THE DEPARTMENT

THE TEACHING FACULTY AND STAFF

Jason M. Belitsky. B.A., Amherst, 1997; Ph.D., California Institute of Technology, 2002. Postdoctoral Fellow at University of California, Los Angeles (2002-2005). Joined the Oberlin faculty in 2005. He teaches general chemistry and biochemistry courses.

His research features an interdisciplinary approach to the study of eumelanin in human pigment and other problems in bio-organic and chemical biology.

Matthew J. Elrod. B.A., Grinnell, 1989; Ph.D., Berkeley, 1994. Department Chair after June 2007. Postdoctoral Fellow at the Massachusetts Institute of Technology (1994-1996). On the faculty of chemistry, Hope College (1996-2001). Joined the Oberlin faculty in 2001. Sabbatical leave at University of Colorado, Boulder (2004-05). He teaches general, environmental, and physical chemistry courses.

His research involves the use of kinetics and mass spectrometric techniques to study reactions relevant to tropospheric smog formation and global climate change.

William H. Fuchsman. Department Chair until July 2007. B.A., Harvard, 1963; Ph.D., Johns Hopkins, 1967. Postdoctoral research at University of South Florida (1967-68) and DuPont Company (1968-70). Joined the Oberlin faculty in 1970. Sabbaticals at CSIRO (Canberra, Australia), Case Western Reserve University, and Indiana University. He teaches general chemistry and bioorganic chemistry courses.

His research involves the chemical and spectroscopic properties of the heme sites in animal and plant hemoglobins.

Cortland S. Hill. B.A., Oberlin, 1977; M.S. Florida State, 1984. Senior Scientist at Foster Wheeler Environmental Corp. (1990-1999), where he designed treatment systems for the environmental remediation of contaminated ground water and soils. Joined the department in 2000. He teaches general chemistry laboratory sections.

Albert R. Matlin. B.A., Bard, 1977; Ph.D., Yale, 1982. Postdoctoral research at Rockefeller University (1982-84). Joined the Oberlin faculty in 1984. Visiting Assistant Professor at Rockefeller University (1988-89). He teaches introductory chemistry and organic chemistry courses.

His research is in the area of mechanistic organic photochemistry and the synthesis and study of enzyme model systems.

Manish A. Mehta. A.B., Wabash, 1986; Ph.D., Yale, 1990. Postdoctoral research at the University of Oxford (1990-91), University of Toronto (1992-93), and the University of Washington (1994-97). Joined the Oberlin faculty in 1998. He teaches general chemistry and physical chemistry courses.

His research involves the investigation of the techniques of solid-state nuclear magnetic resonance and the application of those techniques to the elucidation of biomolecular structure.

Michael W. Nee. B.S., Santa Clara, 1977; Ph.D., California Institute of Technology, 1981. Postdoctoral research at UC Santa Barbara, 1981-83. Joined the Oberlin faculty in 1983. He has spent sabbaticals at UC Berkeley (1990-91 and 2004-05) and the University of York, UK (1997-98). He teaches organic and general chemistry courses.

His research involves the study of oxidation catalysts and the chemistry of cucurbituril-encapsulated molecules.

Catherine M. Oertel. B.A. Oberlin, 1999; Ph.D., Cornell, 2005. Postdoctoral Fellow, Cornell University and Chalmers University of Technology (Sweden), 2004-05. Joined the Oberlin faculty in 2006. She teaches general and inorganic chemistry courses.

Her research involves the synthesis and characterization of inorganic-organic hybrid solids and the use of methods of materials chemistry to study the composition and corrosion of historic organ pipes.

Alison S. Ricker. Science Librarian. B.S. Alma, 1975; M.L.S. Rhode Island, 1977. Joined the college in 1983. She is active in national organizations that focus on information literacy. She team-teaches the chemical information course.

Robert Q. Thompson. B.A., Wooster, 1978; Ph.D., Michigan State, 1982. Joined the Oberlin faculty in 1982. Faculty Fellow at the University of Tennessee (summer, 1989). Research associate with Professor William R. Heineman at the University of Cincinnati (1989-90). Visiting scientist at the Forensic Science Research and Training Center, FBI Academy (1997) and the National Institute of Standards and Technology (2003-04). He teaches analytical chemistry, forensic chemistry, and general chemistry courses.

His research focuses on the analysis of chili pepper extracts and explosives residue, using molecularly imprinted polymers, solid phase extraction, and liquid chromatography.

Rebecca J. Whelan. B.A., Lawrence University, 1996; Ph.D., Stanford, 2003. Postdoctoral research at Michigan, 2003-04. Joined the Oberlin faculty in 2005. She teaches general and analytical chemistry courses.

Her research involves analytical uses of single-stranded oligonucleotides that possess specific affinities for biomarkers of ovarian cancer.

EMERITUS FACULTY

Martin N. Ackermann. Professor Emeritus. B.S., Carnegie Mellon, 1963; Ph.D., Berkeley, 1966. Joined the Oberlin faculty in 1966. He spent sabbatical leaves at the University of Georgia (1972-73), the General Electric Research and Development Center in Schenectady, NY (1979-80), and Ohio State University (1995). He taught general and inorganic chemistry courses and the synthesis laboratory course.

His research involved the synthesis of transition-metal organometallic complexes and exploration of the relationships between ligand structure and complex structure and reactivity.

Terry S. Carlton. Professor Emeritus. B.S., Duke, 1960; Ph.D., Berkeley, 1963. Joined the Oberlin faculty in 1963. He was a research associate at the University of Sheffield, England (1969-70) and visiting professor at the University of North Carolina – Chapel Hill (1976-77). He taught general and physical chemistry courses and courses on energy technology.

His research fields are thermodynamics of water and aqueous solutions, intermolecular forces, and quantum mechanics.

