

**2010-2011 Faculty Grant for International Connections  
Developing Ties Between Lehigh University and Bar-Ilan University  
Robert A. Flowers, Department of Chemistry, Lehigh University**

**Abstract**

The project described in this proposal is designed to integrate research and graduate studies between my group and the research group of Professor Shmaryahu Hoz at Bar-Ilan University. Funding will be used for travel to Bar-Ilan to enhance interactions and co-advising of graduate students. The long-term goal is to develop stronger ties between Lehigh and Bar-Ilan and develop international experiences in research and teaching at the undergraduate and graduate level. I also intend to visit several other Israeli universities during my visit to give research talks and educate colleagues about my own research and broader research activities at Lehigh University.

**Background, Scientific Basis for the Collaboration**

Professor Hoz and I have a mutual interest in the chemistry of samarium diiodide ( $\text{SmI}_2$ ) and follow each other's work. We first met when I invited Professor Hoz to give a lecture when I arrived at Lehigh. We recognized that we had complimentary skills that could be used to solve one of the remaining important challenges in the chemistry of  $\text{SmI}_2$ : the development of catalytic processes. One of the major challenges of organic synthesis is the design and development of sustainable chemical processes. In this regard, radical reactions initiated by  $\text{SmI}_2$  are among the most powerful methods available for the construction of chemical bonds. Presently catalytic radical-initiated reactions are still largely unexplored and my group has just begun to make important progress in this area. Using our collective skills, we have begun to discuss a photochemical approach to regenerating active  $\text{SmI}_2$  using light initiated reductions by titanium dioxide ( $\text{TiO}_2$ ), an inexpensive and abundant material. We will use this approach to study a number and refine a number of important bond-forming reactions in organic synthesis with the end goal being a catalytic approach to nitrogen fixation. This ambitious project aims to design an environmentally friendly approach for the use of  $\text{SmI}_2$  and if successful, this process will not only lead to important publications, but also in the development of sustainable chemical processes important in the fine chemical industry. Working individually, the two groups do not have the necessary skills required to address this major problem. Students working on this team will receive a unique and multidisciplinary training in the use and application of important and useful techniques not typically used in standard organic chemistry laboratories.

**Professional and Personal Goals for the Visit**

The initial goal of this visit is to establish a long-term collaboration between our research groups on the development of a sustainable and catalytic approach for the use of reagents based on  $\text{SmI}_2$ . During the visit we will discuss co-mentoring of graduate students and exploring funding mechanisms to fund extended student visits in the partnering lab. The goal is to have a seamless interaction where students are co-mentored and receive training in both the Lehigh and Bar-Ilan labs. One long term goal we will discuss in detail is integration of our teaching and educational mission at the graduate level through distance education. The department of chemistry at Lehigh has a vibrant, high quality M.S. program with admission standards the same as our on campus programs (minimum 3.0 GPA, etc.). In the last review of programs by Chemical & Engineering News, our program was ranked 6<sup>th</sup> in the nation. We have several

Israeli students in the program and would like to use this as the basis to recruit other qualified Israeli students and also to give domestic distance students access to courses taught at Bar-Ilan. Once established, this approach will be used as the blueprint for possible joint degree programs at the graduate level between Bar-Ilan and Lehigh. We will use this experience as the foundation to help Lehigh build further ties with Bar-Ilan and other prominent Universities in Israel.

#### **Expected Outcomes**

During the initial two-week visit to Bar-Ilan, we plan to work out a procedure for dual mentoring of a graduate student and developing more consistent interactions between our research groups including exchange of information. During this visit, I will also explore other potential collaborations for colleagues in chemistry at Lehigh and possible interest in joint degree programs at the graduate level through distance education. We will also pursue external funding to support ongoing work. If future requests for funding are successful, we will formalize joint mentoring of students and have our students spend up to three months in the collaborator's lab working on aspects of the project outside the skill set of their research sub-group.

#### **Pre-trip Planning and Preparation**

Professor Hoz will serve as my host during the visit to Bar-Ilan. I will stay at a hotel in close proximity to the Chemistry Department at Bar-Ilan and spend two weeks taking part in research group meetings and seminars. I will also visit several other universities in Israel to discuss graduate programs at Lehigh University. I have attached a supporting letter from Professor Hoz (addressed directly to the committee) to this application outlining his expectations for the visit.

#### **Follow-up**

Upon my return, I will write up the results of my visit and volunteer to speak about my experience with faculty and others interested in international collaboration. I also plan to explore external funding opportunities to support both the ongoing scientific work and the development of joint graduate degree programs through distance education.

#### **Proposed Budget**

The budget below provides estimates for travel during the first the autumn, 2012

Car travel to Newark and Airfare to Tel-Aviv (10/1/12-10/14/12):	\$2,600 <sup>1</sup>
Housing Rental and meals:	\$4,930 <sup>2</sup>
Internal travel in Israel	\$400
Total:	\$7,930

<sup>1</sup>[www.united.com](http://www.united.com)

<sup>2</sup>U.S. State Department website for per diem rates for international travel:  
[http://aoprals.state.gov/web920/per\\_diem.asp](http://aoprals.state.gov/web920/per_diem.asp)



Bar-Ilan University  
אוניברסיטת בר-אילן

Faculty of Exact Sciences  
Department of Chemistry  
Prof. Shmaryahu Hoz

הפקולטה למדעים מדויקים  
המחלקה לכימיה  
פרופ' שמריהו הוז

Faculty Grants for International Connections Committee  
Office of International Affairs  
Lehigh University  
Bethlehem, PA 18015

2/3/2012

**RE: Invitation to Professor Robert Flowers**


Dear Sir or Madam,

I am writing to support Professor Flowers' application for funds for a collaborative visit to Bar-Ilan University for two weeks during the autumn of 2012. Bar-Ilan University, with its satellite colleges, is the largest university in Israel. In a recent survey conducted by the Budgeting and Planning Committee for Higher Education, our department of chemistry came out first among the seven Israeli universities. An international review committee for the Israeli nano-material centers concluded that the Bar-Ilan center has the most outstanding accomplishments over the last five years. The department includes 180 research students and 45 postdoctoral fellows and is world renowned for its achievements.

I had the opportunity to meet Professor Flowers when he invited me to give a seminar soon after his arrival to Lehigh University. We have a mutual interest in studying and understanding the role of additives on the chemistry of samarium diiodide ( $\text{SmI}_2$ ), an important reagent in synthetic organic chemistry. One of the main shortcomings of  $\text{SmI}_2$  is that it is used as a stoichiometric reagent. Professor Flowers and I have discussed several approaches for developing a catalytic reagent for use in a range of fundamentally important bond-forming reactions and possibly nitrogen fixation. If successful, this would be an important breakthrough that would receive a great deal of attention and recognition in the chemistry community. We have discussed working together and arranging further collaborations on this important topic and a travel grant from Lehigh University for this purpose is critical to the success of this project. I will serve as Professor Flowers' host and he will work with my research group during his stay in Israel. I will also explore visits to several other Universities for him to talk about his work at Lehigh.

Providing funding for a collaborative visit to Bar-Ilan University will enable significant interaction between our groups and facilitate training of undergraduate, graduate and postdoctoral students. In addition, I anticipate that a visit to Bar-Ilan will provide for more extensive interactions between faculty and students at our universities and help to further establish Lehigh University's International footprint. If you have any questions about this proposed visit, please don't hesitate to contact me.

Best regards,

  
Professor Shmaryahu Hoz

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