

## **FGIC: Establishing Research and Student Exchange at the University of Rome, Tor Vergata**

*Steven McIntosh, Associate Professor, Department of Chemical and Biomolecular Engineering*

**Summary:** This proposal seeks funding to enable a two-week stay in Italy to strengthen a fledgling research relationship with faculty in the department of Chemical Science and Technologies at the University of Tor Vergata, Rome, Italy. The concrete goals are to generate two collaborative grant proposals to be submitted to both US and Italian funding agencies, build a student exchange program between Lehigh and Tor Vergata at the undergraduate and graduate level, and establish initial agreement regarding a possible sabbatical stay. In addition to staying at Tor Vergata, I will attend two international research conferences held in Italy with my host to present, meet, and discuss our research ideas with our peers and potential funding agencies.

**Personal Motivation:** My motivation to request these funds and spend this time in Italy stems from my deep belief that international study experiences are life changing for students. I am the product of such a life changing 'intervention' by my own undergraduate advisor at the University of Edinburgh who convinced me to study for my PhD at U. Penn. I believe that the resulting challenge, life-experience, and personal growth that uniquely result from studying abroad are invaluable to students. I currently run an IIP program in Malaysia and serve as study abroad coordinator for my department for precisely these reasons. The proposed travel will enable me to establish an international collaboration and exchange opportunity between Lehigh and Tor Vergata.

**Professional goals and Nature of interaction:** The **primary personal professional goal** for the visit is to build upon a fledgling research collaboration with Prof Elisabetta Di Bartolomeo at the University of Rome Tor Vergata. While Elisabetta and I have spent a year discussing our joint interest in energy efficient solid oxide cells for power generation and renewable energy storage, we have never met in person. We have complimentary expertise; where I focus on bulk material properties, Elisabetta is an expert in interfacial phenomenon. Our measurable goal to this end is to outline two collaborative proposals to be submitted to funding agencies in the USA and Italy. We will submit both proposals to our own funding agencies with time and budget for year-long student exchange between the institutions. Note that federal agencies do not allow funding to be directly sent abroad but do allow funding of for PhD students to study abroad for a period. We will collaboratively advise the funded students, whether they are in the US or Italy. Such inter-country student advising is the 'normal' process for European Union funded programs that I had personal experience with as a postdoc at the University of Twente, Netherlands.

The **second goal** is to fully establish a PhD student exchange program in Chemical Engineering between Tor Vergata and Lehigh. Tor Vergata has an exchange program that enables PhD students to study at a foreign institution for up to one academic year. On such student, Caterina Sarno, from Prof. Bartolomeo's group is spending the '16-'17 academic year working with me at Lehigh. She is an excellent and dedicated student who has made exceptional progress in research, conducting neutron diffraction experiments at Oak Ridge National Laboratory and performing the associated data analysis. She will submit a first author journal article prior to leaving in May. The goal is to expand this program to make it bidirectional between multiple research groups. I will meet with the faculty at Tor Vergata to present the ongoing research at Lehigh and encourage the interaction. I will also act as intermediary to collect information on ongoing research at Tor Vergata and present this to my colleagues upon my return to Lehigh. I will then act as the 'middle man' to first introduce my colleagues to prospective collaborators at Tor Vergata.

The **third goal** is to discuss a possible undergraduate student exchange between Lehigh to Tor Vergata. If possible, I seek to establish a semester-long study abroad option for undergraduates in Chemical Engineering. While we currently have an 'option' to study abroad, very few of the students in my department take up this option due to complexities of scheduling with the current partner institutions and perceived lack of interest in the destination (Nottingham, UK). I believe the opportunity to study in Rome will be more attractive. I will meet with the faculty instructors who teach the equivalent to our first semester junior year courses to identify the correct course equivalents and prerequisite requirements. I will present the option for department approval upon my return. I have experience doing this for our Nottingham exchange.

Finally, the visit will coincide with two conferences held in Italy focusing on my research interests. Prof. Bartolomeo at Tor Vergata invited me as a keynote speaker to the International Workshop on Ceramics for Energy, hosted by the National Research Council of Italy. Attending this conference will enable extension of the research program to other potential partners in Europe and enable interaction with Italian funding agency representatives. Prof Bartolomeo and myself will both also attend and present (abstracts have been submitted) at the International Conference on Solid State Ionics. Spending a week together at the leading international conference in our field will be beneficial in focusing our joint conversation around the latest research ideas. This will also enable an additional goal of consolidating another new international relationship for myself with researchers at the University of Oslo, Norway. I was recently asked by Prof. Truls Norby at Oslo to serve on a PhD committee for one of his students who is conducting research based on some of my previous work. They will be attending this conference along with collaborators from SINTEF, the largest research organization in Scandinavia. I will seek to further my interactions with this group and discuss expansion of our collaborative efforts.

**Expected outcomes - short-term:**

1. Collaborative research proposal submission to US and Italian funding agencies.
2. PhD student exchange in Chemical Engineering between Tor Vergata and Lehigh.
3. PhD student mentoring and establishment of research collaboration with the University of Oslo and SINTEF, Norway.

