Aaron Oaks

CONTACT INFORMATION

Department of Nuclear, Plasma, and Radiological Engineering
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RESEARCH INTERESTS

Nuclear engineering, nuclear materials, computational modeling, atomic scale modeling, kinetic monte carlo, metropolis monte carlo, molecular dynamics

EDUCATION

University of Illinois, Urbana-Champaign, Urbana, IL USA

Ph.D., Nuclear Engineering, December 2015

- Advisor: Professor James F. Stubbins
- Thesis Title: *KMC Modeling of Helium Bubble Clustering and Evolution in BCC Iron*

M.S., Nuclear Engineering, December 2010

- Advisor: Professor James F. Stubbins
- Thesis Title: *Development of Kinetic Monte Carlo Code to Study Oxygen Mobility in Lanthanum-doped Ceria*
- Graduate Specialization in Computational Science and Engineering certification

University of California, Berkeley, Berkeley, CA USA

B.S., Computational Engineering Science, May 2007

- Nuclear Engineering specialization

REFEREED JOURNAL PUBLICATIONS

[1] A. Oaks and J. F. Stubbins, *KMC cluster model comparison in BCC iron*, Journal of Nuclear Materials, Volume 442, Issue 1–3, Supp. 1, November 2013, Pages S639–S642. doi:10.1016/j.jnucmat.2013.03.059

[2] B. Ye, A. Oaks, M. Kirk, D. Yun, W. Chen, B. Holtzman, J. F. Stubbins, *Irradiation effects in UO_2 and CeO_2*, Journal of Nuclear Materials, Volume 441, Issue 1–3, October 2013, Pages 525–529. doi:10.1016/j.jnucmat.2012.09.035

[3] B. Ye, D. Yun, A. Oaks, W. Chen, M. Kirk, J. Rest, A. Yacout, J. F. Stubbins, *The effects of xenon implantation in ceria with and without lanthanum*, Nuclear Instruments and Methods in Physics Research, Section B: Beam Interactions with Materials and Atoms, Volume 272, 1 February 2012, Pages 236–238. doi:10.1016/j.nimb.2011.01.073

[4] D. Yun, B. Ye, A. Oaks, W. Chen, M. Kirk, J. Rest, A.M. Yacout, J. F. Stubbins, *Fission gas transport and its interactions with irradiation-induced defects in lanthanum doped ceria*, Nuclear Instruments and Methods in Physics Research Section B: Beam Interactions with Materials and Atoms, Volume 272, 1 February 2012, Pages 239243. doi:10.1016/j.nimb.2011.01.074

[5] A. Oaks, D. Yun, B. Ye, W. Chen and J. F. Stubbins, *Kinetic monte carlo model of defect transport and irradiation effects in La-doped CeO_2*, Journal of Nuclear Materials, Volume 414, Issue 2, 15 July 2011, Pages 145–149. doi:10.1016/j.jnucmat.2011.02.030

[6] D. Yun, A. Oaks, W. Chen, M. Kirk, J. Rest, Z. Insopov, A. Yacout, J. F. Stubbins, *Kr and Xe irradiations in lanthanum (La) doped ceria: Study at the high dose regime*, Journal of Nuclear Materials, Volume 418, Issues 1–3, November 2011, Pages 80–86. doi:10.1016/j.jnucmat.2011.08.005

[7] B. Ye, M. Kirk, W. Chen, A. Oaks, J. Rest, A. Yacout, and J. F. Stubbins, *TEM Investigation of Irradiation Damage in Single Crystal CeO_2*, Journal of Nuclear Materials, Volume 414, Issue 2, 15 July 2011, Pages 251–256. doi:10.1016/j.jnucmat.2011.03.052

THESIS

[8] A. Oaks, *Development of Kinetic Monte Carlo Code to Study Oxygen Mobility in Lanthanum-doped Ceria*, M.S. Thesis, Nuclear, Plasma, and Radiological Engineering, University of Illinois, Urbana-Champaign, 2010. http://hdl.handle.net/2142/18427

[9] A. Oaks, *KMC Modeling of Helium Bubble Clustering and Evolution in BCC Iron*, Ph.D. Dissertation, Nuclear, Plasma, and Radiological Engineering, University of Illinois, Urbana-Champaign, 2015.