Norman C. Craig. Professor Emeritus. B.A., Oberlin, 1953; Ph.D., Harvard, 1957. Joined the Oberlin faculty in 1957. Experience elsewhere includes research associateships at the University of Minnesota (1963-64), U. C. Berkeley (1970-71), Justus Liebig University, Giessen, Germany (1994) and visiting professorships at Princeton (1974-75) and at the National Institutes of Health (1978-79). He taught environmental, general, and physical chemistry.

His research involves infrared and Raman spectroscopy of labile species such as carbocations and of small fluorocarbons, and the determination of molecular structure from the analysis of high-resolution infrared and microwave spectra. Students can work on his research projects.

THE STAFF

Cortland S. Hill. Laboratory Manager. See listing in Teaching Faculty and Staff. In addition to his teaching duties, he oversees the general chemistry laboratory program and the chemistry stockroom.

Dennis P. Bescak. Technical Assistant. Joined the department in 1982. Before coming to Oberlin, he worked in the laboratories of Harshaw (chemical analysis of catalysts), Anderson-Ibec (food analysis), and Hydroclear (waste water analysis). He prepares equipment and solutions for chemistry laboratories.

Cynthia M. Manning. Chemistry Resources Coordinator. Joined the department in 1992 as department secretary and became resources coordinator in 2000. Before coming to Oberlin she worked in chemical reagent quality control at Ciba Geigy. She handles purchases and sales for the department.

Patricia L. West. Department Secretary. Joined the department in 2007 after 7 years of service in various offices on the Oberlin campus.

THE MAJORS COMMITTEE

The majors committee serves as a liaison between chemistry majors and the department.

TEACHING ASSISTANTS AND OTHER DEPARTMENTAL ASSISTANTS

A limited number of qualified junior and senior majors are offered jobs as assistants in the general chemistry, organic chemistry, inorganic chemistry, and analytical chemistry laboratories and in the computer room. It is sometimes possible for students receiving work-study aid to obtain jobs such as checking homework assignments, duplicating course materials, and updating departmental web pages. Student Academic Services often hires chemistry majors as tutors.

THE CURRICULUM

Preparation for Graduate Study or Immediate Employment in Chemistry

The Chemistry section of the college catalog contains an extensive discussion of the course work needed in preparation for careers in chemistry. The following recommendations supplement these comments.

Completing as many core courses (Chem 205, 211, 213, 339) as possible by the end of the junior year will permit you a wider and more informed choice of intermediate and advanced courses and will prepare you for a greater number of research opportunities. Because Chem 211 helps students develop skill in accurate laboratory measurements, there are many advantages to taking it early. In order to take physical chemistry (Chem 339) in the junior year, you must complete Mathematics 134 no later than the fall semester of the junior year and Physics 111 (or 104) no later than the spring semester of the junior year.

Advanced laboratory experience is highly advisable, whether in courses such as Chem 327, 341, 349, and 374 or in independent laboratory investigations. The latter can be accomplished through summer research experience, a semester or more of research (Chem 525 and/or 526 which are repeatable), or an on-campus or off-campus Winter Term project.

If you intend to do graduate work in chemistry or related fields or to secure immediate employment as a chemist, you should take courses beyond the minimum requirements for the major. Although the minimum major can involve only one semester of organic chemistry or only one semester of physical chemistry, a second semester of organic chemistry (Chem 325/326 and/or Chem 254) is important for employment and essential for graduate study. A second semester of physical chemistry (Chem 349) is helpful for graduate study in chemistry. Other specific courses will depend in part on your intended area of specialization. Consult early with your major advisor as you plan your choice of electives. Mathematics courses such as multivariable analysis, linear algebra, differential equations, and statistics also may be advisable. Chemical Information (Chem 396) is an important course for those planning to attend graduate school and is required of Honors students. Keep in mind that private reading courses can be arranged with the consent of an instructor and the department chair.

Preparation for Graduate Study or Immediate Employment in Biochemistry

The Biochemistry section of the college catalog contains an extensive discussion of the course work needed in preparation for careers in biochemistry. Biochemistry majors interested in participating in senior-year research are encouraged to take Chemistry 374 in the junior year.

Preparation for Graduate Study in Medicine or Dentistry

In addition to Chemistry major requirements, chemistry students planning careers in medicine or dentistry must complete a second semester of organic chemistry and at least 8 hours of biology with laboratory. Although the Biochemistry major requirements include all science requirements for medical or dental school, biochemistry majors should obtain formal or informal training in organismal biology if it is not part of their majors. Most medical schools recommend an undergraduate biochemistry course. Most medical and dental schools require a year each of mathematics and English.

Sample Schedules: Chemistry Major

The following sample schedules outline some of the possible ways a Chemistry major can be completed in four years. Usually Chem 101-102 or 103 are done in the first year and Chem 205 in the sophomore year. However, a major also can start the core sequence with other courses such as Chem 211 or 213. Chem 205 is offered every semester. Consequently, a student taking Chem 103 can begin organic chemistry in the spring term of the first year, and other students can schedule organic chemistry more flexibly. Each of the sample minimum major schedules includes two semesters of organic chemistry and two semesters of physical chemistry.

