



THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

COLLEGE OF ARTS & SCIENCES

STUDY ABROAD OFFICE

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Administrative Board of the College of Arts & Sciences

Proposed Program: **UNC Science in Germany**

Proposed Program Location: **Freiburg, Germany & Basel, Switzerland**

Faculty Program Leaders: **Josh Beavers**

Dear Colleagues:

The UNC Study Abroad Office submits for your approval a proposal for the establishment of a new faculty-led program to be offered beginning **Summer 2021** and continuing annually.

PROGRAM INFORMATION

This proposed faculty-led program would be offered for **6 credits** during the Summer term, tentatively scheduled for **six weeks in late May through June**.

Program Rationale: This proposed program is located in Freiburg, Germany and will hold classes at the University of Freiburg. In working with Lynn Neddo, I have been in contact with administration in the International Office, as well as the Chemistry Department at the University of Freiburg, and the possibility of hosting summer sessions has been met with enthusiasm from our counterparts in Germany. The Study Abroad Office at UNC has already developed a relationship with Freiburg outside of the sciences, and this summer program opens the door to explore additional exchanges and continue to strengthen our relationship with the University of Freiburg.

While Germany is famous for its precision engineering, and environmental sustainability, it also has a rich history of contributions to chemistry. During the introductory chemistry courses at UNC, students learn about the chemical contributions of numerous famous German scientists including Haber, Fischer, Bunsen, Hoffman, and Baeyer. In addition to famous chemists, some of the most important chemical companies in the world, including IG Farben and Baeyer were founded by German scientists. Another famous German chemist is Justus von Liebig who is considered one of the greatest chemistry teachers of all time and is also credited with founding organic chemistry and modernized chemistry education globally.

While CHEM 261 has been offered abroad for the past 5+ summers, including two sections abroad in 2018 and 2019, CHEM 262 has not been offered during that time. Offering CHEM 262 during the summer abroad, provides another opportunity for premedical/preprofessional students and other STEM majors to study abroad and receive graded credit from a UNC professor for a course required for their major or professional aspirations.

During the academic year approximately 1000 students take CHEM 262, and more than 170 students took the course during first and second summer sessions this past summer 2019.

Over the past 5 years, students taking organic chemistry during summer abroad programs have benefited significantly from the small class sizes offered during summer abroad sessions. They also report developing a closer connection with their professor. Because students develop a deeper understanding and appreciation for the course material, they also have opportunities when they return to become peer mentors or undergraduate learning assistants. Acting as peer mentors significantly enhances a student's

undergraduate education and broadens the depth of his/her learning and understanding of science. Since teaching CHEM 261 in Sevilla, Spain in 2017, and in Dublin, Ireland in 2018, eight different students from these programs have been peer mentors in my classroom, many of them serving multiple (upwards of four) times.

While Organic Chemistry II is the targeted class for this proposal, chemistry and biology programs should be able to alternate locations relatively seamlessly between established locations. Other science courses with regional relevance should also be able to rotate through this location. Based on preliminary discussions with faculty members in the Chemistry Department, Southern Germany, with proximity to the Black Forest, Switzerland and Southern France, is an attractive location for faculty teaching abroad.

Target Audience/ Major & Discipline/Student Levels: The primary target class for this proposal is Organic Chemistry II, CHEM 262. This course follows Organic Chemistry I, CHEM 261, and is generally taken during the sophomore or junior year. CHEM 262 is a large enrollment science course because it is a required course for medical and dental schools, as well as the Chemistry and Biology majors at UNC. CHEM 262 is also a prerequisite for Biochemistry, CHEM 430, which is taken by approximately 900 students per year from a variety of majors.

During the academic year approximately 1000 students take CHEM 262, and more than 170 students took the course during first and second summer sessions this past summer 2019.

I am involved in recruiting students for faculty led programs and have had success recruiting for CHEM 261. Since I teach CHEM 261 during the semester, I expect to be able to recruit students from my own classes as well as other sections of the class.

Anticipated Number of Students: Minimum of 10 students; maximum 22

Program Learning Objectives: Chemistry 262 uses organic chemistry to promote a fundamental understanding of concepts in chemistry and science. The material covered in this class expands upon the content covered in CHEM 261 and to introduce reactivity of new functional groups and biomolecules, including the following primary objectives for the course:

- Build critical thinking and problem-solving skills
- Predict mechanisms and products of reactions with various functionalities, including carbonyl groups and carboxylic acid derivatives, as well as classes of molecules, including aromaticity, electrophilic aromatic substitution, reactions of carbohydrates and amines.
- Elucidate chemical structures from NMR spectra and predict NMR chemical signals from organic structures
- Solve multi-step syntheses of organic molecules using known reactions

In addition to learning organic chemistry II concepts, students will expand their world view by living in another country for 5 weeks. Through a 5-week seminar course, students will interact with European scientists as well as German undergraduate students to learn about interdisciplinary research and chemical industries in Germany as well as environmental sustainability and energy production in Germany and central Europe.

