

## Foreword from the Chairperson

This Handbook is intended to provide information for a varied audience-- the information on the following pages will be most useful to the Gettysburg undergraduate who may wish to major in chemistry or biochemistry/molecular biology. At the same time the high school student who is considering Gettysburg College and the parents of prospective students who may like to know just what opportunities are available for their sons and daughters in the chemistry program at the college should also benefit. Perusal of the Handbook should serve to answer some basic questions that may arise about the program in chemistry such as required courses, the possibilities for student research and laboratory assistantships, extracurricular activities, and the opportunities available to a chemistry student upon graduation. While it is impossible to anticipate all questions that might arise concerning chemistry at Gettysburg, we trust that this Handbook at least will serve as a broad introduction to our program.

The department is located on the second and third floors of the Science Center, which is connected to McCreary Hall (Biology and Psychology) and adjacent to Masters Hall (Physics). This physical arrangement allows for much more interaction among the science departments and provides a more suitable home for the interdisciplinary Biochemistry/Molecular Biology program. The Science Center is also home to the Environmental Studies and the Health Science Departments.

Chemistry and biochemistry/molecular biology are laboratory sciences in which students and faculty work closely with each other. In introductory courses with somewhat larger enrollments, in advanced courses with just a few students, or in collaborative research work, considerable effort is made by each staff member to develop personal contacts with students outside the classroom. Faculty members are available throughout the week to handle questions that the individual student may have concerning course work or other areas. We welcome and cultivate the informal exchange that occurs with our students -- we believe it to be as important as the formalized education that happens in the classroom.

Our students receive a great deal of "hands-on" experience with modern instrumentation in course work and in tackling research problems. The department's summer research program has been endowed by the estate of Mary C. Albaugh '54. This endowment provides funds for summer student stipends, supplies and materials, and student travel to scientific meetings. This research experience coupled with the intensive laboratory instruction in our courses has served and will continue to serve our graduates well so that they can be successful in whatever career they choose following their college years, whether it be graduate or professional school, high school teaching, or a job in the chemical industry.

Anyone with specific questions about the chemistry program is encouraged to contact me, or any member of the department.

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## I. THE ACADEMIC PROGRAM

### Department Goals

The Chemistry Department's goal is to provide motivated students with a solid foundation in the principles of chemistry. The department's program introduces students to the broad range of chemical knowledge from theoretical calculations through synthetic techniques. Emphasizing problem-solving skills and hands-on laboratory experiences that include the use of modern instrumentation, the department prepares students to be scientists who can read and understand the scientific literature, design experiments, interpret data, and communicate their results effectively through oral and written reports. A student who majors in chemistry is expected to emerge from the program with sufficient knowledge and experience to allow them to succeed in graduate/professional school or to tackle an entry level job in the chemical industry with a minimum of additional training.

### Academic Program

Each course offered by the department of Chemistry provides an opportunity for a concentrated study of the various principles of classical and contemporary chemical knowledge. From the introductory to the advanced courses, application is made of basic theories and methods of chemical investigation. The courses offered utilize lectures, discussions, library work, on-line computer literature searching, computer-assisted instructional and modeling programs, and laboratory investigations in order to emphasize the concepts that underlie the topics covered.

All chemistry majors are required to take the following eight core courses within the department:

Chemistry 105 or 107	Fundamental Chemistry: Down on the Farm or Chemical Structure & Bonding
Chemistry 108	Chemical Reactivity
Chemistry 203, 204	Organic Chemistry
Chemistry 221	Chemical Applications of Spectroscopy
Chemistry 305, 306	Physical Chemistry
Chemistry 317	Instrumental Analysis

In addition, the following courses should be completed before enrolling in Chemistry 305:

Physics 111, 112	Introductory Modern Physics I, II
Mathematics 111, 112	Calculus I, II
Mathematics 211	Multivariable Calculus

The following courses may be elected according to the interests and goals of the individual student:

Chemistry 216	Introduction to Forensic Science
Chemistry 333, 334	Biochemistry
Chemistry 353	Advanced Organic Chemistry
Chemistry 375	Advanced Inorganic Chemistry
Chemistry 460-465	Individualized Study Research

The department offers the degrees of bachelor of arts and bachelor of science in chemistry and in conjunction with the Biology Department, offers an interdisciplinary bachelor of science in biochemistry/molecular biology (BMB).