1. Chemistry 101-102, early start, minimum major

	Fr		**So**		**Jr**		**Sr**	
Chem	101	102	205	213	211	339	349	323
Chem				325/326**				
Math	133	134						
Phys					110*	111*		
Hrs./wk	8	8	4	8	8	8	4	2
Labs/wk	1	1	1	2	2	2	1	0

2. Chemistry 101-102, late start, minimum major

	So		**Jr**		**Sr**	
Chem	101	102	205	213	211	325/326**
Chem					327	339
Chem					349	
Math	133	134				
Phys			110*	111*		
Hrs./wk	8	8	8	8	11	8
Labs/wk	1	1	2	2	3	2

3. Chemistry 101-102, enriched major, suitable for American Chemical Society certification, honors, and graduate school.

	Fr		**So**		**Jr**		**Sr**	
Chem	101	102	205	213	327	339	323	254
Chem			211	325/326	396		349	
Chem							525+	526 +
Math	133	134						
Phys					110*	111*		
Hrs./wk	8	8	8	8	8	8	8	7
Labs/wk	1	1	2	2	2	2	3	4

4. Chemistry 103, minimum major

	Fr		So		Jr		Sr	
Chem	103	205	211	213		339		323
Chem				325/326**			349	
Math	133	134						
Phys					110*	111*		
Hrs./wk	8	8	4	8	4	8	4	2
Labs/wk	1	1	1	2	1	2	1	0

5. Chemistry 103, enriched major, suitable for American Chemical Society certification, honors, and graduate school.

	Fr		So		Jr		Sr	
Chem	103	205	211	213	327	339	349	254
Chem				325/326**	396		525+	323
Chem								526+
Math	133	134						
Phys					110*	111*		
Hrs./wk	8	8	4	8	8	8	6	9
Labs/wk	1	1	1	2	2	2	3	4

*Physics 103 and 104 may be substituted for Physics 110 and 111 (Physics 110 and 111 use calculus; Physics 103 and 104 do not). Physics 110 and 111 provide better problem-solving experience for Chem 339 and 349. Physics 111 has a recommendation but not a requirement or corequisite of Math 231.

** Chem 254 may be substituted for Chem 325/326. Taking both Chem 254 and Chem 325/326 is not only possible but a good idea.

+ Variable credit possible, 2 hours listed here for fall and 3 hours for spring. Chem 525 and 526 may be taken for credit multiple times.

Sample Schedules: Biochemistry Major

The following sample schedules outline some of the possible ways a Biochemistry major can be completed in four years. Usually Chem 101-102 or 103 are done in the first year and Chem 205 and 254 in the sophomore year. Chem 205 is offered every semester. Consequently, a student taking Chem 103 can begin organic chemistry in the spring term of the first year, and other students can schedule organic chemistry more flexibly.

1. Chemistry 101-102, minimum major

	Fr		So		Jr		Sr	
Chem	101	102	205	254	211	213	349**	
							374	
Bio	118/119***		213/214					
Math		133	134					
Phys					110*	111*		
Hrs./wk	8	8	12	4	8	8	8	
Labs/wk	2	1	2	1	2	2	2	

2. Chemistry 103, minimum major

	Fr		So		Jr		Sr	
Chem	103	205	211	254	374	213		339**
Bio		120***	213/214					
Math	133			134				
Phys					110*	111*		
Hrs./wk	8	8	8	8	8	8		4
Labs/wk	1	2	2	1	2	2		1

3. Chemistry 101-102, enriched major, suitable for American Chemical Society certification, honors, and graduate school.

	Fr		So		Jr		Sr	
Chem	101	102	205	213	211	339	349	526+
Chem				254	374		396	
Chem							525+	
Biology	118/119***		213/214					314****
Math		133	134					
Phys					110*	111*		
Hrs./wk	8	8	12	8	12	8	7	7
Labs/wk	2	1	2	2	3	2	3	4

*Physics 103 and 104 may be substituted for Physics 110 and 111 (Physics 110 and 111 use calculus; Physics 103 and 104 do not). Physics 110 and 111 provide better problem-solving experience for Chem 339 and 349. Physics 111 has a corequisite of Math 231.

** Either Chemistry 339 (spring) or Chemistry 349 (fall) satisfies biochemistry major requirements.

*** Either Bio 118/119 or 120 fulfills Biology Department prerequisite for Bio 213/214, but Bio 118/119 is more likely to be useful for most biochemistry majors.

**** Bio 314 is one of several appropriate upper level biology courses with laboratory.

+ Variable credit possible, 2 hours listed here for fall and 3 hours for spring. Chem 525 and 526 may be taken for credit multiple times.

Sample Schedules Providing Preparation for Graduate Study in Medicine or Dentistry

The following sample schedules permit entry into medical or dental school in the fall following graduation from Oberlin College. Note that a Chemistry major who takes the medical school-recommended biochemistry course meets the requirements for a double Chemistry/Biochemistry major. In the sample schedules, the spring semester of the junior year is kept relatively free of science courses for studying for and taking the MCAT examination. All MCAT-related science courses are scheduled before or during spring semester, junior year. See the footnotes under the sample chemistry and biochemistry schedules for information about Physics 103/104 and Physics 110/111.

Chemistry Major

	Fr		So		Jr		Sr	
Chem	101	102	205	213			327	339
Chem			211	254			374	323
Bio	118/119				213/214			
Math		133	134					
Phys					110	111		
Hrs./wk	8	8	12	8	8	4	7	6
Labs/wk	2	1	2	2	2	1	2	1

Biochemistry Major

	Fr		So		Jr		Sr	
Chem	101	102	205	254	211		349	213
Chem							374	
Bio	118/119		213/214					
Math		133	134					
Phys					110	111		
Hrs./wk	8	8	12	4	8	4	8	4
Labs/wk	2	1	2	1	2	1	2	1

Course Descriptions

Chemistry 205. Principles of Organic Chemistry. 4 hrs, 3 hours of lecture and 1 afternoon of laboratory per week, fall semester or spring semester. Required for both majors. Prerequisite: Chem 102 or 103. A one-semester introduction to the basic principles, theories, and applications of the chemistry of carbon compounds. Representative reactions, preparation, and properties of carbon compounds are covered. The laboratory provides experience with purification, physical and spectroscopic characterization, and synthesis of organic substances. Taught in the fall by Mr. Matlin and in the spring by Mr. Nee.

