and aims to explore living systems at the single-cell and single-molecule level. Ultimately, the research will lead to the discovery of new chemical and biochemical concepts and mechanisms, and the invention of novel technologies. Her research program is supported by several active research awards from federal funding agencies, including NSF, NIH, DoD, and DoE.

Selected Publications:

T. Huang, X. Xu*, "Multicolored nanometre-resolution mapping of single protein–ligand binding complexes using far-field photostable optical nanoscopy (PHOTON)", *Nanoscale*3, 3567 (**2011**) (Front-cover).

T. Huang, X. Xu*, "Synthesis and characterization of tunable rainbow colored silver nanoparticle solutions using single-nanoparticle plasmonic microscopy and spectroscopy", *J. Material Chemistry***20**, 9867 (**2010**) (Back cover)

P. Nallathamby, K. Lee, T. Desai, X. Xu*, "Study of multidrug membrane transporters of single living *Pseudomonas aeruginosa* cells using size-dependent plasmonic nanoparticle optical probes", *Biochemistry***49**, 5942 **(2010**)

K. J. Lee, L. Browning, T. Huang, F. Ding, P. Nallathamby, X. Xu*, "Probing multidrug ABC membrane transporters of single living cells using single nanoparticle plasmonic optical probes", *Anal. Bioanal.Chem.* **397**, 3317 (**2010**).

P. Nallathamby, X. Xu,* "Study of cytotoxic and therapeutic effects of stable and purified silver nanoparticles on tumor cells" *Nanoscale***2**, 942 (**2010)**.

L. Browning, T. Huang, X. Xu*,"Electric pulses to prepare feeder cells for sustaining and culturing of undifferentiated embryonic stem cells", *Biotechnol. J.* **5**, 588 (**2010**).

P. Nallathamby, T. Huang, X. Xu*, "Design and characterization of optical nano rulers of single nanoparticles using optical microscopy and spectroscopy", *Nanoscale* 2, 1715 (**2010**)

Dr. Marie Melzer

Lecturer – General Chemistry

Education:

Ph.D., Inorganic Chemistry, Georgetown University, Washington, DC, 2009
BS, Chemistry; BA Biology, University of North Carolina, Charlotte, NC, 2004

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Teachesinorganic, general, and organic chemistry.

Dr. Pinky A. McCoy

Lecturer– General Chemistry, Biochemistry

Education:

Ph.D. in Biomedical Sciences, ODU/EVMS, 2000
B.S. in Pharmacology and Toxicology, Philadelphia College of Pharmacy and Science, 1992

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Although not currently pursuing research, her research background includes biochemistry, specifically protein purification and molecular genetics.

Dr. Joshua Wallach

Lecturer - General Chemistry

Education:

Ph.D. in Polymer Science, University of Connecticut, 2000
B.S. in Chemistry, College of William and Mary, 1996

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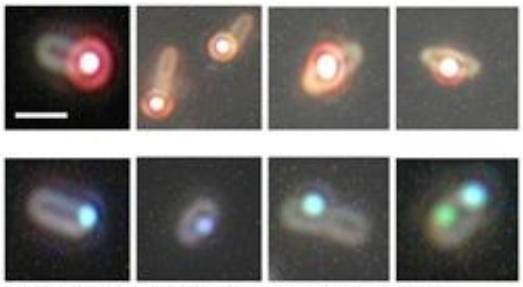
Dr. Wallach has a background and maintains interest in biodegradable and biomedical polymers, as well as polymers derived from renewable resources. His current focus is on supporting and improving the undergraduate program in Chemistry and Biochemistry.

Major Instrumentation

The College of Sciences Major Instrumentation Cluster (COSMIC), under the direction of Dr. Patrick Hatcher, includes a superconducting Fourier transform ion cyclotron resonance mass spectrometer with an extended high performance actively shielded 12-Tesla magnet. This instrument is the highest field instrument of its type, and only one other university research center in the nation has one. A 400 MHz nuclear magnetic resonance spectrometer (NMR) is also part of COSMIC. The purchase of an 800MHz NMR is in the works.