### **College Requirements**

Beginning with the class entering in the fall of 2004, students will be required to complete a new set of requirements called the **Gettysburg Curriculum**. These courses are intended to broaden the student's experience and to provide him or her with a balanced understanding and background in keeping with the liberal arts tradition at Gettysburg College. These requirements include:

- a. One course in the Arts
- b. One course in the Humanities
- c. One course in the Social Sciences
- d. Two courses in the Natural Sciences (one must be a laboratory course)
- e. Foreign language proficiency through the 202 level (0-4 courses)
- f. One course in Quantitative Reasoning
- g. One course in Composition
- h. One course in Diversity: Non-Western Culture
- i. One course in Diversity: Domestic or Conceptual
- j. Two interdisciplinary courses or paired courses in two disciplines
- k. Communication conventions in the discipline (see page 6 below)
- l. Capstone Experience (see page 6 below)

Note: It is possible for multiple requirements to be satisfied by a single course, for example, a course in the humanities can also satisfy the diversity requirement in non-western culture (i.e. this list of courses is not as imposing as it first may seem).

### **Scheduling Considerations**

Any student considering the Chemistry Major should incorporate Chemistry 105 or 107,108 and Mathematics 111,112 into the first year schedule. A student interested in the biochemistry/molecular biology degree should definitely enroll in Chemistry 105 or 107,108 and Biology 111, 112 in the first year. If this is not done, scheduling in the remaining three years becomes much less flexible. However, students have switched to the Chemistry or BMB major as sophomores. Some courses may not be offered every year so try to plan ahead. Students who are considering studying abroad should plan well ahead to schedule their required courses.

### **American Chemical Society Certification of Chemistry Majors**

Since the degree program of Gettysburg's Chemistry Department is approved by the American Chemical Society, students who complete the program outlined in Table I (below) are certified by the Society. Such certification may be listed among the student's credentials when applying for employment or graduate school following graduation from Gettysburg College. ACS certification also allows a person to join the American Chemical Society without the usual probationary period of membership. Because of the large number of chemistry courses required, being certified enhances a student's credentials for obtaining an industrial position.

A complete list of requirements for ACS certification in chemistry or biochemistry may be obtained from the department chairperson.

## Sample Programs of Study

Suggested programs for chemistry and BMB majors are presented in the following tables. Chemistry majors who plan to go to professional school (dental, medical, or veterinary) must elect Biology 111, 112 sometime during the first three years. The actual planning of a student's course schedule should be done in consultation with a faculty member in the Chemistry Department. Since chemistry majors have pursued such a variety of careers after their graduation from Gettysburg College it is impossible to outline all possible programs here; what follows are the degree options within our chemistry major program. Because many first-year students may not have firm plans about a career, each program contains a degree of flexibility. Many variations of these degree programs have been accomplished including variations that lead to certification in secondary education, preparation for the 3-2 program in chemical engineering, or the ability to spend a semester abroad (See Study Abroad section below, page 8).

(Note: In the tables below "GC Requirement" stands for one of the required courses in the Gettysburg Curriculum outlined above)

**Table I. Sample program leading to the BS degree in Chemistry with ACS Certification.**

YEAR	FALL	SPRING
1st	Chemistry 105 or 107 Mathematics 111 GC Requirement GC Requirement	Chemistry 108 Mathematics 112 GC Requirement GC Requirement
2nd	Chemistry 203 Mathematics 211 Physics 111 GC Requirement	Chemistry 204 Chemistry 221 Physics 112 GC Requirement
3rd	Chemistry 305 Chemistry 317 GC Requirement Elective	Chemistry 306 Chemistry 375 GC Requirement Elective
Summer:	(Chemistry 465) <sup>1</sup>	
4th	Chemistry 333 <sup>2</sup> GC Requirement Elective Elective	(Chemistry 460) <sup>1</sup> GC Requirement Elective Elective

<sup>1</sup>One research course is required for the BS and is often taken during the summer preceding the senior year (Chem 465), but may also be taken in the senior year (Chem 460) or whenever it fits into a student's schedule. Students are highly encouraged to take more than one research course.

<sup>2</sup>Chemistry 333 or 334 (Biochemistry I or II) must be taken for ACS certification.

**Table II. Sample program leading to the BA in Chemistry (permitting a maximum number of elective courses in other areas). NOTE: First two years are the same as Table I.**

YEAR	FALL	SPRING
3rd	Chemistry 305 GC Requirement Elective Elective	Chemistry 306 GC Requirement Elective Elective
4th	Chemistry 317 GC Requirement Elective Elective	GC Requirement GC Requirement Elective Elective

**Table III. Sample program for a student pursuing the BS degree in Biochemistry/Molecular Biology (BMB).**

YEAR	FALL	SPRING
1st	Chemistry 105 or 107 Biology 111 Mathematics 111 GC Requirement	Chemistry 108 Biology 112 Mathematics 112 GC Requirement
2nd	Chemistry 203 Biology 211 (Genetics) Physics 111 GC Requirement	Chemistry 204 Biology 212 (Cell Biology) Physics 112 GC Requirement
3rd	Chemistry 333 BMB Elective <sup>1</sup> GC Requirement Elective	Chemistry 334 GC Requirement GC Requirement Elective
4th	Chemistry 305 Biology 351 (Molecular Genetics) GC Requirement Elective	GC Requirement BMB Elective <sup>1</sup> Elective Elective

