

# Sean McGuire

Maître de Conférences, CentraleSupélec  
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## Office Contact Information

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Citizenship: USA

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## Education

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### Princeton University

PhD in Aerospace Engineering (*September 2015*)  
GPA: 3.875 / 4.000  
Supervisor: Prof. Richard Miles

2010 - 2015

### Whitworth University

B.S. in Physics / B.A. in Mathematics  
Graduated *summa cum laude* (GPA : 4.000 / 4.000)

2006 - 2010

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## Research Experience

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### Maître de Conférences, CentraleSupélec

*Plasma research team, laboratoire EM2C*

Research: Optical diagnostics for the study of plasma and gas dynamics.

Teaching: Heat Transfer, Thermodynamics, Fluid Mechanics, Student Workshops  
(Development of professional skills in engineering)

Sep. 2017 - present

### Postdoctoral Researcher, CNRS (EM2C/CentraleSupélec)

Application of laser and optical techniques to the study of high enthalpy flows and weakly ionized plasmas. Relevant techniques included absorption/emission spectroscopy, LIF and Raman scattering. Specific focus was on the application of these diagnostics to atmospheric reentry studies and identification of atomic/molecular species produced within the high temperature boundary layer of a reentry capsule as it reenters the earth's atmosphere.

Oct. 2015 - Aug. 2017

### Graduate Student, Princeton University

Development of nonintrusive gas diagnostic techniques for application to hypersonic flows, including new laser-based concepts for determining flow speed and sampling molecular population distributions.

Jul. 2010 - Aug. 2015

### Visiting Student, École Polytechnique

Assessed the potential for using absorption spectroscopy to make concentration measurements in plasma assisted combustion systems. Implemented codes which simulated absorption spectra under various conditions and identified spectral features of interest.

Jun. 2013

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## Teaching Experience

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Maître de Conférence, CentraleSupélec

Sep. 2017 - present

- Heat Transfer: beginning and advanced courses (steady/unsteady heat transfer, radiation, convection and conduction)
- Thermodynamics: thermodynamic cycles, power generation, phase changes for pure substances and mixtures
- Transport Phenomena: heat transfer (radiation, conduction, convection), fluid mechanics (Navier-Stokes equations, compressible flow)
- Professional skills workshop: leader/ animator of student workshop which teaches students professional engineering skills such as leadership, working in a team, communicating and presenting results, etc...
- Laboratory Session: Emission Spectroscopy of a Plasma Discharge (part of the “Physique des Plasmas et de la Fusion” program)

**Laboratory Instructor, CentraleSupélec / Physique des Plasmas et de la Fusion** October 2015/2016

Designed and taught laboratory course for master’s level students within the program Physique des Plasmas et de la Fusion (PPF). Course focused on the use of emission spectroscopy to study plasma systems.

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## Publications and Presentations

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### Journal Publications

McGuire, S., Tibère-Inglesse, A., Mariotto, P., Cruden, B. and Laux, C. “Measurements and modeling of CO 4th positive (A - X) radiation,” *Journal of Quantitative Spectroscopy and Radiative Transfer*, forthcoming.

Tibère-Inglesse, A., McGuire, S., Mariotto, P. and Laux, C., “Experimental study of recombining nitrogen plasmas: I. Vibronic population distributions and nonequilibrium molecular radiation,” *Plasma Sources Science & Technology*, 28 (7), 2019.

Tibère-Inglesse, A., McGuire, S., Mariotto, P. and Laux, C., “Validation cases for recombining nitrogen and air plasmas,” *Plasma Sources Science & Technology*, 27 (11), 2018.

McGuire, S. Tibère-Inglesse, A. and Laux, C., “Ultraviolet Raman spectroscopy of N<sub>2</sub> in a recombining atmospheric pressure plasma,” *Plasma Sources Science & Technology*, 26 (11), 2017.

McGuire, S. Tibère-Inglesse, A. and Laux, C., “Infrared spectroscopic measurements of Carbon Monoxide within a high temperature ablative boundary layer,” *Journal of Physics D: Applied Physics*, 49(48):485502, 2016.

Miles, R.B. et al., “New diagnostic methods for laser plasma- and microwave-enhanced combustion,” *Phil. Trans. R. Soc. A*, 373, 20140338 (2015)

McGuire, S. and Miles, R. B., “Collision induced ultraviolet structure in nitrogen radar REMPI spectra,” *Journal of Chemical Physics*, 141, 244301 (2014)

### Doctoral Thesis

Sean McGuire. *Stand-Off Gas Phase Diagnostics by Microwave Detection of Laser Generated Ionization*. PhD thesis, Princeton University, 2015.

