Project Details:

This PhD project is part of an international collaboration investigating thermal nonequilibrium in hypersonic separated flows, funded through an Australian Research Council Discovery Projects grant.

At high speeds, the nitrogen and oxygen molecules in air can rotate and vibrate at very different characteristic temperatures, and prediction of the thermal behaviour of these flows is not well developed, despite accurate modelling being necessary to predict the heating of vehicles entering into planetary atmospheres.

To measure vibrational and rotational temperatures in hypersonic flows, it is necessary to use laser-based methods. One method that can simultaneously measure the vibrational and rotational temperatures of nitrogen and oxygen molecules is the dual-pump coherent anti-Stokes Raman scattering method (dual-pump CARS). This PhD project involves building a dual-pump CARS system and measuring the temperatures in a hypersonic separated flow. These measurements will be compared with state of the art computations, and experimental measurements of rotational measurements made using another laser-based technique.

The successful PhD applicant will undertake this work in the high-speed fluids research group within the School of Engineering and Information Technology at UNSW Canberra. This group performs internationally recognised research in hypersonic aerothermodynamics and gas turbine, rocket and scramjet propulsion systems and the development of associated experimental, diagnostic and simulation techniques. The academics and research students in the group also work closely with their colleagues at UNSW Canberra on the analysis and development of space-based systems.

The successful applicant, subject to admission to the PhD degree program, will be awarded a UNSW Scholarship with an annual tax-free stipend of $25,853 (2014 rate). This scholarship is for a period of 3 years, subject to satisfactory progress reviews. The successful applicant would be expected to be available to commence their studies no later than Session 2, 2014. Applications will be accepted until a suitable candidate is found.

The Canberra campus of the University of New South Wales is located at the Australian Defence Force Academy (ADFA). ADFA is located in an Australian bushland setting less than five kilometres from the city centre and the Canberra airport in Australia’s Capital city.

The UNSW Canberra campus has a large and comprehensive library, state-of-the-art computing facilities, and well-equipped, modern laboratories.

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