<sup>1</sup>BMB Elective courses (two are required):

Biology 251 (Bioinformatics)  
Biology 320 (Developmental Biology)  
Biology 332 (Immunobiology)  
Chemistry 317 (Instrumental Analysis)  
Chemistry 375 (Advanced Inorganic Chemistry)  
Research (Biology 460 or 461, Chemistry 460 or 465)

## Effective Communication Conventions in Chemistry

The Gettysburg Curriculum requires that all students acquire the means of communicating within their major fields of study. The Chemistry Department identifies the following as the important means of communication in chemistry:

The ability to

- search, read, and understand the primary literature of chemistry (including electronic databases).
- record and organize data in an understandable fashion (e.g. keeping a lab notebook).
- communicate scientific results in a professional manner both orally and in writing.
- critically analyze the scientific results of other scientists.

Rather than try to achieve all of these goals in a single course, the Chemistry Department elects to meet these goals throughout the curriculum in a number of ways in a number of different courses. As students move from general chemistry through the upper level courses to the culminating capstone experience, they acquire the skills of effective communication in the discipline of chemistry. The main components of this path to acquiring effective communication skills are the two seminars presented in the student's Junior and Senior years as part of the capstone experience (see below).

### Capstone Experience

The Gettysburg Curriculum requires that all students complete a capstone experience in their major field of study. The capstone experience in the Chemistry Department is dependent on the degree that the student pursues as outlined below.

#### Capstone Experience in the B.S. Degree.

All B.S. degree candidates in chemistry must complete a research project as their capstone experience. The research can be conducted on-campus or off-campus. If the research is done off-campus, a Gettysburg faculty member must serve as the student's on-campus sponsor. The research project can be in any area of chemistry or in an interdisciplinary area on the borders of chemistry and other scientific fields.

Students are encouraged to participate in the department's summer research program and then continue their work into the academic year. However, the minimum amount of time to be spent on laboratory research while satisfying the capstone experience requirement is one semester.

Students who elect to do research must present their research to the members of the department in a seminar and produce a formal written thesis, which is kept on file in the Chemistry Department office. The research seminar is given in either the Junior or Senior year (or in both years; in the past, some students have presented a progress report in their Junior year followed by a final report in their Senior year). These seminars are advertised to the campus community and are open to the public. The thesis must follow the guidelines developed by the department and include a title page, a formal acceptance statement, a vita, an acknowledgement,

a table of contents, and list of figures, a list of tables, an abstract, an introduction, an experimental section (including physical methods used), a discussion section, a conclusion, and a list of literature references. The final version of the thesis is approved by the faculty mentor and by the chairperson of the department.

This capstone experience requires the student to be able to read and understand the primary literature of chemistry, design and carry out experiments that have not been tried before, evaluate those experiments and the data obtained, redesign experiments in a iterative process to improve the results, and communicate those results both orally and in writing.

### **Capstone Experience in the B.A. Degree.**

All chemistry majors must give two seminars to the department, one in their Junior year and one in their Senior year. These seminars are not part of any course and are viewed as a graduation requirement. If a student is not pursuing an independent research project, these seminars are based on library research into scientific topics of interest. Under the guidance of a faculty mentor, the student chooses a topic, researches that topic in the literature, and prepares a seminar. The seminars are presented to the faculty and students during the Department's Thursday Seminar series usually during the spring semester of the student's Junior year and the fall semester of the Senior year. These seminars are advertised to the campus community and are open to the public.

This capstone experience requires the student to choose a topic and define its scope, research that topic in the chemical literature, evaluate and organize the information obtained from the literature search, and present that information orally to the faculty and students of the Chemistry Department.

### **Special Features of Chemistry Courses**

The department recognizes the educational value of having students working independently on projects within a course. This approach allows for student initiative and imagination while generating a high level of interest. Several courses within the department utilize this project approach, especially in conjunction with laboratory work. For example, in the Chemistry 107 laboratory, a two-week period late in the fall term is spent in identifying an unknown organic carboxylic acid. The unknown is identified utilizing techniques learned in previous laboratory experiments and by applying structure and bonding knowledge gained from studying material discussed in class.

In other courses such as Chemistry 204, Chemistry 306, Chemistry 317, Chemistry 334, and Chemistry 375, a portion of the laboratory work is also done in project form. In upper level courses, homework assignments may take the form of projects, but most of the project-oriented work is done in the laboratory.

One interesting offering of the Chemistry Department is Chemistry 221, Chemical Applications of Spectroscopy. This particular course is required of chemistry majors in the spring term of their second year and occurs concurrently with the second term of organic chemistry. The laboratory periods involve the use of the principal spectrometers in the department in the identification of organic compounds. Following this experience the second-year chemistry major is able to use these spectrometers in further course work and research. This

“hands-on” opportunity early in the student’s career is an important feature of the chemistry program at Gettysburg.

