DEPARTMENT OF CHEMISTRY

Faculty

Distinguished Professor Emeritus

Harry L. Frisch, Ph.D.
Polytechnic Institute of Brooklyn

Distinguished Professor

Eric Block, Ph.D.
Harvard University

Distinguished Teaching Professor of Earth and Atmospheric Sciences and Chemistry

John W. Delano, Ph.D.
State University of New York at Stony Brook

Professors Emeritae/i

Shelton Bank, Ph.D.
Purdue University

Robert E. Frost, Ph.D.
Harvard University

Henry Kuivila, Ph.D.
Harvard University

Eugene Mclaren, Ph.D. (Collins Fellow)
Washington University

Yash P. Myer, Ph.D.
University of Oregon

Ramaswamy H. Sarma, Ph.D.
Brown University

Professors

Frank M. Hauser, Ph.D.
University of North Carolina

Bernard J. Laurenzi, Ph.D.
University of Pennsylvania

Charles P. Scholes, Ph.D.
Yale University

Lawrence C. Snyder, Ph.D.
Carnegie Institute of Technology

John T. Welch, Ph.D.
Case Western Reserve University

Andrew J. Yencha, Ph.D.
University of California, Los Angeles

Professor of Education and Chemistry

Audrey Champagne, Ph.D.
University of Pittsburgh

Associate Professors Emeritae/i

Arthur O. Long, Ph.D.
University of Wisconsin

Associate Professors

Lawrence H. Daly, Ph.D.
Rensselaer Polytechnic Institute

Paul J. Toscano, Ph.D.
Johns Hopkins University

Assistant Professors

Evgeny Dikarev, Ph.D.
Moscow State University

Igor Lednev, Ph.D.
Moscow Institute of Physics & Technology

Rabi A. Musah, Ph.D.
University of Arkansas

Li Niu, Ph.D.
University of Wisconsin

Marina Petrukhina, Ph.D.
Moscow State University

Adjuncts (estimated): 4
Teaching Assistants (estimated): 25

The objective of the department is to provide students with a broad, fundamental knowledge of modern theoretical and experimental chemistry enabling graduates to embark immediately on professional careers in chemistry or to continue study at an advanced level toward higher degrees.

The general program in chemistry is approved by the Committee on Professional Training of the American Chemical Society. For students interested in engineering, 3–2 programs with Rensselaer Polytechnic Institute and Clarkson University are available.

Careers

Careers graduates have pursued include: industrial production chemist, industrial control chemist, analytical chemist (industrial and governmental laboratories), research assistant, technical sales and service representative, secondary school teacher, science writing and editing, forensics, chemical business, patent law, information science, toxicology, and even investment counseling and public relations.

Special Programs

For students interested in engineering, there are available 3-2 programs with Rensselaer Polytechnic Institute, Clarkson University, SUNY at New Paltz, and SUNY at Binghamton. Students in these programs spend their first three years at this campus and the last two years at the other. The tuition is at the University at Albany rate for the first three years only. Upon successful completion of the programs, students are awarded a B.S. in Chemistry from the University at Albany, and B.S. in Chemical Engineering from the other institution.

A typical program, in the three years here, includes all courses required for the B.S., Chemistry emphasis, degree except for A Chm 341B, 420A, and the 6 credits of advanced chemistry. Equivalent work at the engineering school is accepted for these last 12 credits. In addition, students take more mathematics, physics, and computer science, to prepare for the engineering school. This includes A Mat 220 and 311, A Phy 321C and 462, A Csi 101 and 204.

Degree Requirements for the Major in Chemistry

General Program B.A.: Combined major and minor sequence consisting of a minimum of 51 credits: A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225, 320, 321, 420a, 430, and 6 credits in advanced chemistry including at least 3 credits in courses other than A Chm 424, 425, or 426; A Mat 111 or 112 or 118 and 113 or 119; A Phy 105N, 106, 108N, and 109.

Note: A Phy 140N and 150N will substitute for A Phy 105 and 108 sequence.

General Program B.S.: Within this program, a student has a choice of four tracks: Chemistry Emphasis (66 credits); Chemistry/Polymers Emphasis (67 credits); Chemistry/Materials Emphasis (67 credits); and Chemistry/Forensic Chemistry Emphasis (69 credits). The specific requirements for individual tracks are outlined below.

