Andrew T. Till

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EDUCATION

Ph.D., Nuclear Engineering, 2015
Advisors: M. L. Adams and J. E. Morel
Dissertation Title: *Finite Elements with Discontiguous Support for Energy Discretization in Particle Transport*
Texas A&M University, College Station, TX

M.S., Nuclear Engineering, 2014
Advisors: M. L. Adams and J. E. Morel
Thesis Title: *A Generalized Multigroup Method*
Texas A&M University, College Station, TX

B.S.E., Nuclear Engineering and Radiological Sciences, 2010
Minors: Mathematics and Physics; *summa cum laude*
University of Michigan, Ann Arbor, MI

SKILLS

Programming

- **Parallel programming** (MPI, OpenMP) on HPC platforms (LLNL, LANL, TAMU)
- Code development (Unix, CMake, Eclipse, TotalView) with version control (Git, Subversion) and profiling (VTune, HPCToolkit) with verification (unit tests, nightly regression suites)
- Writing and collaborating on large codes (PDT, Capsaicin, OpenMC) in several languages (C++, Fortran, Matlab, Python)

Numerical Methods

- **Finite elements** (nodal, modal, face-based, continuous, discontinuous)
- Iterative solvers (CG, GMRES, Newton, JFNK, Anderson Mixing / NKA)
- Preconditioning (linear multifrequency-gray, diffusion, physics-based operator splitting)
- **Uncertainty quantification** (verification, validation, uncertainty quantification, Latin Hypercube sampling [LHS], Markov-Chain Monte Carlo [MCMC], Kennedy-O'Hagan modeling, emulators)

Nuclear Engineering

- **Neutron transport** (diffusion, MOC, S_N, Monte Carlo) for reactor (criticality eigenvalue, depletion) and pulsed source (time-dependent time-of-flight) applications
- Nuclear data and cross section preparation (ENDF-6, NJOY, MC^2-3, multigroup [MG], multiband [MB], subgroup [SG], probability tables [PT])
- **Radiation hydrodynamics** (Euler equations, S_N, flux-limited diffusion, implicit Monte Carlo [IMC], Lagrangian and Eulerian fames)
- Radiological sciences (plasma physics, radiation detection, health physics, modern physics)

RESEARCH

Dissertation work: Used clustering algorithms from machine learning to generate energy meshes, which were combined with basis functions to provide a discretization of the energy variable for the neutron transport equation; applied the method to several reactor problems and a time-dependent pulsed-source time-of-flight problem

Thesis work: Researched higher-order, multiband-like discretizations of the energy variable for the neutron transport equation; applied the method to pin-cell problems

Other work: Implemented k-eigenvalue and NKA solvers in PDT, a **massively parallel deterministic transport code** developed at Texas A&M University

EXPERIENCE

Los Alamos National Laboratory —- Postdoc — June 2016 – present
Nicholas C. Metropolis Fellow
Computational Physics and Methods Group (CCS-2)

Texas A&M University — Lecturer — Jan. 2016 – May 2016
Department of Nuclear Engineering

Argonne National Laboratory — Intern — Summer 2014
Applied k-means clustering to compress cross sections in OpenMC, drastically reducing required memory footprint

Los Alamos National Laboratory — Intern — Summer 2013
Implemented and compared formulations of the linear multifrequency-gray acceleration for radiation transport in Capsaicin; found efficient formulation

Lawrence Livermore National Laboratory — Intern — Summer 2011
Used MFEM, a finite element library in C++, to study higher-order H(div) (face) finite elements for the radiation diffusion method using unstructured curvilinear meshes; wrote up results in paper

FELLOWSHIPS

DOE Computational Science Graduate Fellowship (**CSGF**) — 2012 — 2015

Nuclear Regulatory Commission (NRC) Fellowship — 2010 — 2011

PUBLICATIONS

1. T.S. Haut, C. Ahrens, A. Jonko, R. Lowrie, and **A. T. Till**. A New Multigroup Method for Cross-Sections that Vary Rapidly in Energy. *Journal of Quantitative Spectroscopy and Radiative Transfer*, 2016 (submitted).

REFEREED CONFERENCE PROCEEDINGS

1. **A. T. Till**, M. Hanuš, J. Lou, J. E. Morel, and M. L. Adams. Comparisons of the Finite-Element-with-Discontiguous-Support Method to Continuous-Energy Monte Carlo for Pin-Cell Problems. In *The International Conference on the Physics of Reactors (PHYSOR) - Unifying Theory and Experiments in the 21st Century*, Sun Valley, ID, USA, May 2016. American Nuclear Society.
2. **A. T. Till**, M. L. Adams, and J. E. Morel. The Finite Element with Discontiguous Support Multigroup Method: Application. In *The Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA), and the Monte Carlo (MC) Method*, Nashville, Tennessee, May 2015. American Nuclear Society.
3. **A. T. Till**, M. L. Adams, and J. E. Morel. The Finite Element with Discontiguous Support Multigroup Method: Theory. In *The Joint International Conference*

on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA), and the Monte Carlo (MC) Method, Nashville, Tennessee, May 2015. American Nuclear Society.

4. M. P. Adams, M. L. Adams, C. N. McGraw, **A. T. Till**, and T S Bailey. Provably Optimal Parallel Transport Sweeps with Non-Contiguous Partitions. In *The Joint International Conference on Mathematics and Computation (M&C), Supercomputing in Nuclear Applications (SNA), and the Monte Carlo (MC) Method*, Nashville, Tennessee, May 2015. American Nuclear Society.

5. **A. T. Till**, M. L. Adams, and J. E. Morel. A Generalized Multigroup Method Based on Finite Elements. In *The International Conference on the Physics of Reactors (PHYSOR) - The Role of Reactor Physics toward a Sustainable Future*, Kyoto, Japan, Oct. 2014. American Nuclear Society. (**Best student paper**).

6. T. A. Brunner, T. V. Kolev, T. S. Bailey, and **A. T. Till**. Preserving Spherical Symmetry in Axisymmetric Coordinates for Diffusion Problems. In *The International Conference on Mathematics and Computational (M&C) Methods applied to Nuclear Science and Engineering*, Sun Valley, ID, USA, May 2013.

7. **A. T. Till**, M. L. Adams, and J. E. Morel. Application of Nonlinear Krylov Acceleration to Radiative Transfer Problems. In *The International Conference on Mathematics and Computational (M&C) Methods applied to Nuclear Science and Engineering*, Sun Valley, ID, USA, May 2013.