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### **Project: Next-Generation Small Molecule Acceptors for use in Organic Solar Cells**

This project aims to develop new acceptor materials for organic photovoltaics (OPVs) in order to evaluate non-traditional design principles.

Fullerene acceptors were the traditional materials of choice for OPVs. However, fullerenes have now been shown to be susceptible to photochemical oxidation, which limits their potential for large-scale utilisation. In contrast, small molecule acceptors (SMAs) have significant potential for development. In particular, recent observations suggest that two long-held OPV design principles do not apply to SMAs. First, much smaller donor/acceptor orbital energy offsets can drive electron transfer than previously thought, meaning that more absorbed solar energy can be converted into electricity. Second, it has typically been assumed that strong electronic coupling between donor and acceptor molecules is desirable, because strong coupling increases the rate of charge transfer. However, the charge recombination rate also increases with electronic coupling. It was recently proposed that, in SMA systems, decreasing the donor/acceptor coupling may in fact *increase* the difference between the rates of charge transfer and charge recombination, thereby increasing overall photovoltaic efficiency. In this project, we will design, prepare and evaluate a series of novel SMAs to assess the validity of this hypothesis. The successful applicant will have the opportunity to develop a diverse set of skills, including: synthesis and characterisation of OPV materials, device fabrication and ultrafast spectroscopy.

We are seeking a highly motivated person with interests in organic synthesis, physical chemistry, materials science and spectroscopy. Applicants should have a degree equivalent to the 4-year BSc (Honours) degree in New Zealand, with 1st class Honours and a major in Chemistry or a related field. Candidates should satisfy the requirements for admission as a PhD candidate at Victoria University of Wellington.<sup>1</sup>

The successful researcher will work under the supervision of Dr Paul Hume, associated with the ultrafast spectroscopy group led by Professor Justin Hodgkiss.<sup>2</sup> Our highly interdisciplinary group is based at Victoria University of Wellington,<sup>3</sup> located in the thriving capital city of New Zealand.<sup>4</sup> This collaborative project also involves Associate Professor Geoffrey Waterhouse of the University of Auckland, and Professor Xioawei Zhan of Peking University. As such, the project will involve travel to Peking University.

Funding for this project is provided by the Marsden Fund. The successful applicant will receive a tax-free stipend of NZ\$27,500 per annum and PhD tuition fees for three years.

To apply, please send a CV, academic record, and the names and contact details of two referees to paul.hume@vuw.ac.nz with "SMA PhD Project" in the subject line.

#### **References:**

- 1) <http://www.victoria.ac.nz/fgr/prospective-phds/how-to-apply>
- 2) <http://www.victoria.ac.nz/scps/about/staff/justin-hodgkiss>
- 3) <http://www.victoria.ac.nz>
- 4) <http://www.wellingtonnz.com/discover>