CONFERENCE PUBLICATIONS

[10] B. Ye, D. Yun, M. Kirk, A. Oaks, W. Chen, B. Holtzman, M. ElBakhshwan, B. Heuser and J. F. Stubbins, *Irradiation Effects in UO_2 and CeO_2*, Transactions of the American Nuclear Society, Volume 102, 2010, Pages 765–766

CONFERENCE TALKS

[11] A. Oaks, Y. Miao, W-Y. Chen, B. Ye, D. Yun, M. Okuniewski, M.A. Kirk, J.F. Stubbins, *Gas Migration and Clustering in Irradiated Metals and Ceramics*, Presentation at the International Workshop on Spallation Materials Technology, Ghent, Belgium, November 5–November 9, 2012

[12] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium-Vacancy Clustering in Iron*, Presentation at the Minerals, Metal, & Materials Society Conference, Orlando, FL, March 11–March 15, 2012

[13] A. Oaks, B. Holtzman, B. Ye, D. Yun, W. Chen and J. F. Stubbins, *Kinetic Monte Carlo Model of Defect Transport and Irradiation Effects in U, UMo, and UO_2-type Fuels*, Presentation at the Nuclear Materials Conference, Karlsruhe, Germany, October 4–7, 2010

CONFERENCE POSTERS

[14] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium-Vacancy Diffusion and Clustering in Iron*, Poster Presentation at the 17th International Conference on Fusion Reactor Materials, Aachen, Germany, October 11–October 16, 2015

[15] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium Bubble Clustering and Evolution in BCC Iron*, Poster Presentation at the Minerals, Metal, & Materials Society Conference, Orlando, FL, March 15–March 19, 2015

[16] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium Bubble Clustering and Evolution in BCC Iron*, Poster Presentation at the 12th International Workshop on Spallation Materials Technology, Bregenz, Austria, October 19–October 23, 2014

[17] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium-Vacancy Diffusion and Clustering in Iron*, Poster Presentation at the 16th International Conference on Fusion Reactor Materials, Beijing, China, October 20–October 26, 2013

[18] A. Oaks and J. F. Stubbins, *KMC Modeling of Helium-Vacancy Diffusion and Clustering in Iron*, Poster Presentation at the Materials Modeling and Simulation for Nuclear Fuels Conference, Chicago, IL, October 14–October 16, 2013

[19] A. Oaks, A. Hamed, Z. Insepov, A. Yacout, J. F. Stubbins, *Equation of State for Xenon in Molybdenum by Monte Carlo Simulation*, Poster Presentation at the Nuclear Materials Conference, Osaka, Japan, October 22–October 25, 2012

[20] A. Oaks and J. F. Stubbins, *KMC Model of Vacancy Diffusion and Clustering in BCC Iron*, Poster Presentation at the 15th International Conference on Fusion Reactor Materials, Charleston, SC, October 16–October 22, 2011

[21] A. Oaks, D. Yun, B. Ye, W. Chen and J. F. Stubbins, *Stoichiometric Dependence of Oxygen Diffusivity in $La_xCe_{1-x}O_{2-x/2}$*, Poster Presentation at the Minerals, Metal, & Materials Society Conference, San Diego, CA, February 27–March 3, 2011

RESEARCH EXPERIENCE

Argonne National Laboratory, Lemont, IL USA

Fracture Modeling Techniques for Used Fuel Storage Canisters **June 2015 to August 2015**

- Reviewed background material for used fuel storage canister design and operation
- Learned mathematical basis of Finite Element Method, and specific implementation in GetFEM++ open source finite element library

- Implemented example crack propagation system in GetFEM++
- Learned mathematical basis for Finite Volume Method, and specific implementation in OpenFOAM finite volume library
- Learned implementation of OpenFOAM fracture mechanics application developed by UCD computational mechanics group. Demonstrated example crack propagation system using said OpenFOAM application.

Equation of State for Xenon in Molybdenum **May 2012 to August 2012**

- Implemented EAM potential form in SPPARKS monte carlo code
- Used SPPARKS and recently developed Mo-Xe EAM potentials to relax bubble systems
- Developed and used tools to process data and directly calculate the equation of state for xenon in molybdenum

University of Illinois, Urbana-Champaign, Urbana, IL USA

KMC Modeling of Helium-Vacancy Clustering in Iron **March 2011 to December 2015**

- Researched and developed helium and vacancy transport and clustering mechanisms in BCC iron
- Implemented general defect clustering framework in custom KMC code
- Implemented possible helium/vacancy transport and clustering mechanisms in custom KMC code
- Implemented OpenMP shared memory parallelization in custom KMC code
- Used KMC code to generate data, and analyzing data to determine void size distribution in iron under irradiation
- Compared effects of various model parameters on defect size distribution

Web-based Crystalline Property Calculator **September 2013**

- Designed and implemented web application front-end (HTML/CSS/Javascript)
- Configured web server Python environment to support required calculations and plot generation
- Prepared Python-based crystalline property calculator back-end for web deployment and integrated with front-end interface
- Published final application allowing users to input elastic constants for custom materials and generate bulk elastic response plots and data