Chemistry Emphasis: B.S.: (combined major and minor sequence) 66 credits: A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225, 317, 340A, 340B, 341Z, 341B, 420A, 440A or 342, and 3 credits in advanced chemistry in courses other than A Chm 424, 425, or 426; A Mat 111 or 112 or 118, 113 or 119, and 214; A Phy 140N, 145, 150N, 155, 240.

Chemistry/Forensic Chemistry Emphasis: B.S.: (combined major and minor sequence) (69 credits): A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225, 340A, 340B, 341Z, 417, 420A, 430, 440A (or 342), 450A, 450B and A Mat 111 or 112 or 118, 113 or 119, and 214 and 108; A Phy 140N, 145, 150N, 155.

Chemistry/Polymers Emphasis: B.S.: (combined major and minor sequence) (67 credits): A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225, 340A, 340B, 341Z, 408, 420A, and 496; A Mat 111 or 112 or 118, 113 or 119, and 214; A Phy 140N, 145, 150N, 155 240, and 462; X RPI 300 (RPI 72-464, Polymer Science Laboratory—student cross-registers at Rensselaer Polytechnic Institute for the course).

Chemistry/Materials Emphasis: B.S. (combined major and minor sequence) (67 credits): A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225, 340A, 340B, 341Z, 408, 420A, and 495; A Mat 111 or 112 or 118,113 or 119 and 214; A Phy 140N, 145, 150N, 155, 240, 462 and 464; X RPI 300 (RPI 72-464 Polymer Science laboratory) may be substituted for A Phy 464.

Honors Program

The honors program in chemistry is designed for outstanding students enrolled in the general program leading to the B.S. degree, chemistry emphasis. Students may apply for admission to the honors program by submitting a letter of request to the department chair no later than April 15 of the sophomore year (for admissions in the Fall) or November 15 of the junior year (for admission in the Spring). Junior transfers may apply at the time of their admission to the University. Primary emphasis will be placed on indications of academic ability and maturity sufficient for applicants to pursue with distinction a program involving independent research.

The minimum requirements for admission include: (1) Completion of A Chm 120N, 121N, 122A, 122B, 216A, 216B, 217A, 217B, 225 or their equivalents; (2) An overall grade point average of 3.50; (3) A grade point average of 3.60 in chemistry courses required for the major; and (4) Written recommendations from at least three faculty members, one of whom, preferably should be from outside the Department of Chemistry.

Students in the program must maintain both a minimum grade point average of 3.50 overall and of 3.60 in chemistry courses taken to satisfy major requirements during the junior and senior years. The progress of participants in the honors program will be reviewed at the end of junior year by the student's adviser and the Departmental Undergraduate Committee. Students not meeting academic and independent research standards at that time may be precluded from continuing in the program during their senior year. These students may, of course, continue as majors.

Students in the program are required to complete a minimum of 72 credits as follows: in addition to the 19 credits listed above and mathematics and physics requirements listed for the general B.S. program with chemistry emphasis, A Chm 340A, 340B, 341Z, 341B, 420A, and six credits of advanced chemistry, *not including research courses* (64 credits total); A Chm 424 (1 credit), 3 credits of A Chm 426 (Undergraduate Research), and 4 credits of A Chm 426T (Honors Undergraduate Research). The independent study must include an honors research project, culminating with a written honors thesis and departmental seminar by the end of the student's last semester.

After completion of the requirements above, the records of the candidates will be reviewed by the Departmental Undergraduate Committee. After consideration of overall academic record, performance and accomplishments in the independent study project, the quality of the Honors Seminar and Thesis, and the evaluations of departmental faculty members who have supervised these activities, a recommendation for or against a degree "with honors in chemistry" will be made by the committee to the departmental faulty. The final recommendation will be made by the departmental faculty and transmitted to the departmental chair.

Combined B.S./M.S. Program

The combined B.S./M.S. program in chemistry provides an opportunity for students of recognized academic ability and educational maturity to fulfill integrated requirements of undergraduate and master's degree programs from the beginning of the junior year. A carefully designed program can permit a student to earn the B.S. and M.S. degrees within nine semesters.

The combined program requires a minimum of 138 credits, of which at least 30 must be graduate credits. In qualifying for the B.S., students must meet all University and college requirements, including the requirements of the undergraduate major described previously, the minimum 60-credit liberal arts and sciences requirement, general education requirements, and residency requirements. In qualifying for the M.S., students must meet all University and college requirements as outlined in the Graduate Bulletin, including completion of a minimum of 30 graduate credits and any other conditions such as a research seminar, thesis, comprehensive examination, professional experience, and residency requirements. Up to 12 graduate credits may be applied simultaneously to both the B.S. and M.S. programs.