Other special features of the department’s offerings and program such as research, seminars, and a variety of student opportunities will be discussed later in this Handbook.

## **Research**

Students may elect Individualized Study 460 Research in either the fall or spring term. The department also encourages upperclass majors to enroll in Chemistry 465, a summer research experience that is supported by an endowment from the estate of Mary C. Albaugh ‘54. In addition to receiving one course credit the student is paid a summer stipend, receives free College housing, and gains valuable experience on a project that usually is continued in the academic year. To elect Chemistry 460 the student should consult with their faculty advisor and their prospective research director at least two weeks before the beginning of the final exam period of the term preceding the term in which the course will be taken. For example, to register for Research for the spring term the consultation should occur before the first week of December. An application process is initiated early in the spring term for entry to Chemistry 465.

The current research interests of the faculty are briefly listed below. Students are encouraged to talk directly to faculty members whose projects interest them to learn more about the research area. Each student enrolled in Chemistry 460 spends the equivalent of ten to fifteen hours per week on the study, makes an oral presentation on his or her work, and submits a thesis as a final report on the study (Thesis guidelines are available from any faculty member). Students enrolled in Chemistry 465 normally work 40 hours per week for a ten week period immediately following Commencement Day and also make a presentation and submit a thesis. The department also has an annual cooperative summer internship program with the Alcohol, Tobacco, and Firearms Laboratory in Rockville, MD, as well as other periodic summer research internship opportunities.

## **Study Abroad**

More and more students are electing to spend a semester or even an entire year studying abroad. Recently we have had science students studying in England, Spain, Denmark, France, and Australia. However, because of the many specific courses required for the Chemistry or the Biochemistry/Molecular Biology program, a student majoring in these areas who plans to study abroad must plan well in advance. Finding upper level science courses at foreign universities that exactly match Gettysburg’s requirements is not always possible so careful planning is imperative. If you are interested in spending time abroad, see your advisor as early in your academic career as possible.

## II. THE CHEMISTRY DEPARTMENT -- STAFF AND FACILITIES

### The Staff

Donald L. Jameson – Chairperson – ([djameson@gettysburg.edu](mailto:djameson@gettysburg.edu))

Professor Jameson teaches Introductory Chemistry, Organic Chemistry (204), and Advanced Organic Chemistry (353). His research interests are in the areas of synthesis of organic ligands and the study of their resultant metal complexes.

Koren Holland Deckman -- ([kholland@gettysburg.edu](mailto:kholland@gettysburg.edu))

Professor Deckman teaches Biochemistry (333,334), and Introductory Chemistry and has research interests in the mechanistic studies of secondary metabolic pathways that involve the production of biologically active metabolites.

Shelli Frey – ([sfrey@gettysburg.edu](mailto:sfrey@gettysburg.edu))

Professor Frey teaches Introductory Chemistry, Biochemistry (333,334) and Physical Chemistry (305,306). Her research, at the interface of biochemistry and physical Chemistry, involves studies of model cell membranes.

Timothy W. Funk – ([tfunk@gettysburg.edu](mailto:tfunk@gettysburg.edu))

Professor Funk teaches Organic Chemistry (203) and Chemical Applications of Spectroscopy (221) and has research interests in the design of efficient catalysts for the synthesis of complex organic molecules.

Joseph J. Grzybowski – ([jgrybow@gettysburg.edu](mailto:jgrybow@gettysburg.edu))

Professor Grzybowski teaches Instrumental Analysis (317), Chemical Applications of Spectroscopy (221), and Introductory Chemistry and has research interests in the synthesis and characterization of functionalized clathrochelate complexes.

William E. Parker -- ([wparker@gettysburg.edu](mailto:wparker@gettysburg.edu))

Professor Parker teaches Advanced Inorganic Chemistry (375), Introductory Chemistry (107 and 108) and has research interests in chemical education.

Michael R. Wedlock -- ([mwedlock@gettysburg.edu](mailto:mwedlock@gettysburg.edu))

Professor Wedlock teaches Physical Chemistry (305,306) and Introductory Chemistry and research interests in using resonance Raman spectroscopy to study the photodissociation dynamics of small molecules.

Jeremy J. Kuhar – ([jkuhar@gettysburg.edu](mailto:jkuhar@gettysburg.edu))

Mr. Kuhar teaches laboratory sections of Organic Chemistry (203, 204) and Introductory Chemistry. He also is in responsible for laboratory preparations.