Chemistry 211. Analytical Chemistry. 4 hrs, 3 hours of lecture and 1 afternoon of laboratory per week, fall semester. Required for both majors. Prerequisites: Math 133; Chem 102 or 103. Principles of chemical measurements with a focus on instrumental analysis, including spectrophotometry, electrochemistry, and separations. Laboratory develops quantitative skills and provides experience with chemical instrumentation. Spreadsheets are used to treat experimental data. Taught by Mr. Thompson.

Chemistry 213. Inorganic Chemistry. 4 hrs, 3 hours of lecture and 1 afternoon of laboratory per week, spring semester. Required for both majors. Prerequisite: Chem 102 or 103. Development of the principles and theories of inorganic chemistry. Topics include atomic structure, structure and bonding in covalent and ionic compounds, periodic properties, acid-base concepts, coordination compounds, and selected descriptive chemistry of the main group elements. Laboratory involves synthesis and characterization of inorganic substances and activities illustrating principles covered in the lecture. Taught by Ms. Oertel.

Chemistry 339. Quantum Chemistry and Kinetics. 4 hrs, 3 lectures and 1 afternoon of laboratory, spring semester. Required for chemistry major. Biochemistry major must include Chem 339 or 349. Prerequisites: Chem 102 or 103; Physics 111 or 104 (may be taken concurrently); Math 134. Kinetics of chemical reactions, quantum theory of atomic and molecular structure, and molecular spectroscopy. Taught by Mr. Elrod.

Advanced Courses, Category I

Chemistry 254. Bioorganic Chemistry. 4 hrs, 3 hours of lecture and 1 afternoon of laboratory, spring semester. Required for biochemistry major. Prerequisite: Chem 205. Organic chemistry of the major classes of biological substances. Emphases on structures and reaction mechanisms as they apply to biological transformations. Taught by Mr. Fuchsman.

Chemistry 325. Organic Mechanism and Synthesis. 3 hrs, 3 lectures, spring semester. Prerequisite: Chem 205. This second course in organic chemistry systematically explores reactions of carbon-containing compounds and the mechanistic pathways involved in these processes. Reactions and topics include functional group transformations, oxidations, reductions, cycloadditions, stereospecific reactions and carbon-carbon bond formation. Strategies are presented for the design of multi-step organic syntheses. Taught by Mr. Matlin.

Chemistry 326. Organic Mechanism and Synthesis Laboratory. 1 hr, 1 afternoon laboratory, spring semester. Corequisite: Chem 325 or permission of instructor. P/NP grading. The laboratory is intended to complement the Organic Mechanism and Synthesis lecture course. Laboratory involves experiments illustrating principles presented in the lecture course. Taught by Mr. Matlin.

Chemistry 327. Synthesis Laboratory. 3 hrs, 1 lecture and 1 afternoon of laboratory, fall semester. Prerequisites: Chem 205; Chem 213. Laboratory work involves the synthesis of organic and inorganic compounds by a variety of techniques (*e.g.* photochemical, electrochemical, inert atmosphere) and the use of spectroscopic methods (*e.g.* Fourier-transform NMR, infrared, ultraviolet) for their characterization. The lectures develop the theory and unified application of spectroscopic analysis to solve structural problems. Taught by Ms. Oertel.

Advanced Courses, Category II

Chemistry 341. Trace Analysis. 3 hrs, 2 hours of lecture/discussion and 1 afternoon of laboratory, spring semester. Prerequisite: Chem 211. Principles and practices of trace chemical analysis (nanoscale volumes and concentrations) with a focus on environmental samples. Topics include atomic spectrophotometry, spectrofluorometry, gas chromatography, electrochemistry, and mass spectrometry. Lecture-discussion format. Taught by Mr. Thompson.

Chemistry 323. Materials Chemistry. 2 hrs, 2 lectures, spring semester. Prerequisites: Chem 213 and Chem 205. Topics will include structures and electronic properties of solid materials, mechanical properties, defects in solid structures, and synthetic strategies. Methods of materials characterization including X-ray diffraction and electron microscopy will also be discussed. In covering these topics, we will explore current literature on materials such as polymers, nanoparticles, biomimetic materials, semiconductors, and superconductors. Taught by Ms. Oertel. Not available 2008-09.

Chemistry 349. Chemical and Statistical Thermodynamics. 4 hrs, 3 lectures and 1 afternoon of laboratory, fall semester. Biochemistry major must include 349 or 339. Prerequisites: Chem 102 or 103; Physics 111 or 104; Math 134. Thermodynamics, introduction to statistical thermodynamics, and kinetic theory. Application of mathematical methods and physical principles to chemistry. Taught by Mr. Mehta.

Other Intermediate and Advanced Courses

Chemistry 208. Environmental Chemistry. 3 hrs, 3 lectures, fall semester. An in-depth consideration of the environmental issues of stratospheric ozone depletion, air pollution, acid rain, climate change, fossil fuel-based, nuclear and renewable energy production, surface and ground water pollution, and water treatment. The detailed chemical aspects of the environmental problems and their potential remedies will be discussed at significantly higher level than Chem 051 and various models will be constructed to elucidate the key concepts. Taught by Mr. Elrod. Not available 2008-09.

Chemistry 374. Biochemistry. 4 hrs, 3 lectures and 1 afternoon of laboratory, fall semester. Required for biochemistry major. Prerequisites: Chem 254; Biology 213, 214. Rigorous examination of the chemical basis of enzyme catalysis, metabolism and metabolic control, and aspects of molecular biology. Taught by TBA.

Chemistry 396. Chemical Information. 1 hr, 1 lecture, fall semester, first module. Prerequisites: Chem 205; one other core chemistry course. Finding chemical information with printed and electronic indexes and reference materials. On-line searching of Chemical Abstracts. Assessing the information obtained. Presenting chemical information using equation-editing and chemical-structure software. Junior majors are encouraged to enroll. Required for honors research. P/NP grading. Taught by Mr. Nee and Ms. Ricker.