## Conference Proceedings

McGuire, S., Tibère-Inglesse, A., Mariotto, P., Cruden, B. and Laux, C. “VUV radiation of high temperature CO<sub>2</sub>/Ar plasmas”, 2020 AIAA Scitech Meeting, (AIAA 2020-0732).

- Presented at AIAA Scitech 2020

Grimaldi, C., McGuire, S. and Laux, C. “Temperature and radiation measurements of an atmospheric pressure CO<sub>2</sub> plasma”, 2020 AIAA Scitech Meeting, (AIAA 2020-1708).

McGuire, S., Tibère-Inglesse, A. and Laux, C. “Carbon monoxide radiation in an equilibrium plasma torch facility”, 2019 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2019-1775).

- Presented at 56th AIAA Aerospace Sciences Meeting

Tibère-Inglesse, A, McGuire, S. and Laux, C. “Atomic radiation from a recombining nitrogen plasma”, 2019 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2019-2068).

McGuire, S., Bailet, G. and Laux, C. “Development of a probe for in-situ radiative heat flux measurements at the surface of an ablator”, 2018 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2018-0498).

- Presented at 56th AIAA Aerospace Sciences Meeting

Tibère-Inglesse, A, McGuire, S. and Laux, C. “Nonequilibrium radiation from a recombining nitrogen plasma”, 2018 AIAA Aerospace Sciences Meeting, AIAA SciTech Forum, (AIAA 2018-0241).

McGuire, S. and Laux, C., “Experimental analysis of atomic Carbon and Carbon Monoxide production within a high temperature ablative boundary layer,” *55th AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2017.

- Presented at 55th AIAA Aerospace Sciences Meeting

McGuire, S. and Miles, R. B., “Methods for Enhancing Radar REMPI Sensitivity,” *53rd Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2015.

- Presented at 53rd AIAA Aerospace Sciences Meeting

McGuire, S. and Miles, R. B., “Radar REMPI measurements of  $N_2$  rotational temperature,” *45th Plasmadynamics and Lasers Conference*, American Institute of Aeronautics and Astronautics, 2014.

- Presented at AIAA 45th Plasmadynamics and Lasers Conference

McGuire, S., Chng, T. L. and Miles, R. B., “Nanosecond time-resolved 2+2 Radar REMPI measurements performed in molecular nitrogen,” *44th Plasmadynamics and Lasers Conference*, American Institute of Aeronautics and Astronautics, 2013.

- Presented at AIAA 44th Plasmadynamics and Lasers Conference

McGuire, S., Zaidi, S., Dogariu, A. and Miles, R. B., “The intrinsic phase shift and its effect upon the measurement of airflow velocities using LITRA,” *51st AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2013.

- Presented at 51st AIAA Aerospace Sciences Meeting

McGuire, S., Zaidi, S., Dogariu, A., Howard, P. and Miles, R. B., “Measuring the Velocity of a Supersonic Airflow Using Laser Ionization Tagged Radar Anemometry (LITRA),” *50th AIAA Aerospace Sciences Meeting*, American Institute of Aeronautics and Astronautics, 2012.

- Presented at 50th AIAA Aerospace Sciences Meeting

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## Honors and Awards

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Centre National d’Études Spatiales (CNES) Postdoctoral Fellowship

beginning Oct. 2016

**Program in Plasma Science & Technology Fellowship**  
Princeton University

Sep. 2012 - Aug. 2015

**Wu Prize for Excellence**  
*Mechanical & Aerospace Engineering Dept.*, Princeton University

Jun. 2014

**Cummins Merit Fellowship**  
*Mechanical & Aerospace Engineering Dept.*, Princeton University

Mar. 2011 - May 2012

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## Skills

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- Optical Diagnostics: primary : resonance-enhanced multiphoton ionization (REMPI), absorption/emission spectroscopy, laser induced fluorescence (LIF), schlieren/shadowgraph
- Laser Alignment/Operation - Nd:YAG, Dye and Ti:Sapphire systems
- Microwave Engineering - radar system assembly, homodyne/heterodyne detection, waveguides, amplifiers, mixers, circulators/isolators, etc.
- Imaging - optical elements, cameras, intensifiers
- Vacuum engineering - high vacuum system design, helium leak testing
- CAD - basic level of proficiency (experience working with the SpaceClaim software)
- Computer Programming - C++, MATLAB, Mathematica, Python
- Electrical Control Systems - microcontrollers, printed circuit boards, etc...