Sally L. Abma – ([sabma@gettysburg.edu](mailto:sabma@gettysburg.edu))

Ms. Abma teaches laboratory sections of Introductory Chemistry

Lisa I. Gregory -- ([lgregory@gettysburg.edu](mailto:lgregory@gettysburg.edu))

Ms. Gregory teaches laboratory sections of Organic Chemistry (203,204) and Introductory Chemistry.

## Staff (continued)

Matthew P. Nelson – ([mnelson@gettysburg.edu](mailto:mnelson@gettysburg.edu))

Mr. Nelson teaches laboratory sections of Organic Chemistry (203, 204) and Introductory Chemistry.

Robert R. Garrity – ([rgarrity@gettysburg.edu](mailto:rgarrity@gettysburg.edu))

Dr. Garrity teaches laboratory sections of Biochemistry (333, 334) and Introductory Chemistry.

## Additional Programs

Each year the Chemistry Department sponsors a number of activities in order to expand its program. The Musselman Endowment for Visiting Scientists provides funds each year to bring to the campus a visiting scholar in chemistry to interact with students and staff and to discuss a significant research area in a lecture/discussion format. Additional speakers are brought to the campus through the Sceptical Chymists, usually on a Thursday evening. Biochemistry/molecular biology seminars are also scheduled each semester. These visits are an integral part of the offerings of the department. They provide an opportunity for students and staff to meet with other chemists and educators, to learn of new areas of current research, and to exchange ideas and information with experts in various fields of chemistry.

## Major Equipment

The department is equipped with the following major instruments:

Bruker Avance 400 MHz Nuclear Magnetic Resonance Spectrometer  
Two ThermoElectron IR200 FT-IR Spectrometers  
Varian Saturn 2100 Gas Chromatograph/Mass Spectrometer  
Varian Gas Chromatograph with FID detector  
Nd:YAG Laser Spectrometer  
Beckman Coulter PA 800 Capillary Electrophoresis System  
Hewlett-Packard 8453 UV-Visible Spectrometer  
Jasco V-550 UV-Visible Spectrometer  
Bioanalytical Systems CV 50W Electrochemistry Apparatus  
Thermo Electron Model S4 Atomic Absorption Spectrometer  
Perkin-Elmer Model 341 Polarimeter  
Millennium 2010 Diode Array High Performance Liquid Chromatograph  
Scientific Systems Model 401-2 High Performance Liquid Chromatograph  
Forma B-22 High Speed Refrigerated Centrifuge  
Perkin-Elmer Model 2400 Thermal/Cycler  
Vacuum Atmospheres HE-43-2 DRI-LAB  
Shimadzu RF-1501 Spectrofluorometer  
Portable Laptop Laboratory – 16 Dell Latitude D610 laptops

## Library Facilities

The College's library collection is housed in Musselman Library. The chemistry collection consists of over 1800 titles (over 2400 volumes). In addition to the many print subscriptions to scientific journals that the College maintains, we have been acquiring electronic subscriptions to

journals, which allow access to these journals from any computer linked to the College's network. For example, all American Chemical Society journals and all Royal Society of Chemistry journals are currently available on-line. In addition to the on-line journals the College subscribes to SciFinder Scholar which is a powerful tool that allows students and faculty to search the vast chemical literature database electronically.

### **III. OPPORTUNITIES FOR STUDENTS**

#### **Research Opportunities**

Students may take advantage of a number of opportunities to participate in research activities. In addition to the formal "research for course credit" discussed in an earlier section, students may work informally with faculty members on projects of varying magnitude. Much of the department's research takes place during the summer months. Students should consult the department chairperson early in the spring term concerning summer research opportunities. Off-campus research opportunities on the campuses of other colleges and universities are also available each summer. Notice of such programs is posted on departmental bulletin boards. Information regarding the specific programs is available from the department chairperson.

A special opportunity for a rising junior or senior student is available as a summer internship at the Alcohol and Tobacco Tax and Trade Bureau Laboratory in Rockville, MD. This position, which was initiated in 1992, offers a government stipend and course credit for students interested in analytical/instrumental chemistry.

Each year students from colleges and universities in this area hold a meeting of the Intercollegiate Student Chemists at which students report on their undergraduate research. Prizes are awarded for the best research work reported. These meetings provide a valuable introduction to scientific meetings and an opportunity for students to visit other colleges and universities, to meet with other chemistry students, and exchange ideas and information. In addition to the ISC meetings, students have presented their work at regional and national meetings of the American Chemical Society.

#### **The Sceptical Chymists**

The Sceptical Chymists, a locally founded chemistry club, offers an opportunity for students interested in science generally and in chemistry particularly to meet and share ideas. This group engages in a variety of activities including talks presented by students, faculty members and invited outside speakers; social events such as Halloween and Christmas parties and picnics, student and faculty skits, and occasional volleyball and softball matches with other local department clubs. In addition, the Sceptical Chymists act as host for prospective Gettysburg College students on "Get Acquainted Day" and for alumni during Homecoming weekend.