**Expected outcomes - long-term:**

1. Semester Study abroad option for Chemical Engineering Students
2. Undergraduate and graduate student research exchange for RCEAS students with Tor Vergata

**Host academic:** Prof. Elisabetta Di Bartolomeo, University of Rome Tor Vergata. See attached letter.

**Pre-trip planning:** Caterina Sarno, the current exchange student visiting Lehigh, has offered to aid in coordinating my visit. She will help with the practical arrangements of accommodation at Tor Vergata. I will book all of my other accommodation and will travel by train and other public transport while in Italy.

**Follow-up:** In addition to the program requirements, I will present a summary of research interests from Tor Vergata to the ChE faculty at Lehigh and act as facilitator for initial contacts. I will also present research and study abroad opportunities to the sophomore class to encourage them to either travel during summer or spend a junior semester abroad. I will also work closely with the international programs office to facilitate the required MOU to establish any study abroad programs.

**Dates/Schedule of trip:** I have arranged this travel to coincide with my return trip from IIP program that I currently run to the University of Technology Petronas, Malaysia. There is currently a \$500 differential to include the additional stop in Rome on the return from Malaysia. This timing, and one week break during my time in Italy, will also enable me to attend both conferences in Italy. I will stay at Tor Vergata for five days (June 2<sup>nd</sup> -6<sup>th</sup>: ) prior to attending all three days of the International Workshop on Ceramics for Energy, Faenza, Italy, to deliver my invited keynote talk (June 7<sup>th</sup>-9<sup>th</sup>). I will then take a one-week personal break (June 10<sup>th</sup>-18<sup>th</sup>) prior to attending the 21<sup>st</sup> conference on Solid State Ionics, Padova, Italy (June 19<sup>th</sup>-24<sup>th</sup>). I will attend both conferences with my host and students from Tor Vergata to make a total of two work weeks plus one weekend with them. The focus during the days on-site at Tor Vergata will be to solidify the undergraduate and graduate student exchange components with the faculty and to more fully understand their ongoing research. The focus during the two conferences will be to work with Prof. Bartolomeo to generate research proposal outlines between the two of us and, potentially, with our international peers.

I used a rate of \$150 per night for hotels (note I will not stay in expensive central Rome), accommodation in Faenza is covered by the conference organizers. I will pay my conference registration fees in Padova from my residual Class of '61 professor funds and cover my personal travel to Padova from Faenza.

**Budget:** Additional Flight Cost: \$500. Train tickets from Rome-Faenza, Padova-Rome, Rome Airport to Rome Termini = \$200. Total of 11 hotel nights and 13 days of Meals:  $\$150 \times 11 + \$100 \times 14 = \$3,050$ .

**Total request including flight: \$3,750**



# Università di Roma "Tor Vergata"

Dipartimento di Scienze e Tecnologie Chimiche

Via della Ricerca Scientifica, 1 - 00133 Roma (IT) - Tel +39 06 72594337 Fax +39 06 72594328

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Dear Committee,

I am writing to offer my full support to Prof. Steven McIntosh in his application to the Faculty Grants for International Connections program. We share a common research interest in developing electrode materials for solid oxide fuel cells and electrolysis cells and have been working to build a collaborative research program over the past six months. The main purpose of his visit to Italy will be to discuss and outline two grant proposals that we will submit to funding agencies in Europe and the USA. We will jointly advise any PhD students who are supported on this funding. We will also work to build an exchange program for students from Lehigh and Tor Vergata.

My PhD student, Caterina Sarno, has been studying with Prof. McIntosh at Lehigh since September 2016 and will return to Italy in May 2017. During this time she has had the opportunity to perform experiments at the Spallation Neutron Source at Oak Ridge National Laboratory under Prof. McIntosh's guidance. Access to this globally unique facility and opportunity to study at Lehigh has had a dramatic impact on Caterina's research outlook and personal growth. I hope that this is the first of many such successful student exchange to occur in the future.

I also look forward to our jointly attending both the International Workshop Ceramics for Energy in Faenza and the 21<sup>st</sup> International Conference on Solid State Ionics in Padova. I personally invited Prof. McIntosh to the Faenza conference and the conference organizers will provide his registration fee and accommodation during the conference. Attending both conferences will allow us to discuss our research ideas with other possible international collaborators and possibly extend the scope of the proposed program. It will also enable us to receive critical feedback on the ideas and put them in context of the latest advances in the field.

I look forward to welcoming Prof. McIntosh to Rome where we will seek to further our own research collaboration and establish a substantial student exchange program between our institutions. Our initial efforts towards these goals are proving quite successful.

Yours faithfully,

Elisabetta Di Bartolomeo

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Associate Professor  
University of Rome Tor Vergata  
Department of Chemical Science and Technologies  
via della Ricerca Scientifica 1  
00133 Rome Italy  
Tel: +390672594491  
Fax: +390672594328