Cover Sheet: Group Program Information

Program Leader Name: *H. Daniel Ou-Yang, Professor, Physics Department*
Email: hdo0@lehigh.edu

Program Title: *Sustainable Polymeric Materials Research in Bordeaux, France*

Country: *Bordeaux, France*

Dates: *June 4, 2018 – July 29, 2018*

Duration (6 weeks, 8 weeks, 10 weeks): *Eight Weeks*

Total budget request *$29,689 (see page 5 for details)*

- Number of students who will participate as Iacocca Interns: *Four Students*
- Additional students (if so, funding source, number of anticipated students, purpose): *Two students with support by Lehigh Physics NSF-REU site grant to conduct collaborate research*
- Will additional students beyond IIIP Program be considered? If so, approximately how many students and what other funding sources? – *Yes, two students from NSF-REU.*

Host organization name: *University of Bordeaux (See page 4 for email of support)*
Ranked among the top universities in France, the University of Bordeaux is renowned for the quality of its academic courses and research.

We had a successful IIIP in Bordeaux program in 2017. We were invited to bring students to conduct collaborative research in the participating laboratories that hosted our students in 2017. Specifically, internships positions are available in some laboratories of the department: LOMA, LCPO, CRPP, LOF, I2M. Actions will be coordinated between Prof Daniel Ou-Yang and Dr. Pierre Guillot at Laboratorie du Futur (LOF), the research unit that was the main host of the 2017 program.

Last year (2017) we included two students beyond the support from IIIP. One student was supported by NSF-REU and the other by Martindale Scholars Program. While Martindale will not run program in Europe in 2018, the NSF-REU program co-directors have indicated support for two students to join the 2018 Lehigh cohort in Bordeaux.

Host organization website:
http://www.u-bordeaux.com/

Host organization contact information (name, title, email, phone)
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Executive Summary:

Funds are requested to support 4 Iacocca International Internship (IIIP) students for eight weeks to conduct international collaborative research on sustainable polymer materials and materials sustainability in Bordeaux, France. This will be a continuation of the successful 2017 IIIP in Bordeaux program. This unique experience for the participating students will leverage the existing international research collaboration, between Lehigh, Solvay Laboratory of the Future, University of Bordeaux, and the French National Center for Scientific Research (CNRS) and strengthen the collaboration through the IIIP. The IIIP students, along with two students supported by Lehigh's NSF-REU site grant, will enjoy the vibrant city of Bordeaux, its rich culture, education, and research. University of Bordeaux is strong in research in the areas of sustainable polymer materials and material sustainability. Our student will have an advanced research experience in a broad areas of polymer science and engineering. The IIIP students will mix with French and other international students on the University of Bordeaux campus in an international and interdisciplinary laboratory setting. Selected students will be matched with the advisers of their host groups to prepare for research projects in advance of their arrival to the host laboratories. Weekly group meetings with the lead faculty member will be held in one of the participating laboratories to discuss research progress, and issues within or outside the laboratories. The program will conclude with a mini-symposium of presentations by the IIIP students to members of all hosting laboratories.

Goals and Objectives:

1) Providing students with opportunities to conduct research and to learn how to communicate research progress to an audience of a diverse background
2) Providing students with experience to work in a highly interdisciplinary environment
3) Providing students with the knowledge of sustainable polymer materials and material sustainability
4) Introducing students to French culture, education, science, and technologies through working relationships with local students, researchers, and faculty.

Internship Description and Schedule: The lead faculty has an existing international research collaboration, and hopes the IIP will further strengthen it, between Lehigh, Solvay LOF, the University of Bordeaux and CNRS. In this case, the lead faculty will help recruit appropriate students with appropriate research interests and back ground. Once selected, each of the internship student will be matched in advance with a hosting faculty to prepare for research before arriving at the laboratory. Examples of research topics include:

a) Microfluidics, opto-fluidic techniques and applications
b) Bio-based polymers for 3D printing
c) Foams, colloids and emulsions
d) Nanoparticles and composites
e) Coatings and films made of polymeric latexes
f) Advanced, high resolution thermal imaging