The requirement for membership is an interest in chemistry. Initiation ceremonies are held each year. The club meets approximately semi-monthly on Thursday evenings. A schedule of events is made available at the beginning of each semester.

## Student Assistants and the Work Study Program

Student assistants are needed for all introductory chemistry courses, organic chemistry, and some upper level courses. Assistants for a particular course are expected to have completed that course and have demonstrated a proficiency in chemistry and the ability to accept responsibility. Students interested in assisting should express their interests to the department chairperson. Final assignments are arranged during registration.

The duties of student assistants vary, but may include: assisting students in the laboratory; evaluating laboratory work and notebooks; assisting the instructor and students in setting up and cleaning up equipment; instructing in problem and review sessions; preparing supplies and solutions for use in the laboratory; and supervising the use of special equipment. Each instructor will provide a detailed set of duties and responsibilities for each student assistant. Each student assistant must complete the Chemical Safety Training program before assisting in the laboratory.

The benefits to the student of serving as an assistant are several. In addition to the monetary one, he or she has the chance to review the content of courses taken earlier and to brush up on previously learned laboratory techniques. Student assistants are paid at the standard student wage rate established by the Business Office of the College.

Gettysburg College participates in a work/study program that provides a form of financial aid to students. Work/study opportunities are available in the Chemistry Department. Students participating in this program are employed to work for the department, usually in the departmental office or as laboratory assistants. They perform tasks commensurate with their experience and background. See the Financial Aid Office for information.

## Honors and Awards

Outstanding student achievement in chemistry is recognized through a variety of honors and awards. They are listed in the table below along with the eligibility requirements and criteria used in making the awards.

AWARD	ELIGIBILITY	CRITERIA
Departmental Honors at Graduation	Senior Major	Selected by the faculty. Honors are awarded on overall contribution to the department's programs and achievement in chemistry or biochemistry.
American Chemical Society Southeastern Pennsylvania Section Award	Senior Chemistry Major	The outstanding senior chemistry major as selected by the faculty.
American Institute of Chemists Award	Senior Chemistry and BMB Major	Outstanding senior majors selected by the faculty.

**Honors and Awards (continued)**

AWARD	ELIGIBILITY	CRITERIA
American Institute of Chemists Award	Senior Chemistry and BMB Major	Outstanding senior majors selected by the faculty.
Society for Analytical Chemists of Pittsburgh Award	Senior Chemistry Major	An outstanding senior chemistry major selected by the faculty.
Stine Chemistry Prize (Income from a sum of money donated by Charles M. A. Stine)	Senior Chemistry Major	Selected by the faculty. The award is based on grades in chemistry, laboratory technique, personality, improvement, and proficiency at the time of selection.
BMB Award	Senior BMB Major	Given to the BMB major who has excelled in both course work and laboratory research.
J. B. Zinn Research Award (Income from a sum of money donated by Frances and John Zinn)	Senior Chemistry or BMB Major	The faculty select the student who has contributed most to the research activities of the department.
Laboratory Assistant Award	All Laboratory Assistants	Student who has made the most significant contribution to the laboratory program. Selected by the faculty.
Glenn S. Weiland Summer Research Scholarship	Chemistry Major in Chemistry 465	Outstanding student participating in summer research. Selected by the faculty.
American Chemical Society Undergraduate Award in Analytical Chemistry (a subscription to <i>Analytical Chemistry</i> )	Junior Chemistry or BMB Major in Chemistry 317	The award is made to the student showing outstanding promise in Analytical Chemistry.
Organic Chemistry Award (A Merck Index)	Chemistry Major in Chemistry 204	Awarded to the major with the highest exam average at the time of selection.

**Honors and Awards (continued)**

<u>AWARD</u>	<u>ELIGIBILITY</u>	<u>CRITERIA</u>
Sceptical Chymists Achievement Award (An organic textbook)	Chemistry or BMB Major in Chemistry 108	Awarded to the student doing good work and showing improvement during the year. Chosen by the instructor(s).
Chemical Rubber Company Handbook Award	Chemistry or BMB Major in Chemistry 108	The award is made to a student doing outstanding work in Chemistry 107, 108.
Edgar Fahs Smith Chemistry Scholarship	Chemistry Major	Outstanding student with financial need, recipient is selected by the Department

**IV. JUST FOR SENIORS****Opportunities After Graduation**

The pathways followed by graduates with the BA or BS degree in chemistry or biochemistry/molecular biology depend upon the interests of the individual student. The natural progression for many has been enrollment in a graduate program, while many students have pursued professional work in medicine and dentistry. Others have entered the chemical industries, pursued work in chemical engineering, become high school science teachers, or have been employed by government agencies.