PROGRAM ACADEMICS

Proposed Course Name/Number:

CHEM 262 Organic Chemistry Concepts II

Course Description: Chemistry 262 is the second of a two-semester sequence on organic chemistry. Chemistry 262 uses organic chemistry to promote a fundamental understanding of concepts in chemistry and science. The material covered in this class expands upon the content covered in CHEM 261 to introduce reactivity of new

functional groups and biomolecules.

Minimum GPA: 2.5

Course Prerequisites: Yes - CHEM 261 Organic Chemistry Concepts I

Language Prerequisites: None

Degree Requirements: The proposed course can be applied to the following programs:

Major: Chemistry and Biology

Minor: Chemistry

Other: Pre-Medical, Pre-Dental, Nutrition, and others intending to take CHEM 430, Biological Chemistry

Description of Academic Instruction: Course instruction will be founded in the classroom, with additional problem-solving sessions to complement the main course material. As part of the course, we will also take a trip to BASF in Basel, Switzerland, which is a large chemical manufacturing company. We anticipate having a tour of one of the facilities and meeting with scientists. This will be directly related to the course and integrated into the curriculum.

Adaptation of Current UNC Course: I have already taught this course during the summer, here at UNC. Instead of using online homework, I have developed a course pack with Guided Reading Questions, practice problem sets and homework assignments as well as example practice exams and worksheets. I intend to use the course pack as a resource for the students throughout the summer. I also hold longer Q&A type sessions and incorporate more group work to better facilitate active learning within the classroom.

Description of Excursions/Activities:

- BASF Tour
- Winebau on campus
- Optional Excursion: Oldest brewery in Germany

A proposed syllabus is included as an addendum to this proposal.

FACULTY PROGRAM LEADER INFORMATION

Faculty Program Leader Bios: Joshua graduated from Juniata College, a small liberal arts college in the foothills of Pennsylvania, in 2009 with a B.S. in Chemistry with Distinction and Highest Honors. He immediately enrolled in graduate school at the University of North Carolina at Chapel Hill, and received an NSF Graduate Research Fellowship for his studies of molecular recognition of small molecules under the direction of Dr. Marcey Waters. He earned a Ph.D. in Organic Chemistry in 2014 and joined the lab of Dr. Ashutosh Chilkoti at Duke University as a postdoctoral scholar in the Biomedical Engineering Department. Joshua completed his postdoctoral training in 2016 and returned to UNC-Chapel Hill as a visiting lecturer, teaching general chemistry, CHEM 101. Following a successful year of teaching, Joshua was brought onto the faculty at UNC in the Chemistry Department as a Teaching Assistant Professor in 2017. During his first summer at UNC, he led a successful faculty-led program, UNC Science in Sevilla, teaching Organic Chemistry I, CHEM 261, to 23 students in Sevilla, Spain. Joshua's involvement and accomplishments in study abroad were recognized within the department and he has acted as the liaison between the Study Abroad Office and the Chemistry Department since Fall 2017. He also served as the US Co-Director of TASSEP with Lynn Neddo 2018-2019, is coordinating the agreement for a Joint Degree Program in Chemistry between UNC and the National University of Singapore, and is an active member of the Science Working Group in Study Abroad, which is charged with identifying and developing study abroad opportunities and programs for STEM majors and undergraduate students on the pre-medicine path. Joshua led another successful summer program abroad in 2018, Organic Chemistry I in Dublin, Ireland, and has been significantly involved

in recruiting efforts for summer science abroad programs since 2016.

Experience in Proposed Location(s): I visited Germany once and one of my closest friends lived in Germany for 4 years. I unfortunately canceled a visit to Freiburg and the University at the end of September because of illness, so I have not been to Freiburg yet. I am working with the Study Abroad Office to coordinate a visit in April or May 2020.

Lynn Neddo mentioned off hand to me that UNC was building its relationship with the University of Freiburg and that they had expressed interest in our summer programs. I was aware that a number of Chemistry Faculty at UNC speak German, and after speaking with Lynn and other faculty, felt that this was an appropriate location to explore the possibility for a summer program.