Description of partnering organizations or agencies, including previous experience with the partner(s):

The program will be a continued collaboration with the University of Bordeaux and participated by researchers from the University, CNRS (Centre National de la Recherche Scientifique) and Solvay in Bordeaux, France. Professor Ou-Yang, who will lead the program, has spent two months during each of the past two summers working with Dr. Pierre Guillot, director of LOF, a joint laboratory of Solvay/CNRS/University of Bordeaux to develop a collaboration between Lehigh and several research groups in Bordeaux. Several research laboratories affiliated with LOF, such as CRPP, LOMA, LCPO and I2M, have indicated interest in hosting Lehigh IIIP students.

Description of the role for each faculty member participating in the internship program, his or her experience with the partner or specific project, and the dates on which the faculty member will be traveling with the students:

Professor Ou-Yang will be the project leader for the Lehigh in Bordeaux program. Since he will be visiting Bordeaux to continue his research collaboration with LOF, he will travel with the IIIP students to and back from Bordeaux. He will be conducting collaborative research in France during the most of the 8-week period but will dedicate two full weeks at the beginning and the end of the program to work with the students. During his visit in Bordeaux for his own collaborative research, he will also conduct weekly group meetings with the IIIP student to discuss their research progress and resolve personal issues in and outside the laboratories. In the event of an emergency either he or Dr. Pierre Guillot will be available during the entire 8-week period. The coordinators of the University of Bordeaux, Office of International Affairs will also be available in case of emergencies.

Collaboration between IIIP and NSF-REU: Like the arrangements in 2017, Professor Ou-Yang will be seeking an agreement with Prof. Ginny McSwain and Prof. Volkmar Dierolf, the co-leaders of the Lehigh NSF-REU site grant at the Physics Department, to support two students to conduct collaborative research in Bordeaux in 2018. The NSF-REU-supported students will join the cohort of the IIIP students to do research in Bordeaux.

How the proposed group program advances the Iacocca International Internship Program:

The proposed IIIP in Bordeaux program will engage undergraduate students in doing research at an interdisciplinary environment where researchers from university, national laboratories and industry interact and collaborate. This program will focus on issues related to materials sustainability where the students are exposed to the challenges of making polymer materials that are green, high performance and commercially viable. The proposed program will bring IIIP students to a vibrant cultural, education and technology center of Bordeaux.

Tentative schedule for the group internship program including dates of student and faculty travel and professional and cultural activities:

Once the students are selected, during April – May, orientation meetings will be scheduled to prepare for a research plan the summer program. The lead faculty and his co-lead in Bordeaux will help students identify the best matches to host advisors. Through email exchanges between the students and their future host advisers will discuss research topics and develop a draft plan for their summer research before arriving at the host laboratories.

June 3 (Sunday): flight from Newark via Brussels (or Dublin) to Bordeaux

June 4 (Monday): arrival in Bordeaux and check in to university dormitory

June 5 (Tuesday): report to host laboratories

June 5 – 7: orientation and lab safety training

July 14 (Saturday): Bastille Day, French National Holiday, culture experience in Bordeaux areas

July 23(Monday): research mini-symposium of presentations by our IIIP students followed by a reception and luncheon with coworkers from host groups

July 24 – 26: preparation of research final written report

July 26 (Thursday): conclusions of the research program

July 27 (Friday): Check out of the dormitory; travel to Paris by TGV high-speed train

July 27 – 29: Culture experience in Paris, museums, theaters, and other culture events

July 30 (Monday): flight from Paris CDG airport to Newark

In addition, weekly group meetings will be scheduled to discuss research progress and issues both in, and, outside the laboratory

Qualifications or profile of student's best prepared for this program, including relevant majors, previous experiences, etc.:

We plan to recruit students who are majoring in bioengineering, chemistry, physics, materials science and engineering, mechanical engineering and mechanics, and chemical and biomolecular engineering at junior level who are interested in doing research in areas that are broadly related to polymer materials and material sustainability at an international setting and willing to continue research after returning to Lehigh. Prior research experiences are helpful but not required.