NERI, Project #07-064 **August 2007 to December 2010**

- Project Title: Fundamental Studies of Irradiation-Induced Defect Formation and Fission Product Dynamics in Oxide Fuels
- Implemented queuing system on commodity computers enabling efficient parallelization of computational runs
- Researched and developed defect and fission product transport mechanisms
- Implemented possible defect and fission product transport mechanisms in custom built KMC simulation code (C++)
- Used custom built KMC code to generate data, and analyzed data to determine material properties of oxide fuels

University of California, Berkeley, Berkeley, CA USA

Undergraduate Researcher **June 2006 to December 2006**

- Molecular Dynamics study of dislocation loop formation and growth in ferritic material after irradiation with Dr. Brian Wirth in Nuclear Engineering
- Literary study on TRISO nuclear fuel particle fabrication and burning

Teaching Experience

University of Illinois, Urbana-Champaign, Urbana, IL USA

Course Instructor **August 2013 to December 2013**

- Course Title: ENG 315 – Learning in Community
- Liaised with community partner (University YMCA)

- Lead class in course-long project to improve partner's sustainability efforts
- Prepared slides/materials for and lead project management meetings/classes
- Facilitating discussions/brainstorming for class project solutions
- Evaluated homework assignments and group projects based on standard criteria
- Provided objective, constructive feedback on assignments and problem solving sessions

Course Instructor **September 2010 to December 2013**

- Course Title: LaTeX Programming for Math and Science
- Organized, prepared, and delivered class lectures to audiences at varying experience levels
- Developed and evaluated homework assignments based on specific learning goals
- Held office hours for advanced problem solving after lectures
- Recorded and edited videos of content formatted for online consumption (YouTube)

CITL Graduate Affiliate **January 2014 to May 2014**

- Small Group Session Facilitator, 08/2013, 01/2014, Prepared slides for and gave presentation on lesson planning, effective questioning strategies, and microteaching preparation during University-wide TA training program (Graduate Academy)
- Facilitated microteaching lesson sessions (08/2013, 01/2014), reviewed and provided feedback to students on their microteaching lessons (01/2014)
- Observed the classroom teaching of TAs and provided constructive feedback in a face-to-face meetings
- Reviewed informal and formal instructor evaluation results with TAs and provided suggestions for improvement

Seminar Speaker **February 2014**

- Seminar Title: Selecting Appropriate Technology Tools for Your Classroom
- Prepared slides for and gave seminar presentation comparing a variety of classroom and collaboration software available to instructors
- Prepared follow-up resource guide

Workshop Teaching Assistant **January 2014**

- Workshop Title: Software Carpentry Boot Camp
- Example-driven two-day workshop on computing skills for graduate engineering research
- Assisted participants and clarified issues with Bash shell/scripting, Python, and Git

Workshop Panelist **May 2012**

- Workshop Title: Managing your Course: Secrets to Surviving your Semester of Teaching or TAing
- Gave information and advice to future instructors on effective strategies for class management

Seminar Speaker **April 2010**

- Seminar Title: Optimize Your Publications and Thesis Using LaTeX
- Prepared slides for and gave seminar presentation of benefits of LaTeX programming
- Prepared follow-up resource guide

University of California, Berkeley, Berkeley, CA USA

DeCal Course Facilitator **January 2007 to May 2007**

- Course Title: System Administration for the Web
- Wrote detailed lecture notes for all class lectures
- Prepared slides for and presented weekly class lectures
- Held lab hour after lectures and out of class office hours
- Created and graded weekly homework/lab assignments and final project

DeCal Course Co-Facilitator **January 2006 to May 2007**

- Course Title: LaTeX Programming for Math and Science
- Prepared slides for and gave class lectures for select topics
- Assisted in holding lab hour after lectures
- Graded weekly homework/lab assignments

Professional Memberships and Service

American Nuclear Society, Member since 2009
- Professional Development Coordination Committee, 06/2011–06/2012
- Young Members Group, 06/2011–Present

American Society for Engineering Education, Member since 2009
- Paper Reviewer, 2013 ASEE National Conference
- Paper Reviewer, 2014 ASEE National Conference

The Minerals, Metals & Materials Society, Member since 2010

Service

University of Illinois, Urbana-Champaign, Urbana, IL USA

College Teaching Effectiveness Network **May 2011 to May 2014**
- Coordinating seminars and workshops of interest to graduate students who are currently teaching college-level classes and/or preparing for an academic career
- Secretary/Treasurer, 05/2012–May 2014, Taking meeting minutes, managing group funds
- Steering Committee Member, 08/2011–May 2014, Organizing seminars sponsored by the committee, raising awareness of seminars offered