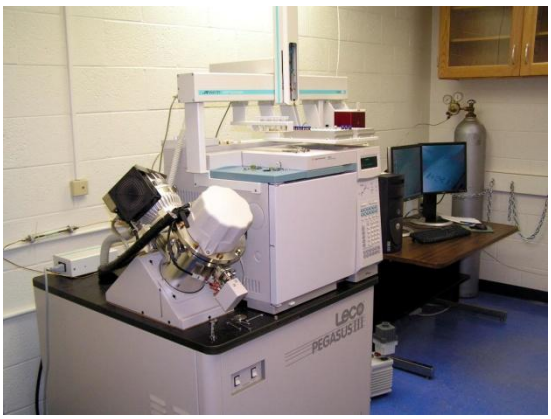
A stable isotope ratio mass spectrometer (IRMS) system which determines the presence of carbon, hydrogen, nitrogen, oxygen and sulfur in organic and inorganic materials will be relocated to the new Physical Sciences Building in the instrument core facility.

Dr. X. Nancy Xu has been working with nanobiotechnology to create nanoparticles that can be used as probes to trace cellular functions. This research will assist scientists to better understand multidrug resistance. It will also increase the efficacy of cancer therapy and the treatment of infectious diseases.



Extracellular and intracellular silver nanoparticles

The department has Linux, Sun and SGI workstations and a 20-processor dual core Opteron cluster. The university supports a 24-processorSun SMP machine and a 64-processor Opteron cluster. These computers areused for quantum chemical calculations, molecular dynamics simulations,drug design, protein alignments and genomic studies.



The department has a LECO Pegasus III time-of-flight mass spectrometer equipped with an Agilent gas chromatograph for rapid GC/MS analysis of small organic molecules.The CTC AnalyticsCombiPal®sampling system allows for autosampling of multiple vial types as well as head-space sampling for vapor analysis. This GC/MS is a real workhorse. It is capable of running fast GC because the time-of-flight mass spectrometer can sample up to 500 spectra a second and modern deconvolution methods allow it to find clean mass spectra in complex, not to mention crowded, chromatograms. It also has a very high sensitivity and good mass accuracy. Applications: quantification of the products from TMAH thermochemolysisand general quantitation/ identification of compounds.

The Laboratory for Isotope and Trace Element Research (LITER) is comprised of an inductively coupled plasma optical emission spectrometer (ICP-OES) and high-resolution inductively coupled plasma mass spectrometer (HR-ICP-MS) which are used for the analysis of geological, biological, environmental, nuclear and metallurgical samples. The facility also possesses a laser ablation and HPLC system which can be coupled with the ICP-MS.

The MALDI-TOF (matrix assisted laser desorption/ ionization-time of flight) is primarily used for studying the structure and function of large proteins.

Operating in positive or negative ionization mode, this instrument is capable of analyzing samples with very high molecular weights.

Our new Biochemistry Instrumentation Laboratory will contain: an Applied Biosystems API 2000 high-performance triple quadrupole mass spectrometer with a mass range of m/z 5 to 1800 and also an Agilent 1200 HPLC; a Cary 5000 UV-Vis NIR spectrophotometer, 175-3300nm spectral range and 24,000mm/min scanning capability for molecular spectroscopy research and teaching; and an optical measurement system, microsecond stopped-flow/quench flow kinetic and equilibrium fluorescence and absorbance type.

Our department's strong biogeochemistry focus means that some departmental research projects start outside the lab. Researchers from Old Dominion University have gone to many varied locations to further their projects.

Dr. Patrick Hatcher, the Batten Endowed Chair in Physical Sciences at Old Dominion University, is pictured right, collecting a water sample from a wetland in Wilmington, N.C.

The Great Dismal Swamp, less than an hour away, offers great environmental research opportunities for biologists, chemists and geologists.

Working jointly with researchers from the Woods Hole Oceanographic Institute, Dr. Kenneth Mopper's research groupcollected sediment from the floor of the Gulf of Maine. This photo shows a sediment coring device being retrieved after deployment.

Other research cruises have been made to the Atlantic Ocean (north and south), the Pacific Ocean (north and south), the Chesapeake Bay, the Delaware Bay, the Amazon River plume, and the Tiete River in Brazil.

Dr. Mopper'sresearch group studies marine and environmental chemistry in Antarctica and elsewhere. The group has several areas of interest, some of which are: impact of photochemistry on carbon cycling in the sea; dissolved organic water in natural waters: nature and photochemical properties; dissolved organic matter in estuaries; and atmospheric chemistry.

Contact Information/Acknowledgements

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