Chemistry 407. Chemical Biology. 2 hrs, spring semester. Prerequisites: Chem 374, or Chem 325 with either Bio 118 or Bio 213, or instructor's consent. Research at the interface of chemistry and biology, with a focus on the interactions of synthetic molecules with biological systems. Topics may include drug discovery, solid-phase synthesis and combinatorial chemistry, molecular recognition, glycobiology, bio-imaging, expansion of the genetic code, and artificial regulation of gene expression. Taught by Mr. Belitsky. Not available 2008-09.

Chemistry 525, 526 Research. 1-5 hrs, both semesters. Prerequisite: Consent of department chair. Projects for original investigation are assigned. Normally taken in the senior year. Interested students are encouraged to speak with faculty members about possible projects. Students in the Honors program are required to enroll in both semesters.

Current research projects are indicated by the following titles of 2007-08 research projects.

Student	**Title**	**Advisor**
Isaac Nelson-King '08	"Reaction Development for the Construction of Synthetic Eumelanin."	Belitsky
Karin Sono '08	"Synthetic Eumelanin for Environmental Remediation."	Belitsky
Valentin Rusu '08	"Toward the Development of Native Chemical Ligation Techniques."	Belitsky
Matthew Leyden '08	"Analysis of the Rotational Structure in the High-Resolution Infrared Spectra of Two C-Type Bands of *cis*-1,3,5-Hexatriene"	Craig
Deacon Nemchick '09	"Synthesis of Carbon-13- and Deuterium-Substituted 1,4-Difluorobutadiene for Use in High-Resolution Infrared Spectroscopy"	Craig
Serena Hsin '09	"Kinetics Studies of the Atmospheric Oxidation of Alkenes by Nitrate Radical."	Elrod
Emily Minerath '09	"Kinetics Studies of Acid-Catalyzed Reactions in Atmospheric Sulfuric Acid Aerosols."	Elrod
Erika Rohrs '09	"Mechanistic Studies of the Atmospheric Oxidation of Aromatics."	Elrod
Rachel Randall '08, Shalini Saha '08, Edwin Takahashi '09	"Spectrophotometric Assays for Hydrogen Peroxide: Methods of Coping with NADH and NADPH Inhibition."	Fuchsman
Assiatou Diallo '08	"Apparent Absence of Saturation Kinetics in an Enzyme-Catalyzed Reaction."	Fuchsman
Ryan Felix '08	"Intramolecular Photocycloaddition Reactions of 4-Oxa-1,5-hexadienes."	Matlin
Robert Hartley '08	"Using Solid State NMR to Determine Tensor Orientation in Molecular Coordinates."	Mehta
Jaie Woodard '11	"Computational Studies of Peptide-Solvent Interactions."	Mehta
Alex Nichols '08	"Hydration Studies of a Series of Alanyl- and Glycyl-containing Tripeptides using Solid-State NMR."	Mehta
Matt Rumizen '09	"NMR analysis of Alanine/Glycine "Capped" Dipeptides."	Mehta
Craig Packard '09, Chen Yan '09	"Kinetic Studies of Cucurbturil-Catalyzed Rearrangements."	Nee

Conor Doss '10	"Template-Based Synthesis of Larger Cucurbiturils	Nee
Christa Wagner ‘08	"Amino Acids as Ligands for Metal-Organic Frameworks."	Oertel
Fall Tian ‘10	"Synthesis and Characterization of Ternary Sulfide Nanoparticles."	Oertel
Katie Mauck '09	"The Role of Sodium Chloride in Corrosion of Lead-Tin Alloys: Applications to Conservation of Organ Pipes."	Oertel
Amelia Hadler ‘08	"Toward a Lead Tungstate-Based Organic-Inorganic Hybrid Material."	Oertel
Robin Gent '09	"Isolating Minor Capsaicinoids from Chili Pepper -- Recovery Study"	Thompson
Joseph Thome ‘10	"Developing a Dot-Blot Assay for CA125."	Whelan
Margaret Compton ‘09	"Development of an SPR Immunoassay for CA125."	Whelan
Sydney Williams ‘09	"Selection of an Aptamer that Recognizes CA125 via Capillary Electrophoresis."	Whelan
Lee Moore '08	"Synthesis and Characterization of a CA125 Mimic Peptide."	Whelan

Seminar Program

Each semester, the Chemistry Department sponsors a set of research seminars given by distinguished outside chemists and Department faculty. They usually are scheduled for 4:45-5:45 p.m. Wednesday afternoons in Science Center A255. Chemistry majors are expected to attend as many research seminars as possible, since the seminar program is planned as a whole to present work in various areas of chemistry and in various professional settings. Conversations with seminar speakers are also an excellent way to learn about educational and work opportunities after Oberlin. When possible, the department tries to arrange for students to meet with speakers over lunch. Notices of seminars are posted outside the Department Office A263 and are mailed to all majors. In addition, special seminars are presented by persons who are candidates for faculty positions in chemistry

2007-08 SEMINAR PROGRAM

Fall 07

Heather Allen, Ohio State University
"Air-Aqueous Interfacial Structure: Lipids, Salts and Acids"
September 12, 2007

Robert Kennedy, University of Michigan
"Probing Insulin Secretion Pathways with Microfluidics and Metabolomics"
September 19, 2007

BLUMENO LECTURE
David Scott, UCLA
"Ancient Egyptian Pigments: Investigations of Some Coffins and Cartonnage"
October 3, 2007

Donald Hultquist*, University of Michigan, Emeritus*
"Pathological Oxidative Damage: A Therapeutic Solution"
October 10, 2007

John Toscano, Johns Hopkins University
"Design and Study of New Nitroxyl (HNO) precursors and Their Potential in the Treatment of Heart Failure"
November 7, 2007