Engineering Graduate Student Advisory Committee **January 2009 to May 2014**
- Advising the College of Engineering on topics that are important to graduate education and that impact the graduate student experience on campus
- President, 09/2012–May 2014, Organizing and presiding over committee meetings, overseeing all organization functions
- Academic Seminars Subcommittee Chair, 09/2009–May 2014, Organizing seminars sponsored by the committee, raising awareness of seminars offered by the various engineering departments
- Founding Member, 2009, Established official committee bylaws and procedures

Tau Beta Pi (Engineering Honor Society) **October 2009 to May 2014**
- Webmaster, 08/2011–May 2014, Maintaining TBP student chapter website
- Peer Tutoring Coordinator, 01/2011–08/2011, Scheduled and coordinated daily open tutoring sessions in core engineering courses
- Member Development Chair, 08/2010–08/2011, Planned both internal and external events to further the members of Tau Beta Pi in scholarship and character

American Society for Engineering Education **September 2009 to May 2014**
- President, 05/2011–May 2014, Preparing meeting agendas and presiding at meetings, contacting potential speakers and organizing seminars, formulating a yearly agenda for the organization, ensuring that all activities fall within the organizational goals as stated in the Constitution
- Public Relations Officer, 05/2010–05/2011, Developed and maintained the Illinois ASEE web site, distributed announcements to Illinois ASEE members, advertised Illinois ASEE meetings and events, and fulfilled duties of liaison to the Engineering Council

American Nuclear Society **September 2009 to May 2014**
- Engineering Open House, 03/2010, 03/2011, Setup and operation of demonstrations of nuclear engineering–related concepts including chain reactions, plasma formation, and magnetic confinement

University of California, Berkeley, Berkeley, CA USA

Open Computing Facility **January 2006 to May 2010**
- Senior Administrator, 09/2006–05/2010, Managed and upgraded OCF server infrastructure (Solaris/Linux), maintained OCF services and security, documented system configurations
- Site Manager, 01/2007–05/2007, Created accounts and virtual hosts, managed the OCF laboratory, dealt with abusive or compromised user accounts
- Windows Imaging Team Leader, 02/2006–01/2007, Built, updated, and propagated disk images for Win2K/WinXP workstations, fixed any problems that come up
- Staff Member, 01/2006–05/2007, Held office hours, fielded user questions, approved new user accounts, trained new staff, maintained lab workstations (XP / Win2K / Linux / Solaris)

CalSol Solar Car Team **September 2005 to December 2006**

- Simulation, Telemetry and Strategy Group Leader
- Designed and implemented simulation system to simulate the vehicle along the 2400 mile solar car race route
- Implemented interface between simulation system and a custom-built on-vehicle telemetry system
- Website Designer/Administrator

Engineering Science Committee **September 2006 to May 2007**

- Contributed to updates to the Engineering Science curriculum

Society of Engineering Sciences **January 2006 to May 2007**

- Website Designer/Administrator

ASUC Elections Council **April 2006, 2007**

- Provided technical support for on- and off-campus electronic polling places during ASUC elections

Mathematics Undergraduate Student Association **August 2005 to May 2007**

Illinois 4-H Robotics Competition, Urbana, IL USA

- Technical Judge, April 2013, Judging robotics design and programming for middle-school and high-school students
- Event Photographer, April 2012, robotics design, teamwork judging, awards ceremony
- Event Photographer, April 2011, robotics design, teamwork judging, awards ceremony

Software Skills

Computer Programming: C++, Python, Bash, Fortran, GNU make, and others

Numerical Analysis: R, MATLAB, Python

Version Control: Git, SVN

Web Development: HTML, CSS, JavaScript (jQuery), Django, MySQL

Document Production: LaTeX (TeXstudio), Microsoft Office, Google Docs

Operating Systems: Microsoft Windows 7/8/10, Debian/OpenSUSE Linux

Awards

CITL Citizen Scholar Certificate, 2014

Fall 2013 List of Teachers Ranked as Excellent by Their Students, 2013

CITL Certificate in Technology-Enhanced Teaching, 2013

CITL Teacher Scholar Certificate, 2013

CITL Graduate Teacher Certificate, 2013

CITL Certificate in Foundations of Teaching, 2013

Nuclear Regulatory Commission Fellowship, 2008–2012

Tau Beta Pi Distinguished Active Member, 2011–2014

Alpha Nu Sigma Membership (Nuclear Engineering Honor Society), 2010

Tau Beta Pi Membership (Engineering Honor Society), 2009