

Subject: Faculty Grant for International Connections

From: David Vicic <vicic@Lehigh.EDU>

Date: 2/26/2014 10:19 AM

To: cmh505@lehigh.edu

Dear Cindy,

Please find attached my application for this grant.

Thank you for your help,
David

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—Attachments: —

Vicic_Oxford.pdf

27 bytes

2014-2015 Faculty Grant for International Connections
Strengthening Ties between Lehigh and the University of Oxford

David A. Vici, Department of Chemistry, Lehigh University

Professional and personal goals for the visit: The goal of the proposed project is to develop new collaborative ideas for research and teaching between my labs and the labs of Professor Véronique Gouverneur at the University of Oxford in the United Kingdom. Currently, we are both studying very different aspects of organofluorine chemistry. Fluorination has become popular for many important reasons, like its ability to increase the oxidative and thermal stability of new materials (examples: Teflon on a non-stick frying pan and seals that could withstand corrosive conditions), and its role in supporting new energy technologies is expected to grow. Moreover, fluorine is a privileged functionality in pesticides and drugs as roughly 30-40 % of agrichemicals and 20 % of pharmaceuticals on the market today are estimated to contain fluorine. A new general rule of thumb in medicinal chemistry is that "smuggling fluorine into a lead structure enhances the probability of landing a hit almost 10-fold."¹

My group is studying the fundamental science of transition metal fluorides and fluoroalkyl groups, while Professor Gouverneur's expertise is organic reaction discovery and how to incorporate the ¹⁸F isotope into organic substrates for medical imaging. At past conferences, she discussed with me how her group does not have any inert-atmosphere gloveboxes. This limits her capability to prepare and study well-defined and air-sensitive metal complexes that may be intermediates in the new methodology that she develops. Our group's expertise is in fact in the preparation of such air-sensitive complexes, and we are equipped with two inert-atmosphere gloveboxes and a single crystal X-ray diffractometer equipped with a nitrogen cooling unit. With equipment like this, we have published many papers in the field, like the first example of a structurally characterized copper(I)-trifluoromethyl complex in 2008,² which has been cited over 151 times. One of our goals in this project is to work with Professor Gouverneur to determine if there may be similar interesting intermediates in her catalysis chemistry that we could prepare, unambiguously structurally characterize, and further study. These efforts will lead to a better understanding into how the well-defined fluorinated intermediates could be better coaxed into targeted reactivity patterns in organic chemistry.

The collaboration is important to us, as we aim to study the fundamental chemistry of industrially relevant processes. Much of Professor Gouverneur's funds come from the health industry, so she is well in-tune with the problems that are of current to that area. Our lab has historically "slanted" to the inorganic/organometallic side to fluorine chemistry, so the collaboration will expose us to new areas in the organic side of the field to which we may contribute. Moreover, we are completely unfamiliar with the general experimental aspects of positron emission tomography, and exposure to her ¹⁸F isotope chemistry will help us understand how we can enter the field in a collaborative manner.

Reference

- 1) Thayer, A. M. In *Chemical & Engineering News*; American Chemical Society: 2006; Vol. 84, p 15.
- 2) Dubinina, G. G.; Furutachi, H.; Vici, D. A. *J. Amer. Chem. Soc.* **2008**, *130*, 8600.

Expected outcomes: The short term outcomes of the project will be to identify collaborative research projects with the Gouverneur group and to disseminate to the University of Oxford and surrounding institutions the chemistry that is taking place at Lehigh University. I have found in the past, when giving lectures at European institutions, that many of the faculty were completely unaware about Lehigh University. These seed grants represent a great step towards changing that. The long term outcomes could be manifold. We will obtain a better understanding of what organofluorine chemistry is important to the health community. We hope to also establish a long term collaboration with the Gouverneur group such that we could apply for external funding together, exchange students, and develop new course materials. Oxford is one of the premier chemistry research institutions in the world, and having access to the developments there would help keep our group "state-of-the-art."

Nature of interaction: The travel will provide an opportunity to have an extended and focused session with the Gouverneur group to facilitate the exchange of ideas. I plan to give a seminar at the beginning of my visit so that everyone in her group and department is aware of the chemistry that is taking place at Lehigh so we can more efficiently discuss how to integrate each other's research efforts into new directions. The seminar will also serve the dual role of advertising Lehigh's Chemistry Department to potential students. We will then focus more on one-on-one conversations. I will also request to attend her group meetings so that I can see what projects all of her students are currently working on and where there is need for help from us.

Pre-trip planning and preparation: Professor Gouverneur will be my host at Oxford, and her letter of support is provided with this application. I will arrange to stay in a hotel close to the Chemistry Department at Oxford. I will also contact neighboring institutions to explore the possibility of giving seminars in their departments to provide further exposure to Lehigh University. These universities include, but are not limited to: Imperial College, University of Cambridge, University of Manchester, and the University of Sheffield.

Expected follow-up steps upon return to Lehigh: Follow-up activities will include first directing my own research group to perform studies we have agreed upon. Obtaining new publications from our joint research efforts will be critical to better position us for exploring sources of funding to support future planned studies and exchanges. As required, I will write up a summary of my experience in the UK for Lehigh University. I will also explore inviting interested chemists from the UK to give talks at Lehigh University.

Proposed budget:

Car travel to Newark and air-fare to London (Expedia):	\$1400.00
Housing and meals (US State Department per diem) for Oxford:	\$3976.00
Internal travel in England:	<u>\$300.00</u>
Total:	\$5676.00

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Professor of Chemistry, Fellow of Merton College
Chair Blaise Pascal 2012-2014
EuChems Organic Division UK Representative - Secretary



To whom it may concern

25/02/2014

Professor David Vicic


I am writing to support Professor Vicic's application for funds to visit the University of Oxford for two weeks during the 2014-2015 academic year. The University of Oxford is the top research University in the United Kingdom, and is consistently ranked as one of the top Universities in the world by the /Times/ /Higher Education/. In terms of chemistry, the latest (2008) Research Assessment Exercise confirmed that Oxford Chemistry has the highest "power rating" (breadth and depth of science) in the UK.

Professor Vicic and I have met at multiple conferences where we were exposed to each other's work. These conferences include, among others, the 20th International Symposium on Fluorine Chemistry in Kyoto, the 17th European Symposium on Fluorine Chemistry in Paris, and at the National American Chemical Society meeting in San Diego. At these conferences we have developed a flavor for how each of us approaches problems in organofluorine chemistry, and I believe our complementary skill sets could be combined for a mutually beneficial collaboration.

The proposed two-week meeting would allow us to brainstorm on new ideas and discuss how our expertise could be combined to tackle unsolved problems in the field. In addition, Professor Vicic would have an opportunity to present a lecture at the University of Oxford, which always has the potential to stimulate interest from other researchers in our large department.

If you have any queries regarding this letter, please do not hesitate to contact me by phone/fax (int 44 1865 275 644) or by e-mail (veronique.gouverneur@chem.ox.ac.uk).

Yours sincerely,



Prof. Veronique Gouverneur