The undergraduate requirement of 420A may be satisfied by A Chm 520A. Likewise, the requirement of 6 credits in advanced chemistry may be satisfied by two 500-level graduate courses.

Students are considered as undergraduates until completion of 120 graduation credits and satisfactory completion of all B.S. requirements. Upon meeting B.S. requirements, students are automatically considered as graduate students.

Students may apply for admission to the combined degree program in chemistry after the successful completion of 56 credits, but no later than the accumulation of 100 credits, and after the satisfactory completion of A Chm 340A. A cumulative grade point average of 3.2 or higher and three supportive letters of recommendation from faculty are required for consideration.

Courses

A Chm 100N Chemical ABCs: Atoms, Bonds, and Citizen Consumers (3)
Introduction to chemistry emphasizing its applications to problems in modern society, consumer goods, and life-related topics. Lecture and demonstration only. Does not yield credit toward the major or minor in chemistry.[NS]

A Chm 120N General Chemistry I (3)
Atomic theory, quantitative relationships in chemical change, electronic structure of atoms and chemical periodicity, chemical bonding, and states of matter. [NS]

A Chm 121N General Chemistry II (3)
Elementary principles of chemical equilibrium, thermodynamics, and kinetics; electrochemistry; descriptive chemistry of the elements and their compounds. Prerequisite(s): A Chm 120N. [NS]

A Chm 122A and B General Chemistry Laboratory (1, 1)
Introduction to laboratory techniques, experiments demonstrating chemical principles and properties of elements and compounds. Prerequisite(s) for A Chm 122B: A Chm 122A; corequisite(s) or prerequisite(s) for A Chm 122A: A Chm 120N; for A Chm 122B: A Chm 121N.

A Chm 216A and B Organic Chemistry (3, 3)
Structure, synthesis, and reactions of the principal classes of organic compounds stressing the underlying principles of reaction mechanisms, stereochemistry, and spectroscopic techniques. Prerequisite(s) for A Chm 216A: A Chm 121N and A Chm 122B; for A Chm 216B: A Chm 216A.

A Chm 217A and B Organic Chemistry Laboratory (1, 1)
Laboratory techniques in organic chemistry, including extraction, crystallization, distillation, and chromatography, exemplified by the application of these techniques to the synthesis and qualitative analysis of organic compounds. Applications of infrared and NMR spectroscopy. Prerequisite(s) for A Chm 217B: A Chm 217A; corequisite(s) or prerequisite(s) for A Chm 217A: A Chm 215 or 216A; for A Chm 217B: A Chm 216B.

A Chm 225 Quantitative Analysis (3)
Theory of quantitative analysis based on modern chemical principles. Practical application to typical gravimetric, volumetric, and colorimetric analysis. Two class periods, one laboratory period each week. Prerequisite(s): A Chm 121N and A Chm 122B.

A Chm 307 (= Atm 307) Introduction to Atmospheric Chemistry (3)
Chemical principles and concepts leading to understanding the composition and change in the chemical/atmospheric environment; sources and sinks of chemical constituents; chemistry of the troposphere and stratosphere; measurement and theory; greenhouse gases; global pollution and ozone depletion. A Atm 307Z is the writing intensive version of A Atm 307 and A Chm 307; only one may be taken for credit. Does not yield credit toward the major in chemistry. Prerequisite(s): A Mat 113 or 119; A Phy150; and A Chm 121N.

A Chm 320 Introduction to Physical Chemistry (3)
Behavior of gases chemical thermodynamics (including solution equilibria, phase equilibria and electrochemistry), dynamics of chemical reactions (reactions, mechanisms, theory) and fundamentals of quantum chemistry with focus on chemical bonding, molecular structure and spectroscopy. Prerequisite(s): A Chm 121N; corequisite(s) or prerequisite(s): A Mat 113 or 119 and A Phy 108N. Does not yield credit toward the B.S. major in chemistry.

A Chm 321 Introduction to Experimental Physical Chemistry (1)
Experimental illustration of physical principles and introduction to instrumentation. Techniques of physical measurements, treatment of experimental data and generalization of results to illustrate the fundamental principles. Corequisite(s) or prerequisite(s): A Chm 320. Does not yield credit toward the B.S. major in chemistry.