Justin Gallivan, Emory University
"Reprogramming Bacteria with Small Molecules and RNA"
November 14, 2007

Spring 08

Linda Doerrer, Boston University
"Fluorinated Alkoxide and Aryloxide Metal Complexes: The Power of Fluorine"
March 5, 2008

Adam Johnson, Harvey Mudd College
"Catalytic Reactions with Chiral Titanium Amide-Alkoxides"
April 2, 2008

HIRSCHMANN LECTURES
David Tirrell, California Institute of Technology
"Reinterpreting the Genetic Code: Non-Canonical Amino Acids in Protein Design, Evolution and Analysis"
April 15, 2008

Honors Program

Students receive invitations for the Honors Program in the spring of their junior year. The principal elements of the Honors Program are: a year-long research project (Chem 525 and 526 for at least 5 hours total and Winter Term), a written thesis, two oral seminar reports, and an oral examination administered by an outside examiner. Each invitee receives a written description of the Program and discusses the invitation with his or her adviser. An invitee should decide whether to participate in the Honors Program by the time of registration in the fall.

Honors candidates take several steps in finding a research adviser. A first step is to attend talks given by the previous year's Honors students at the end of the spring term. Exploratory conversations with faculty members in the spring are welcome. However, research projects usually evolve during the summer months, and new or returning faculty members will not be available for consultation until the fall. At the very beginning of the fall term, honors candidates receive written descriptions of various research projects. Follow-up conversations with faculty members are completed during the first week in order for candidates to submit ranked lists of four preferred projects at the end of the first full week of the semester. The faculty then match students to projects.

Academic Year Research

Nonseniors as well as seniors who are not in the Honors Program are encouraged to participate in research. All seniors may explore research opportunities and submit a list of interests in the same manner as described in the paragraph above for honors candidates. Every effort is made to accommodate the interests of all majors who wish to participate in research.

Winter Term Projects in Chemistry

Winter Term is a good time for students to secure additional experience in chemistry. Each fall, the chemistry faculty develops a list of projects for students to undertake. This list, which is supplied to interested students by the departmental secretary, includes laboratory projects, reading projects, and computer projects. Many of the laboratory projects involve research. Seniors doing honors research are expected to devote Winter Term to their projects. Since the number of students who can be accommodated on most projects is limited, students are encouraged to consult with faculty members as early in the fall as possible. Student-initiated chemistry projects are also open to discussion for possible faculty sponsorship.

Off-campus Winter Term projects are another way in which students obtain useful experience. Often students have located such possibilities on their own. However, the College Alumni Office and the Office of Career Services are sources for names of persons who can direct off-campus projects. Students interested in medicine have found that a Winter Term project in a medical laboratory, a hospital, or a doctor's office is a good way to gain experience. Chemistry faculty members can serve as the faculty sponsors of students who do off-campus projects.

Summer Research Opportunities

Chemistry students are encouraged to secure research experience through summer employment. A limited number of opportunities for research participation in chemistry are available at Oberlin each summer. These positions carry stipends and typically last for 10 weeks. They normally are funded by research grants held by individual chemistry faculty members. The positions are announced on the Chemistry and Biochemistry Department bulletin board near the beginning of the second semester. Decisions of which applicants are accepted are made by the middle of the semester. Many universities and some colleges have similar programs. Advertisements for some of these programs will appear on the departmental bulletin board early in the calendar year. Students may also find it worthwhile to seek unadvertised positions in universities in their home areas by sending letters of inquiry and resumes to department chairs.

LIFE AFTER OBERLIN

EMPLOYMENT AFTER GRADUATION

Some chemistry majors take jobs immediately after graduation from Oberlin. Because chemistry is important to so many areas of science, opportunities for these graduates are quite diverse. Most of these jobs are in industry or academia and involve laboratory activities such as chemical synthesis, analytical work, quality control, environmental monitoring, and basic and applied research. Other jobs have been in the Peace Corps, high school teaching, marketing, and computer programming. Some majors seek immediate long-term employment; others seek one- to three-year temporary employment before beginning graduate or professional studies.

Long-Term Employment

If you are seeking immediate employment, your most important single resource on campus is the Office of Career Services in Stevenson Hall. You should get in touch with them immediately in the fall of your senior year and become a regular reader of their weekly bulletin *Routes*. They can provide advice on specific aspects of the job hunting process, such as resume preparation, interviewing, and locating jobs. Career Services is also the focal point for interviewing companies that send recruiters to campus. Sign up for an interview with any company that looks remotely interesting. A few early interviews for experience with the process almost surely will be helpful.

The resume is an important summary of your skills and background. Although Career Services can provide a great deal of general guidance for preparing a resume, *also discuss your resume with one or more people experienced in your field.* Your adviser and other faculty members who know you well are good candidates and will be glad to help.

In addition to the Office of Career Services, you should be aware of other sources of information about job opportunities. Announcements of jobs sent to the department are posted on the bulletin board outside the department office. *Chemical and Engineering News*, a weekly magazine of the American Chemical Society, has a section on employment and is available in Science Center Library. Other journals such as *Science* and *Physics Today* have similar sections, though not as focused for chemists. Local newspapers or ones from selected cities available in Mudd Library will be helpful if you have a specific geographical location in mind. You may also wish to take the initiative by sending your resume directly to a company in which you are interested. For addresses, consult Career Services, which has useful resources such as *Job Opportunities in Engineering and Technology*. Company activities, locations, and addresses to write to are among items covered; governmental agencies are also included. *Finally, be sure that at least some chemistry faculty members know of your job interests. Faculty often hear of opportunities informally and can bring these to your attention if they are aware of your plans.*

One other step you may wish to take is to join the American Chemical Society (ACS) as a student member. The cost of membership is low to students and has several advantages. Among these is your own subscription to *Chemical and Engineering News* and an opportunity to use the ACS Employment Clearing House. The latter operates both by mail and at national ACS meetings to bring employers and prospective employees into contact with one another. Attendance at a national ACS meeting offers the opportunity to interview many prospective employers over a period of one or two days. ACS members also have access to the ACS Job Bank which is available on-line from the ACS home page at http://www.acs.org. Students who satisfy ACS guidelines are certified to the Society by the department and are eligible for full membership upon graduation.

