Curriculum Vitae

James B. Scoggins, Ph.D.

Postdoctoral Researcher
Center for Applied Mathematics
École Polytechnique

Aerospace Engineer (temporary leave)
Aerothermodynamics Branch
NASA Langley Research Center

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EDUCATION

Ph.D. Energy Sciences 2017
Degree obtained jointly between
CentraleSupélec, Gif-sur-Yvette Cedex, France
von Karman Institute for Fluid Dynamics, Rhode-Saint-Genese, Belgium

M.Sc. Aerospace Engineering and Graduate Minor in Mathematics 2011
North Carolina State University, Raleigh, NC

B.Sc. Aerospace Engineering 2009
Magna Cum Laude
North Carolina State University, Raleigh, NC

RESEARCH AND WORK EXPERIENCE

Aerospace Engineer (currently on temporary leave) 2020 - present
Aerothermodynamics Branch, NASA Langley Research Center

Postdoctoral Researcher 2018 - present
Center for Applied Mathematics, Ecole Polytechnique
- Investigated the solution of multi-scale PDEs with neural networks
- Developed machine learning moment methods for polydisperse spray modeling

Research Associate 2018
Advanced Supercomputing Division, NASA Ames Research Center
- Applied deep learning for emergent sun spot and porous media property prediction
- Supported several active projects as main developer of the Mutation++ library

Postdoctoral Researcher 2017
von Karman Institute for Fluid Dynamics
- Developed narrow band radiation model for meteor physics
- Developed kinetic theory of magnetized plasmas in collaboration with Dr. Vincent Giovangigli at École Polytechnique

Doctoral Student 2012 - 2017
Thesis: Development of numerical methods and study of coupled flow, radiation, and ablation phenomena for atmospheric entry.
Advisors: Dr. Thierry Magin and Dr. Anouar Soufiani
Jointly at CentraleSupélec and von Karman Institute for Fluid Dynamics

Graduate Student 2009 - 2011
Thesis: The development of a thermochemical nonequilibrium ablation and pyrolysis model for carbon-phenolic thermal protection systems.
Advisor: Dr. Hassan A. Hassan.
Department of Mechanical and Aerospace Engineering, North Carolina State University

NASA Ames Research Center Summer Intern 2009 - 2012
Technical Monitor: Dr. Nagi N. Mansour
- Carbon-phenolic thermal protection system modeling
- Arc-jet radiation and flow modeling

HONORS AND AWARDS

Fondation Mathématique Jacques Hadamard Postdoctoral Fellowship 2019

NASA Graduate Student Research Program 2009
NASA Ames Research Center

North Carolina Space Grant 2009

NOAA Ernest F. Hollings Scholarship 2007

Undergraduate Honor Societies 2005 - 2009
- Sigma Gamma Tau National Aerospace Engineering Honor Society
- Phi Eta Sigma National Honor Society
- National Society of Collegiate Scholars

TEACHING ACTIVITIES

Introduction to Machine Learning, Lab Director 2019 - 2020
Batchelor Program in Mathematics and Engineering
Computer Science Department, École Polytechnique

AI and Data Science Summer School, Lecturer 2019
Aimed at graduate students in various backgrounds
École Polytechnique

Deep Learning, Teaching Coordinator 2018 - 2019
Masters Program in Mathematics
Applied Mathematics Department, École Polytechnique

VKI Programming Seminars, Lecturer and Organizer 2015 - 2016
von Karman Institute for Fluid Dynamics

Introduction to Fortran, Teaching Assistant 2006
Computer Science Department, North Carolina State University

Student Mentoring 2016 - present
- Mentored 3 Ph.D. students (2 are now postdocs and 1 is in final year)

- Co-supervised 4 Master students (1 at NCSU and 3 at VKI)
- Supervised 6 student interns (5 at VKI and 1 at NASA ARC)

SERVICE TO SCIENTIFIC COMMUNITY

Referee of Scientific Journals 2017 - present

- Carbon
- Computer Physics Communications
- International Journal of Heat and Mass Transfer
- Journal of Quantitative Spectroscopy and Radiative Transfer
- Journal of Thermophysics and Heat Transfer
- SoftwareX

Organization of Scientific Forums

- Mini-symposium: *Breaking the Mesh: Solving PDEs with Deep Learning* 2019
  SMAI Congress
- École Polytechnique working group on solving PDEs with Deep Learning 2018 - 2019

Development of Open-Source Software

- Creator of Mutation^{++}: MUlticomponent Thermodynamic And Transport properties for IONized gases in C++. https://github.com/mutationpp/Mutationpp

PUBLICATIONS

1. **J.B. Scoggins**, V. Leroy, G. Bellas-Chatzigeorgis, B. Dias, T.E. Magin. Mutation++: Multicomponent thermodynamic and transport properties for ionized gases in C++. *SoftwareX* 12, 2020.

2. B. Dias, **J.B. Scoggins**, T.E. Magin. Luminosity calculation of meteor entry based on detailed flow simulations in the continuum regime. *Astronomy and Astrophysics* 635:A184, 2020.

3. Q. Wargnier, A. Alvarez Laguna, **J.B. Scoggins**, N.N. Mansour, M. Massot, T.E. Magin. Consistent transport properties in a two temperature multicomponent plasma model. *Astronomy and Astrophysics* 635:A87, 2020.

4. A. Bellemans, **J.B. Scoggins**, R.L. Jaffe, T.E. Magin. Transport properties of carbon-phenolic gas mixtures. *Physics of Fluids* 31:096102, 2019.

5. M. Fossati, A. Mogavero, J. Herrera-Montojo, **J.B. Scoggins**, T.E. Magin. A kinetic BGK edge-based scheme including vibrational and electronic energy modes for high-Mach flows. *Computers and Fluids* 185:1-12, 2019.

6. **J. B. Scoggins**, J. Rabinovitch, B. Barros-Fernandez, A. Martin, J. Lachaud, R.L. Jaffe, N.N. Mansour, G. Blanquart, T.E. Magin. Thermodynamic properties of equilibrium carbon-phenolic gas mixtures. *Aerospace Science and Technology* 66:177-192, 2017.

7. J. Lachaud, **J.B. Scoggins**, T.E. Magin, M.G. Meyer, N.N. Mansour. A generic local thermal equilibrium model for porous reactive materials submitted to high temperatures. *International Journal of Heat and Mass Transfer* 108:1406-1417, 2017.

8. B. Helber, A. Turchi, **J.B. Scoggins**, A. Hubin, T.E. Magin. Experimental investigation of ablation and pyrolysis processes of carbon-phenolic ablators in atmospheric entry plasmas. *International Journal of Heat and Mass Transfer* 100:810-824, 2016.

9. L. Soucasse, **J.B. Scoggins**, P. Rivière, T.E. Magin, A. Soufiani. Flow-radiation coupling for atmospheric entries using a Hybrid Statistical Narrow Band model. *Journal of Quantitative Spectroscopy and Radiative Transfer* 180:55-56, 2016.

10. **J.B. Scoggins**, T.E. Magin. Gibbs function continuation for linearly constrained multiphase equilibria. *Combustion and Flame* 162(12):4514-4522, 2015.

11. J. Lachaud, T. van Eekelen, **J.B. Scoggins**, T.E. Magin, N.N. Mansour. Detailed chemical equilibrium model for porous ablative materials. *International Journal of Heat and Mass Transfer* 90:1034-1045, 2015.