A Chm 340A and B Physical Chemistry (3,3)
Mathematical description of physiochemical systems and their interpretation in terms of thermodynamics, kinetic theory, reaction rates and statistical mechanics. Atomic and molecular structure from the viewpoint of quantum theory with special emphasis on bonding and spectra. Prerequisite(s) for A Chm 340A: A Phy150N, A Mat 214, and A Chm 216B; for A Chm 340B: A Chm 340A or consent of instructor.

A Chm 341Z and B Physical Chemistry Laboratory (3, 3)
The experimental understanding of the basic principles of physical chemistry and development of familiarity with instrumentation. Includes thermodynamics; chemical kinetics; hydrodynamic, electrochemical, and optical properties; and searching of the chemical literature, computer processing of experimental data, and writing laboratory reports. One lecture and two laboratory periods each week. Prerequisite(s) for A Chm 341Z: A Chm 225; for A Chm 341B: Chm 341Z. Corequisite(s) or prerequisite(s) for Chm 341Z: Chm 340A; for Chm 341B: Chm 340B. [WI]

A Chm 342 Biological Chemistry (3)
The chemistry and biochemical interrelationship of carbohydrates, lipids, and nucleic acids; enzyme catalysis and introduction to metabolism. Prerequisite(s): A Chm 215or 216B. .May not be offered in 2003-2004.

A Chm 343 Introduction to Biochemistry Laboratory (1)
Experiments illustrating the fundamentals of biochemistry as discussed in A Chm 342. Prerequisite(s): A Chm 217A; corequisite(s) or prerequisite(s): A Chm 342. .May not be offered in 2003-2004.

A Chm 411A Computer Applications in Chemistry (3)
An introduction to microcomputing in chemistry. An introduction to the principles of microcomputers; programming using BASIC/TURBOBASIC, instrumental interfacing and the use of commercially available microcomputer programs related to chemistry. Prerequisite(s) or corequisite(s): A Chm 320 or 340A or permission or instructor.

A Chm 411B Computer Applications in Chemistry (3)
Introduction to work station operating systems with emphasis on UNIX. An overview of computational chemistry and molecular modeling methods. Applications to database searching, drug design and structure-activity relations. Prerequisite(s) or corequisite(s): A Chm 320 or 340A or permission of instructor.

A Chm 417 Advanced Synthesis Laboratory (2)
Experimental investigation of advanced syntheses of organic and inorganic compounds including their separation and analysis. The development of skills and understanding for the application of complex procedures and methods common in current practice. Prerequisite(s): A Chm 217B.

A Chm 420A and B Inorganic Chemistry (3, 3)
Bonding and reactivity in inorganic systems including ionic solids, metals, covalent molecules, and coordination complexes; acid-base chemistry; descriptive chemistry of the elements and their compounds. A Chm 420B includes main group chemistry, transition metal complexes, organometallic chemistry, catalysis and bioinorganic chemistry. Prerequisite(s) for A Chm 420A: A Chm 320 or 340B; for A Chm 420B: A Chm 420A.

A Chm 424 Retrieval and Presentation of Chemical Information (1)
Instruction and practice in modern methods of searching the chemical literature. Students are required to develop their skills in preparing written presentations and speeches. Prerequisite(s): junior or senior class standing. *S/U* graded.

A Chm 425 Introduction to Undergraduate Research in Chemistry (2)
Original experimental and theoretical research problems A printed or typewritten final report is required. Laboratory and conference hours to be arranged. May not be repeated for credit. Not more than 3 credits of A Chm 425 and/or A Chm 426 may be applied toward the advanced course requirement of the chemistry major. Prerequisite(s): junior or senior class standing, and permission of instructor. Corequisite(s) or prerequisite: A Chm 424. *S/U* graded.

A Chm 426 Undergraduate Research in Chemistry (3)
Original experimental and theoretical research problems. A printed or typewritten final report is required. May be repeated for credit, but not more than 3 credits of A Chm 425 and/or A Chm 426 may be applied toward the advanced course requirement of the chemistry major. Laboratory and conference hours to be arranged. Prerequisite(s): junior or senior class standing, and permission of instructor; corequisite(s) or prerequisite(s): A Chm 424. *S/U* graded.

A Chm 426T Honors Undergraduate Research in Chemistry (4)
Original experimental and theoretical research problems in chemistry with the results reported in a written Honors Thesis, as well as a public Department Seminar.