Severe limitations are not placed upon the chemistry major in terms of a career field. Some graduates have found that the major, as completed within the framework of the liberal arts curriculum, serves as a useful experience prior to a number of fields quite unrelated to the natural sciences. Majors from recent years have entered graduate programs in business, law, engineering, and computer science. An increasing number of students recognize that they need not be locked into science by the undergraduate major; the methodologies, precision of thought, and techniques of analysis developed in the chemistry curriculum provide a sound basis for many types of future study and work. Each student is encouraged to examine his or her plans according to the interests that develop during the undergraduate tenure.

## Recent Graduates -- What They Have Done

Since 1995, 138 Chem and BMB majors have graduated from Gettysburg. Of these 43% (59/138) entered graduate school, 18% (25/138) became industrial chemists/biochemists, and 10% (14/138) entered medical or dental schools. In addition to these pursuits, 3 of these graduates went to law school, 4 became high school teachers, and 33 have chosen alternate careers.

Although they did not all start graduate/professional school immediately after Gettysburg, approximately 75% of all graduates from 1960-2006 have received, or will receive, at least one advanced degree.

## Advice for Seniors

The time arises (all too rapidly) during the senior year when a decision must be made regarding future plans. For those students applying to medical, dental, or veterinary schools the senior year is, in large part, one of waiting for word on the applications which were submitted in early fall of the year. This implies that as a junior the student seeking admission to one of these professional schools has taken the Medical College Admission Test or other examination and has completed the necessary application forms. Information regarding these fields and the details connected with application should be obtained from the College Internship Office (Professor Kristen Stuempfle, Coordinator of Advising for Medicine and the Allied Health Professions) very early in the college career but no later than the beginning of the Junior year.

Those seniors who plan to enter graduate work in chemistry, biochemistry, or other fields normally need not begin the formal application process until late in the first term of the senior year. In fact, the good student has an excellent chance of acceptance at many universities even if application is made in February of the senior year. However, it is not wise to wait until that time to apply to the schools of choice. Generally speaking, applications for graduate work should be submitted by December or January of the senior year. This means that the first three or four months of the year may be spent in deciding upon the field of interest, the preference -- if any -- for geographical location, and in obtaining information from schools in which there is interest. It is assumed that any student contemplating graduate study will discuss such plans with individuals within the chemistry department on a continuing basis. Any questions that can't be answered by a staff member will be referred to someone who can supply the information.

In recent memory no student who seriously wished to continue his or her study of chemistry in graduate school has been unable to gain admission to a graduate program. The quality of the school and the applicant's credentials must be, of course, compatible. It is unrealistic to apply to Harvard with a 2.5 undergraduate grade point average but there are many institutions who will accept the student whose letters of recommendations speak to things such as motivation and drive, characteristics not necessarily reflected in a transcript. It is important for a student to begin to demonstrate these characteristics early in his or her collegiate career. Experience has shown that the most important credential a student can place before an admissions committee is a strong demonstrated interest in the field.

A number of seniors wish positions in chemical industries upon graduation. While finding such openings is not always easy, Gettysburg graduates of recent years who have wanted to work in industry have obtained jobs with established companies. The competition is not as fierce as medical school (where a high GPA and MCAT scores are largely the factors that determine admission or rejection) but does demand a good undergraduate record, especially in the sciences,

backed up by good technical competence and the capacity for independent work such as that developed in a research project. As in the case of admission to graduate study in chemistry, the letters of recommendation are extremely important since they can speak to the individual student's qualifications for a specific type of work. Seniors desiring to apply for an industrial position should speak to department members early in the year for guidance and information.

The preparation of a resume by any student seeking a job in industry is important. While the details to be included need not be listed in entirety here, basic information such as job experience, course work, expertise, and professional interests are important to any prospective employer. The senior should consult her or his adviser and/or the Career Services Office for help in preparing the Vitae during the first term or the senior year.

### **Deadline For Graduate Record, MCAT, And Other Exams**

All professional schools (medical, dental, veterinary, law, etc.) and many graduate schools require a standardized test result as part of the student's credentials. The tests for the professional schools should be taken in the spring of the junior year while the graduate record examination may be taken in October or December (sometimes later) of the senior year. The dates on which the various exams are given (and where they are held) may be obtained from the Career Services Office and/or from notices on the chemistry bulletin board. Check these carefully.

### **Fellowships and Scholarships For Advanced Study**

There is a word of advice for those seniors interested in graduate work in chemistry or biochemistry -- as a rule, do not accept the bid from a graduate program that does not include an offer of financial aid. Very few students accepted by a graduate school will not be offered an assistantship. In the rare instance when the undergraduate record is sub-par, yet the student receives positive recommendations from the chemistry staff, a school may offer admission if the student is willing to pay his or her way for a probationary year. Successful work may then be rewarded by financial aid in subsequent years. Since the payment of tuition and costs is a costly proposition the student is urged to look around at a number of institutions before settling on an acceptance without aid. Those seniors who wish to enter a graduate program outside of the science area may have to pay their way. Financial aid in most other fields appears to be less readily available than in chemistry.