Temporary Employment

If you are seeking temporary employment as a secondary school science teacher, seek information about private schools from the Office of Career Services. (Private schools often do not require the education courses and student teaching that are necessary for public school teaching certification.)

If you are seeking temporary employment as a research technician, you do not need to contact employers (except for those who directly contact the department) until late spring of your senior year or even early summer after graduation. You need to mail or carry letters of inquiry and resumes to departments in universities, medical schools and hospitals where the research is done. Put your resume on file in Personnel or Human Resources Offices only if you are told to do so by the department you visit. (Often the Human Resources Offices do not learn about such temporary job openings until after they are filled.)

APPLYING TO GRADUATE SCHOOLS

Chemistry or Related Fields

Students interested in pursuing graduate study in chemistry or related fields should plan to submit applications by the end of the fall semester of the senior year for admission the following September. Ideally at least some preliminary thinking about fields of study and available graduate programs should occur by late spring of the junior year, e.g. around registration time, but an early start in the fall of the senior year provides adequate time. A number of resources are available to help you with selecting and getting accepted into a graduate program.

Early in the process you should talk with your adviser or another faculty member about your plans. This conversation can help sort out your interests and identify an area of chemistry in which you wish to concentrate. Talk with at least one faculty member whose expertise is in that area; he or she will be able to help you identify graduate programs that are strong in your area of interest and often can supplement written sources with personal knowledge about institutions and individual researchers. Faculty members also may be acquainted with the experiences of recent Oberlin graduates at institutions you are considering. During the year, be sure to talk to seminar speakers who represent your areas of interest.

There are several valuable references available on graduate programs in chemistry and related fields. A brief description of each follows:

1. The *ACS Directory of Graduate Research* is published every two years by the American Chemical Society. Ph.D.-granting departments in the U.S. and Canada are listed in sections on chemistry, chemical engineering, biochemistry, medicinal chemistry, and pharmacology. For each department, there is a list of the faculty, their research interests, and their publications during the last two years. The directory is a good resource for assessing the strength of a department in various subdisciplines and the research activity of the faculty. Recent volumes are available in the Chemistry Department Office. The directory is also available online at http://dgr.rints.com/

2. *Peterson's Guide to Graduate Programs* is issued in several volumes. All are available in the Office of Career Services and on-line at http://www.petersons.com/gradchannel. Each two-page listing describes such things as programs of study, facilities, costs, financial aid, community, application procedure, and faculty. Departments offering only a masters degree are included. A new ACS publication, *Chemical Sciences Graduate School Finder*, competes with Peterson's guides (http://www.cofc.edu/~chem/seminar/gradsch.html).

3. The Web now is an important resource for graduate school information. All graduate departments have web sites that describe their programs and faculty research. Often information on the web site is the most up-to-date, especially about faculty.

Getting accepted to graduate school is competitive, but every Oberlin chemistry student can reasonably expect to be admitted to at least one graduate program. Occasionally an unusually weak record or a late-developing interest in chemistry may require a student to enter a masters program first. Many students apply to too many schools, not recognizing that the acceptance rate is quite good, even for Oberlin students with modest academic averages. A reasonable number is about five spread over a range of recognized quality. Include one or two schools that, based on your record, should accept you but not for certain, and one of lower quality that is virtually certain to admit you. Selection of your list of schools is best done in consultation with one or more faculty members. Their knowledge of how Oberlin graduates with academic records similar to yours have fared in various graduate programs will help you place your own situation in a broader perspective.

After settling on departments of interest, probably more than the number to which you will eventually apply, contact each to request information. Graduate programs have departmental information on the web and many have applications on-line. In your initial inquiry, request application materials for admission and for financial support. Ask specifically about fellowships for entering graduate students as well as about teaching assistantships.

Deadlines for submission of application materials will be specified by each school. Early submission may result in early consideration in cases where admission is done on a rolling basis. Several recommendations will be required for each application. Select faculty members who know your work well and, if possible, have taught you in recent or upper level courses. Ask each faculty member in person and be prepared to spend some time discussing your plans. If the person is writing directly, provide an addressed and stamped envelope and the reference form if one is to be used. An alternative would be to have the faculty member complete a form for the Office of Career Services. You may then request that this office (for a price) send copies of the recommendation to the schools to which you are applying. Some faculty believe that references sent directly by the recommender have a greater impact; you may want to discuss this with each person. The Oberlin form as well as those from other institutions usually have a place for you to indicate whether you wish to waive your right to see the recommendation. It is to your advantage to waive it. Writing recommendations is a demanding task. Consequently you should give those persons who will write on your behalf as much lead time as possible. A month is desirable; less than two weeks may be unworkable.

Respond to acceptances as each arrives, even though you are not yet prepared to make a decision. When you have reached a decision, write a letter of acceptance to your choice and courteously decline the other offers. If you are in a position to decline an offer even though your final choice is not yet made, please do so in order to give that institution an opportunity to admit someone else.

Some students prefer to visit schools to which they have been accepted before making a decision. Many schools will reimburse costs of a visit. This is usually a worthwhile experience if you have the time and/or resources, but certainly not a necessity. A consultation with your adviser or other faculty member may help you decide in your own case, and if you go, how to get the most from a visit.

Graduate Record Examination (GRE).

