Samuel Olivier

Education

University of California, Berkeley Fall 2017 – Present
Applied Science and Technology, PhD (expected May 2021)
Advisors: Rachel Slaybaugh (UCB) and Terry Haut (LLNL)

Texas A&M University 2013–2017
B.S., Nuclear Engineering with Minor in Applied Mathematics. Magna Cum Laude

Research Experience

University of California, Berkeley – Graduate Student Researcher Fall 2017 – Present

Los Alamos National Laboratory – CSGF Practicum Summer 2019

- Developed a Fully Local Quasidiffusion discretization for linear triangles under the supervision of James Warsa
- Implemented FLQD in Capsaicin, a production Thermal Radiative Transfer code at LANL

Lawrence Livermore National Laboratory – High Energy Density Physics Intern Summer 2018

- Developed a high order finite element discretization for the Variable Eddington Factor equations in 2/3D.
- Implemented Variable Eddington Factor acceleration in an LLNL laboratory directed research code for investigating high order FEM methods for thermal radiative transfer on curved meshes.

Lawrence Livermore National Laboratory – High Energy Density Physics Intern Summer 2017

- Created a generalized nuclear reaction network framework capable of simulating the evolution of an arbitrary number of isotopes for Cosmos++, an LLNL astrophysics code.
- Created a massively parallel nucleosynthesis post processor to regain isotopic resolution from simulations run with small networks.
- Used the generalized network and post processor to investigate the effect of tidal disruption on a white dwarf's composition.

Center for Exascale Radiation Transport – Undergraduate Researcher Spring 2017

- Developed a mixed finite element discretization for the Variable Eddington Equations in 1D.
- Created a 1D Lumped Linear Discontinuous Galerkin Discrete Ordinates solver in Python to compare source iteration accelerators (S_2SA, DSA, VEF).
- Showed that VEF acceleration was as effective as S_2SA and that the thick diffusion limit was preserved with the inconsistent mixed FEM discretization.

Lawrence Livermore National Laboratory – High Energy Density Physics Intern Summer 2016

- Implemented a 19 isotope nuclear reaction network into Cosmos++.
- Verified the network with hydrostatic test problems and showed that the 19 isotope network is an inexpensive method for modeling stellar evolution.

Fuel Cycle and Materials Laboratory – Undergraduate Researcher/Lab Technician Fall 2014 – Spring 2016

- Designed an electrorefiner to purify depleted uranium metal with non-aqueous electrolysis.

Skills

Programming

- Languages: C/C++, Python, Julia
- Platforms: Linux
- Parallel Programming: MPI, OpenMP, CUDA, UPC++ on HPC platforms (LLNL, NERSC, OLCF, TAMU)
- Code Development: git, Make, CMake, Doxygen, Jira, Unix, Sublime Text
- Software: MFEM, Gmsh, SuperLU, LAPACK, Hypre, Eigen, VisIt, Paraview, MCNP, Mathematica, OpenFOAM, scikit-learn, MESA, TotalView, LaTeX
- Hardware: I administrate a three-node, "home cluster"/file server

Numerical Methods

- Finite Elements: Lagrange, Raviart Thomas, mixed methods, Discontinuous Galerkin. Solving the resulting linear system with sparse direct (LU, Schur complement) and iterative methods (CG, GMRES). Efficient implementation procedures.
- Spectral Methods: Fourier and Chebyshev solution techniques for Navier Stokes and Euler's equations.
- Time Integrators: Fractional step methods, Implicit Runge Kutta, nonlinear Newton iteration.

Nuclear Engineering

- Neutron Transport: diffusion, S_N, preconditioning (DSA, S_2SA, VEF)
- Hydrodynamics: linear stability analysis

Research Interests

- Algorithm development for efficiently solving Deterministic Radiation Transport on high performance computers
- Methods development for computational multiphysics
- High order finite element spatial discretizations
- GPU computing

Awards and Recognitions

- **Department of Energy Computation Science Graduate Fellowship** (2018–Present)
- Nuclear Regulatory Commission Fellowship (2017–2018)
- Alpha Nu Sigma National Honor Society Member (2015–Present)
- Bill R. Teer '55 Scholarship – Nuclear Engineering Dept. TAMU (2016–2017)
- Harold Joe Giroir Jr. Memorial Scholarship – Nuclear Engineering Dept. TAMU (2015–2016)
- Lechner Scholarship – Texas A&M University (2013–2017)

Publications

1. Ben S. Southworth and **Samuel S. Olivier**, "A Note on 2×2 Block-Diagonal Preconditioning", submitted to SIAM (Jan 2020).

2. Ben C. Yee, **Samuel S. Olivier**, Terry S. Haut, Milan Holec, Vladimir Z. Tomov, and Peter G. Maginot, A Quadratic Programming Flux Correction Method for High-Order DG Discretizations of SN Transport, submitted to *Journal of Computational Physics* (Oct 2019).

3. Peter Anninos, P. Chris Fragile, **Samuel S. Olivier**, Robert Hoffman, Bhupendra Mishra, and Karen Camarda, "Relativistic Tidal Disruption and Nuclear Ignition of White Dwarf Stars by Intermediate Mass Black Holes," *The Astrophysical Journal*, 865:1, (2018).

4. **Samuel S. Olivier** and Jim E. Morel. "Variable Eddington Factor Method for the S_N Equations with Lumped Discontinuous Galerkin Spatial Discretization Coupled to a Drift-Diffusion Acceleration Equation with Mixed Finite-Element Discretization," *Journal of Computational and Theoretical Transport*, 46:6-7, 480-496 (2018).

Conference Proceedings

1. **Samuel S. Olivier**, Peter G. Maginot, and Terry S. Haut, High Order Mixed Finite Element Discretization for the Variable Eddington Factor Equations, in: Proceedings of the International Conference on Mathematics and Computational Methods applied to Nuclear Science and Engineering (M&C 2019), Portland, OR, 2019.