Experience Leading Student Groups: I have led two UNC faculty-led summer programs; Sevilla, Spain in 2017 and Dublin, Ireland in 2018. Both of these programs were for CHEM 261, Organic Chemistry I.

I was also recently one of six adult leaders for a mission trip to Puerto Rico with UNC Lutheran Campus Ministry and Holy Trinity Lutheran Church. I led a group of 6 students while we performed hurricane relief work on houses and a community center in rural PR.

PROGRAM LOCATIONS

Proposed Locations:

- Freiburg, Germany and the University of Freiburg in Freiburg
- Basel, Switzerland, including a tour of a BASF facility

Location Rationale: Germany has a rich history of contributions to chemistry. During the introductory chemistry courses at UNC, students learn about the chemical contributions of numerous famous German scientists including Haber, Fischer, Bunsen, Hoffman, and Baeyer. In addition to famous chemists, some of the most important chemical companies in the world, including IG Farben and Baeyer were founded by German scientists. Another famous German chemist is Justus von Liebig who is considered one of the greatest chemistry teachers of all time and is also credited with founding organic chemistry and modernized chemistry education globally.

Involving the University of Freiburg with this summer program provides unique opportunities for students that they would not experience elsewhere. Through connections at the University of Freiburg, we are coordinating a tour for students to see a BASF facility in Switzerland. BASF is one of the largest chemical producing companies in the world.

Students will also have an opportunity to visit a wine-making laboratory at the University of Freiburg and we will have an opportunity to incorporate some of the chemistry of wine making into our curriculum. In conjunction with faculty at the University of Freiburg, we are also assembling a 1-credit seminar series course that will involve both UNC and German students. This series will explore environmental sustainability, energy production, and chemistry research in Germany.

PROGRAM LOGISTICS

Once the program is approved, the Study Abroad Office will coordinate all program services with a host organization or university, following the [Standards of Good Practice](#) developed by the Forum on Education Abroad.

The Study Abroad Office will work to secure accommodations for students and faculty leaders and assistance coordinating excursions, meal arrangements (individual and group), transportation, and any other services required to support the program on the ground. Information below represents initial discussions that have taken place between the Study Abroad Office and the anticipated host organization.

Anticipated Program Host Organization/University: I have been in contact with faculty and administration at the University of Freiburg and have begun coordinating the program with them. They are interested in having us and building a stronger connection between our universities. Faculty within the University of Freiburg have connections with local business owners, as well as scientists and representatives in large industrial companies, including BASF. We will capitalize on this connection to coordinate a visit to BASF for the UNC, and potentially some German students.

Host Organization/University Website:

[The University of Freiburg](#) and most specifically the Faculty of Chemistry and Pharmacy will be hosting our program. The colleagues in the Office of International Relations, with whom we work closely for our exchange program, have been instrumental in putting us in contact with the professors in the Faculty of Chemistry and Pharmacy.

Services Provided:

Both of the Departments mentioned above will help to secure a classroom for our class; they have also offered to make the initial contact with some of the local appropriate facilities and organizations, and then connect us with them. They will help us put together the Seminar, are willing to give lectures and to attract other lecturers as well as market this opportunity to their local students. They will also help us organize our field trips and excursions.

Anticipated Accommodations:

During a site visit last September, the Program Director met with some colleagues who run the Goethe Institute in Freiburg and visited their housing. They have student lodgings that are available during the time when our program will take place. Students will have the option to either share a room or have a single room in a housing complex specifically for students. Each floor has a large living area with a kitchen and dining area. The residence buildings are locked at all times and students must have a card key to get in. It is located in a residential area of Freiburg, within a 15-20 minute walk to campus but there are also trams that run frequently.

HEALTH & SAFETY INFORMATION

Health Insurance: The Study Abroad Office coordinates with the Office of Risk Management Services to enroll student and faculty participants in international accident and health insurance through GeoBlue for the duration of the program.

Safety & Risk Information: Germany is currently under a US State Department Travel Advisory level 2.

Health Information: Possible health risks are minimal. There are no listed health risks for travel to Germany beyond what would be expected in most developed countries. The global measles outbreak is relevant to Germany, which is at Watch Level 1, Practice Usual Precautions.

Required Vaccinations (if applicable): Travelers should be up to date on routine vaccinations.

Health, safety, and security information will be presented to students during the required pre-departure orientation.

CONCLUSION

A letter of support from the home academic department is included in as an addendum to this proposal.

We are happy to provide any additional information necessary for your review of this program. Thank you for your time and your support of global opportunities for Carolina students.

Sincerely,

Heather Ward
Associate Dean of Study Abroad & Exchanges