Many graduate schools and most fellowship programs require that applicants take the Graduate Record Examination (GRE). The examination results weigh heavily in any admission or award decision. The GRE consists of two parts, a general test and a subject test. The general tests are computer-based and offered year round at regional centers (not in Oberlin). The subject test covers the field in which you plan to do graduate work, are offered on paper only, and are given three times a year (November, December, April) and twice in Oberlin (December and April). Each part is about three hours long. An information bulletin about the GREs along with the registration form is available at the Office of Career Services and on-line at http://www.gre.org. The Office of Career Services organizes trial general test taking in April.

Students report that the subject tests in chemistry and biochemistry are challenging and that the emphases among various areas of chemistry or biochemistry shift somewhat with each test offering. You should review seriously areas of chemistry or biochemistry in which you have not had courses recently. Since the tests are comprehensive, it will be advantageous for most students to take them late in the fall of the senior year when they can benefit from having had the greatest number and variety of relevant courses. Practice subject tests are available to test registrants.

Financial Support.

Admission to a graduate program in the physical sciences invariably includes financial support. In fact, unless there are extenuating circumstances, there is no reason you should begin graduate study without some sort of financial assistance. Typically this support is in the form of a teaching assistantship that entails laboratory teaching, running recitation sections and/or paper grading for a specified number of hours each week. A small number of departments actually require every graduate student to serve as a teaching assistant for at least one year. The size of the stipend varies but is adequate for someone to be self-supporting at a modest standard of living. Most departments also waive or pay directly the normal tuition fees as part of the financial support, while others award a larger stipend and have the student pay tuition. Fellowships through the graduate department are rarely available to first year graduate students, but it is still worth inquiring about them in your initial letter requesting application materials.

National Science Foundation (NSF) graduate fellowships provide full support for three years of graduate study at any U.S. university. They are highly prestigious awards, and competition for them is keen. All Oberlin chemistry majors with strong academic records and definite plans to attend graduate school in a scientific field should consult with the chair of the department about applying for these fellowships. *Early planning is essential*. The GRE general test and the subject test in the intended field of graduate study must both be completed no later than December. A strong performance on the GREs is important for NSF applicants. Watch the Chemistry Department bulletin board in September or October for a brochure announcing these fellowships.
The latest program announcement may be found online at the National Science Foundation web page http://www.nsf.gov/funding/education.jsp?org=NSF&fund_type=1. Applications may be submitted on-line via NSF's Fast Lane system. Details may be found at http://www.fastlane.nsf.gov.

Fellowship programs for graduate study abroad require that applicants be nominated by their undergraduate institution. At Oberlin, these programs are administered by the Fellowships Committee of the General Faculty and include the Churchill, Fulbright, Marshall, Rhodes and Watson Fellowships. Generally these programs carry certain restrictions such as location of study and career goals. Further details may be obtained from the chairperson of the Fellowships Committee or from the Coordinator of Health Professions and Fellowships (Peters G28). To become an applicant for a Churchill Fellowship requires especially early planning. Talk with your faculty adviser if you are interested in any of these programs.

Medicine and Dentistry

If you are considering medical or dental careers, you should contact Carol Sedgwick, the Coordinator of Health Professions (carol.sedgwick@oberlin.edu) early in your college career. *Admissions Requirements of American Medical Colleges*, published annually by the Association of American Medical Colleges, is recommended reading. Current copies are available in Mudd and Science Center libraries

Medical College Admission Test (MCAT) and Dental Aptitude Test (DAT).

If you are planning to enter medical/dental school in the fall following graduation, you should take the test in the spring or summer of your junior year. MCAT registration materials are available online (http://www.aamc.org/students/mcat). DAT materials are also available online (http://www.ada.org/prof/ed/testing/dat/index.asp). A serious review of basic chemistry (through organic), biology, and physics is essential before taking either test. Be guided in your review by the syllabus and sample tests published by MCAT or DAT. Commercial cram courses also are available. Almost every spring a commercial review course is available on campus.

The Application Process.

If you are planning to enter medical/dental school in the fall following graduation, you should complete the application process in the summer following your junior year. Because of the rolling admission process, applications submitted near the deadlines have a negligible chance of success.

Most medical/dental colleges use the centralized Association of American Medical Colleges Admission Service (AMCAS at http://www.aamc.org/audienceamcas.htm), The American Association of Colleges of Osteopathic Medicine Application Service (AACOMAS at https://aacomas.aacom.org) or Association of American Dental School Admissions Service (AADSAS at http://www.adea.org/AADSAS/default.htm). Consult the appropriate admissions requirement publication or web sites.

Letters of recommendation are required by all schools. Writing recommendations is a time-consuming business. You should make it as easy and as unhurried as possible for those who agree to write them. Oberlin College is now providing committee letters to medical schools along with sets of individual letters of recommendation. Information about the process is available from the Coordinator of Health Professions. You should complete the committee letter process in the spring before you apply.

It is important that your completed application and all other required documents be in the hands of the medical or dental school by early August.

Selecting Schools.

You should apply to at least ten medical and/or osteopathic schools. Based on what you can learn about their admissions profiles, you should choose schools ranging from those where you judge you have a reasonable chance to those where you judge you have an excellent chance of acceptance, i.e., from long shots to sure bets. Include one or more state-supported schools from your state of residence. Some admission profile information is given in the admissions requirement publication, but most comes from hearsay. (Acceptance statistics are provided on a later page.) After preparing your list, discuss it with Mr. Fuchsman, the premedical advisers in the department, and Carol Sedgwick.

3-2 Engineering Program

Students interested in 3-2 engineering programs with the Oberlin bachelor's degree in chemistry should consult with the chair. Washington University in St. Louis, one of the cooperating engineering schools, offers a January Term program that is an introduction to engineering. Some Oberlin students interested in the 3-2 program have taken this as a Winter Term project during the sophomore year.