A Chm 430 Instrumental Analysis (3)
Theoretical principles and chemical applications of selected methods of instrumental analysis. Main emphasis is on electroanalytical methods including polarography, conductance, potentiometry, and coulometric methods, and on trace methods of analysis such as spectrograph emission, flame emission, atomic absorption, and fluorometric analysis. Two class periods, one laboratory period each week. Prerequisite(s): A Chm 225; prerequisite(s) or corequisite(s): A Chm 320 or 340B or permission of the instructor.

A Chm 436 Advanced Organic Chemistry (3)
Organic chemistry at an advanced level, including introduction of theoretical background and application in synthesis. Prerequisite(s) or corequisite(s): A Chm 320 or 340B.

A Chm 440A and B Comprehensive Biochemistry (3, 3)
Chemical characteristics of living matter, amino acids, polypeptides and proteins, supramolecular assembly and membrane structure; enzyme mechanisms and kinetics; bioenergetics and the chemistry of metabolism; electron transport and other transports across membranes; biosynthesis, storage, and expression of genetic information. Prerequisite(s): A Chm 216B or permission of instructor

A Chm 441A and B Physical Chemistry for Biochemical Sciences (3, 3)
Foundations of the physical principles and their application to biochemical systems. Topics include: thermodynamics, general kinetics, enzyme kinetics, transport phenomena, quantum chemistry, spectroscopy, and macromolecular conformation. Does not yield credit toward the major in chemistry. Prerequisite(s) for A Chm 441A: A Chm 121N, A Phy150N, and A Mat 113 or 119 (A Chm 216A or B, and A Chm 342 or A Bio 365 recommended); for A Chm 441B: A Chm 441A.

A Chm 450A Forensic Chemistry I (3)
This introductory course combines a series of seminars, lectures, and laboratories which focus on current topics and analytical methods utilized in today's modern forensic laboratories. Seminars in *Forensic Chemistry* will include topics such as: Introduction to Criminalistics, Ethical Dilemmas, and Computer-Assisted Data Analysis. Lecture and laboratory courses will include: Microscopy, Drug Chemistry, Questioned Documents, Toxicology, Latent Prints, Trace- and Firearms/Tool-marks. Various analytical methods currently being used in modern forensic laboratories will be performed utilizing chromatography (TLC, GC, CG/MSD, etc.) and liquid/liquid extractions. One lecture and two laboratory periods each week. Prerequisite(s): A Chm 225, A Chm 430, and senior class standing or consent of the instructor.

A Chm 450B Forensic Chemistry II (3)
Continuation of A Chm 450A. This course combines a series of advanced seminars, lectures and laboratories in *Forensic Chemistry*. Topics such as: public speaking on technical and non-technical subjects, as well as courtroom testimony, will be covered. Lecture and laboratory topics will include: DNA, Quantitative Methodologies in Drug Chemistry and Toxicology, as well as Advanced Statistical Methods such as: chi-square tests, multiple regression and correlation, nonparametric statistics and analytical variances. Prerequisite(s): A Chm 450A, and senior class standing or consent of the instructor.

A Chm 455 Forensic Chemistry Internship (3)
Students will have the opportunity to acquire practical "hands-on" experience in forensic chemistry by participating as an intern in the work of an agency, institution, or corporation other than the University. The student's work will be supervised and evaluated by a designated individual at the internship site. This supervisor will provide an evaluation of the student's work to the University at Albany faculty member who is the instructor of record for final assessment and grading.

Students majoring in chemistry with a *forensic chemistry* emphasis may apply to the Department of Chemistry for permission to enroll in this course. Admission to the Forensic Chemistry Internship course will be dependent upon the acceptability of the candidate to the Department of Chemistry and the host institution or agency. Among the criteria used by these agencies will be completion of A Chm 450A and a possible background check of the applicant. Enrollment in the course is limited in number in order to provide substantial individual hands-on training, and therefore is determined on a competitive basis. Application to the program must be made six months in advance of the beginning of the proposed internship. S/U graded.

A Chm 495 Materials Independent Study (3)
Individually selected topic of independent study in materials science-(chemistry) culminating in a comprehensive written report. The material covered is to be beyond that offered in any other formal undergraduate course. Prerequisite(s): junior or senior class standing, and permission of instructor. *S/U* graded.

A Chm 497 Independent Study (3)
Individual, independent study of selected topics above or beyond those offered in formal undergraduate courses. May be repeated for credit. Prerequisite(s): junior or senior class standing, and permission of instructor. *S/U* graded.