

Opportunity Title: Chemical Lasers and Laser Spectroscopy

Opportunity Reference Code: AFSTFP-AFIT-2018-B5164

Organization U.S. Air Force

Reference Code AFSTFP-AFIT-2018-B5164

How to Apply A complete application package consists of:

- An application
- A current resume/CV
- Transcript(s) – For this opportunity, an unofficial transcript or copy of academic records printed by the applicant or by academic advisors from internal institution systems may be submitted. **Official Transcripts for Junior applicants must be sent to ORAU directly from the academic institution, including graduation date and degree awarded, and must be provided before the fellowship can begin.** All transcripts must be in English or include an official English translation.
- Three references

Additional documents to be uploaded must be in PDF format in a standard typeface no smaller than 12-point font, 1" margins, and double-spaced.

- Research Proposal (maximum of 10 pages)
- Dissertation Abstract (maximum of 1 page) *not required for Senior applicants*
- Summary of Previous and Current Research (maximum of 4 pages)
- List of Publications (maximum of 2 pages)

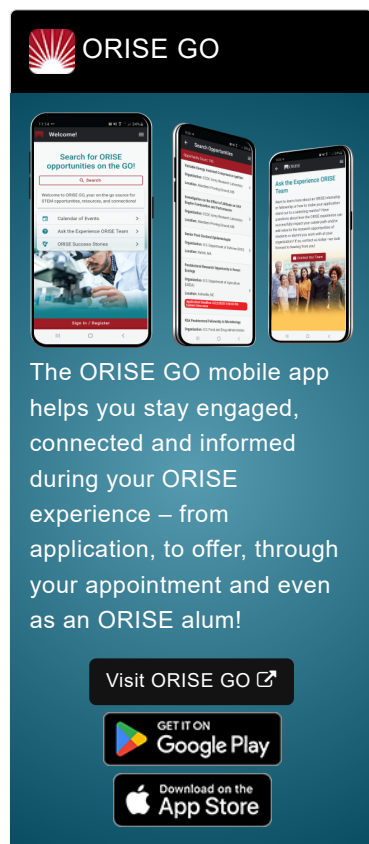
If you have questions, send an email to

AirForceFellowships@orau.org. Please include the reference code for this opportunity in your email.

Description Experimental research in laser physics, spectroscopy, chemical kinetics, flow dynamics, and radiative transfer form the basis for advanced laser demonstrations and the remote sensing of battle-space combustion events. Several technologies supported by the AFIT laser weapons and space surveillance research group include:

(1) *Airborne Laser*. The megawatt class Chemical Oxygen-Iodine Laser (COIL) is the weapon system aboard the Airborne Laser, designed to destroy theater missiles during the boost phase. AFIT has a more than 30-year history support the Air Force's high-energy laser program. Recent AFIT research in support of COIL devices include analyzing gas phase reaction rates, developing optical diagnostics to measure the supersonic flow field conditions, including laser saturation spectroscopy and planar laser induced fluorescence, and novel chemistry for singlet oxygen production.

(2) *Gas Phase Lasers*. Diode or fiber laser pumped alkali vapor lasers have emerged as scalable laser devices and we are investigating lineshapes, energy transfer kinetics, and laser device scaling. In addition, moderate power laser sources are required for electro-optic countermeasure missions such as blinding heat-seeking missiles. We are



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investigating photolytic gas phase laser systems and nonlinear optical techniques to develop new lasers operating in the near infrared at 3-5 microns.

(3) *Remote Sensing.* Space and airborne based surveillance systems for battlespace awareness are being developed. Applications include the classification of detonation and combustion events from spectral and imaging signatures, monocular passive ranging, chromotomography for hyperspectral imaging, and atmospheric transmission of high energy lasers. Both instrument development and basic phenomenology is stressed during field deployment and subsequent data analysis.

(4) *Optical Diagnostics.* New optical methods for detecting and monitoring chemical processes are in high demand. Several examples of AFIT's activities in developing optical diagnostics include (1) assessing desorption of soil contaminants from aircraft degreasing operations, (2) studying thin-film processing from laser ablation and plasma processing, and (3) characterizing combustion chemistry. Emphasis is placed on the fundamental plume dynamics and spectroscopy in pulsed laser deposition of high-temperature superconductors to enable the manufacture of superconducting wires for aircraft power generation.

Research Advisor

Prospective applicants are encouraged to contact the opportunity's Research Advisor, listed below, to discuss the applicant's approach for responding to this research opportunity and to discuss their potential collaboration on the research opportunity.

Dr. Glen P. Perram, glen.perram@afit.edu, (937) 255-3636 Ext.4504

Qualifications Candidates must have a Ph.D., Sc.D., M.D., D.V.M., or academically equivalent research doctorate before beginning the fellowship.

Candidates must have U.S. citizenship. Research opportunities at AFRL, AFIT, and USAFA are open to U.S. citizens only. Qualified applicants will receive consideration without regard to race, creed, color, age, sex, or national origin.

Stipend rates are determined by Air Force officials, and are based on the applicant's academic and professional background. The fellow must show proof of health and medical insurance. Health insurance can be obtained through ORAU. The fellow will not enter into an employee/employer relationship with ORAU, USAF, or any other facility, office or agency. Instead, the participant will be affiliated with ORAU for the administration of the appointment through the ORAU appointment letter and Terms of Appointment.

For more information, please visit the Air Force STFP website at <https://AirForceFellowships.orau.org>.

Eligibility • **Citizenship:** U.S. Citizen Only

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- Requirements**
- **Degree:** Doctoral Degree.
 - **Discipline(s):**
 - **Chemistry and Materials Sciences** ([12](#) )
 - **Computer, Information, and Data Sciences** ([16](#) )
 - **Earth and Geosciences** ([21](#) )
 - **Engineering** ([27](#) )
 - **Environmental and Marine Sciences** ([12](#) )
 - **Life Health and Medical Sciences** ([45](#) )
 - **Mathematics and Statistics** ([10](#) )
 - **Other Non-Science & Engineering** ([2](#) )
 - **Physics** ([16](#) )
 - **Science & Engineering-related** ([1](#) )
 - **Social and Behavioral Sciences** ([18](#) )