The offer of an assistantship includes a stipend (about \$20,000) plus remission of tuition. Depending upon the institution the entire package may amount to \$40,000 per year. As an assistant, the graduate student is generally charged with conducting laboratory/problem sections of undergraduate courses. Alternate duties may include responsibility for televised lectures, grading of examinations, and setting up lecture demonstrations.

The money paid to the graduate assistant is sufficient to live on but hardly conducive to a luxurious life style. After the first two years of graduate study the student is often granted a fellowship of some type. While the income is not greatly different when holding a fellowship, the time (maybe 10-20 hours per week) spent on assisting duties is eliminated thereby enabling the graduate student to spend considerably more time on research and related scholarly activities.

Fellowships (scholarships) may be awarded to exceptional first-year graduate students. These may be given by the university or by an outside agency such as the National Science Foundation or the Woodrow Wilson Foundation. Announcements concerning these two (and others) are posted on the chemistry bulletin board as they are received. Look for them. Additional information may be obtained from the Career Services Office and the College's Provost's Office. Facts about institutional fellowships are obtained directly from the university to which the student may apply.

## V. MISCELLANEOUS INFORMATION

### **Safety in the Chemistry Laboratory**

The College has a Chemical Hygiene Plan that is available in each laboratory in the Science Center or at the following web site:

[www.gettysburg.edu/about/offices/president/ehs/occupational\\_safety/CHEMICALHYGIENEPLAN.pdf](http://www.gettysburg.edu/about/offices/president/ehs/occupational_safety/CHEMICALHYGIENEPLAN.pdf).

### **Things To Consider When Dealing With Others**

During a college career every chemistry student will interact with numerous other people from on- and off-campus. As we all know, any interaction with another person is subject to certain responsibilities. With respect to the frequent contacts of a Gettysburg student with the staff, administration and other students, these responsibilities are in most instances characterized by civilized patterns of behavior. The concerned chemistry student makes life a bit easier for everyone by lending a hand to others when asked, by meeting appointments punctually, and by treating the property and ideas of others as he or she wishes to be treated in turn.

Some things, however, are not automatic responses to situations and demand a conscious effort. For example, when a guest speaker gives a talk in the department, students should think of questions to ask at the conclusion of the talk. Nothing leads a visitor to conclude that an audience is disinterested more than a deathly silence that greets the call "Any questions?" at the end of a presentation. Think of questions during the talk that may be asked when the speaker is finished. When the question period is over, approach the speaker to thank him or her for coming, to tell what a fine talk it was (even if it wasn't), or to ask additional questions. Such action gives an entirely different view of Gettysburg students than one derived by an audience that rushes to the exits at the conclusion of the talk.

When a senior applies to graduate or professional schools or for a job, the time arrives when he or she knows that one of the resulting acceptances or offers is "it". At that point it is not only desirable to accept that offer but to notify immediately all other schools or companies to which application was made. There will be many other persons waiting in line for any position for which you have applied. It is your obligation to withdraw consideration of your application in order to give someone else an opportunity at the position in which you are no longer interested.

A number of students receive awards and honors from the college, department, or outside agencies during the course of the college career. These honors are not given lightly and deserve notes of thanks from the recipients. It is appropriate to acknowledge a departmental award by writing to the Chairperson of the Chemistry Department. Acknowledgment of honors granted by the College may

be sent to the Provost, with a copy to the Chemistry Department Chairperson. Some awards (e.g., Chemistry Department Research Award) are funded by special grants. The Chairperson can supply the name and address of the person to whom thanks should be extended in these instances.

The staff of the chemistry department has their responsibility to offer our students a first rate education in chemistry. We ask our students to accept the responsibility of taking advantage of what is offered and to be courteous and considerate of others when doing so.

### **Course Evaluations**

Student opinion and evaluation of each chemistry course is of value. At the end of each semester, in accordance with faculty legislation, written course evaluations are collected. In addition to these formal course evaluations, students should feel free to provide constructive comments at any time to his or her instructor or to the department chairperson so that each faculty member will have some understanding of the reaction of students in all courses. In addition, course evaluations are useful in helping the department assess the effectiveness of the program and the faculty who teach in the program.

The type of evaluation expected is one which reflects the carefully considered, responsible judgment of the student. The chemistry faculty hopes that increased understanding and trust between students and faculty can result from this evaluation program. The expectations of students and faculty may be more fully understood and the program of the department will continue to improve. The faculty has committed itself to a careful, responsible, conscientious consideration of all evaluations.

In addition to the individual course evaluations, from time to time some students will be selected and asked to evaluate the overall program of the department or individual faculty members who are in the tenure/promotion process.