

# Dr. Cody A. Dennett

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Mailing Address

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| EDUCATION | <b>Doctor of Philosophy (PhD) – Nuclear Science and Engineering</b> June 2019<br>Massachusetts Institute of Technology, Cambridge, MA<br>Thesis Title: Capturing radiation-induced microstructure evolution <i>in situ</i> through direct property monitoring ( <a href="#">link</a> )                 |
|           | <b>Master of Science (SM) – Materials Science and Engineering</b> June 2017<br>Massachusetts Institute of Technology, Cambridge, MA<br>Thesis Title: <i>In-situ</i> investigation of the oxidation kinetics of Fe-12Cr-2Si using time-resolved transient grating spectroscopy ( <a href="#">link</a> ) |
|           | <b>Bachelor of Science (BS) – Engineering Physics</b> May 2014<br>Summa Cum Laude<br>Cornell University, Ithaca, NY  |

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| RESEARCH EXPERIENCE | <b>Russell L. Heath Distinguished Postdoctoral Fellow</b> September 2019 – Present<br>Materials Science and Engineering Department<br>Research Advisor: Dr. David H. Hurley<br>Research Areas: <ul style="list-style-type: none"><li>• Electron and phonon thermal energy transport</li><li>• High throughput testing for alloy design using laser photoacoustics</li><li>• Microstructure evolution in extreme environments</li></ul> <i>Idaho National Laboratory<br/>Idaho Falls, ID</i> |
|                     | <b>Research Affiliate</b> June 2019 – Present<br>Mesoscale Nuclear Materials Laboratory<br>Research Area: <i>In situ</i> materials diagnostic development for ion irradiation<br><i>MIT<br/>Cambridge, MA</i>   |
|                     | <b>Doctoral Research</b> June 2014 – June 2019<br>Mesoscale Nuclear Materials Laboratory<br>Research Advisor: Prof. Michael P. Short<br>Research Areas: <ul style="list-style-type: none"><li>• Non-contact, non-destructive thermomechanical materials testing</li><li>• Nuclear materials science using ion beams</li><li>• <i>In situ</i> monitoring of materials evolution during simulated service</li></ul> <i>MIT<br/>Cambridge, MA</i>  |
|                     | <b>Independent Research Project</b> September 2013 – May 2014<br>School of Applied and Engineering Physics<br>Research Advisor: Prof. Alexander Gaeta<br>Research Area: Fiber-based time-lens temporal pulse magnifiers<br><i>Cornell University<br/>Ithaca, NY</i>   |
|                     | <b>Student Research Associate</b> October 2010 – August 2013<br>Wilson Laboratory for Elementary Particle Physics<br>Research Advisor: Dr. Walter Hartung<br>Research Area: Characterization of chamber coatings for secondary electron mitigation<br><i>Cornell University<br/>Ithaca, NY</i>  |

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| PROJECTS GRANTED | (Co-I) <i>Monitoring nanoscale defect accumulation and recombination via thermal property changes in crystalline materials</i><br>Center for Integrated Nanotechnologies, Sandia National Laboratories, User Proposal – Project 2019BU0048<br>No-fee user access, Sandia Ion Beam Lab – Awarded: January, 2020        |
|                  | (Co-I) <i>Real time monitoring of ion-beam-induced thermal diffusivity and acoustic wave speed changes in fusion reactor tungsten</i><br>Center for Integrated Nanotechnologies, Sandia National Laboratories, User Proposal – Project 2019BU0083<br>No-fee user access, Sandia Ion Beam Lab – Awarded: January, 2020 |

(PI) *Transient nanoscale defect effects in Ni-based solid solution alloys*  
Center for Integrated Nanotechnologies, Sandia National Laboratories, Rapid Access User Proposal – Project 2019BRA0002  
No-fee user access, Sandia Ion Beam Lab – Awarded: November, 2019

(PI) *Probing in situ multi-property evolution during material processing using laser photoacoustics*  
Idaho National Laboratory, Laboratory Directed Research and Development (LDRD) Fund – Project 20P1048-001FP  
\$215,000 – 2-years – Awarded: November, 2019

(PI) *Real time monitoring of ion-beam-induced defect cluster effects in Ni-based solid solution alloys*  
Center for Integrated Nanotechnologies, Sandia National Laboratories, User Proposal – Project 2018BU0123  
No-fee user access, Sandia Ion Beam Lab – Awarded: January, 2019

(PI) *Real time monitoring of ion-beam-induced defect cluster effects in Ni, Fe, and alloys*  
Center for Integrated Nanotechnologies, Sandia National Laboratories, Rapid Access User Proposal – Project 2018ARA0031  
No-fee user access, Sandia Ion Beam Lab – Awarded: September, 2018

(Co-I) *In situ investigation of the thermomechanical performance of HCP metals and Zircaloy-4 under ion beam irradiation*  
Nuclear Science User Facilities, DOE Office of Nuclear Energy, Rapid Turnaround Experiment (RTE) – Project 18-1144  
No-fee user access, Sandia Ion Beam Lab – Awarded: September, 2018

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| TEACHING<br>EXPERIENCE  | <b>MIT School of Engineering Communication Fellow</b> <span style="float: right;">May 2015 - June 2019</span>  |
|   | <ul style="list-style-type: none"><li>• Work with students, post-docs, and staff as a peer-to-peer scientific communication expert (<a href="#">link</a>)</li><li>• Coaching topics: publications, presentations, thesis defenses, fellowship/grant applications, visual design, etc.</li></ul>          |
|   | <b>Kaufman Teaching Certificate Program</b> <span style="float: right;">June 2018</span>   |
|   | <ul style="list-style-type: none"><li>• Intensive program offered by the MIT Teaching and Learning Lab focused on developing teaching skills (<a href="#">link</a>)</li><li>• Topics: designing courses, facilitating classes, teaching pedagogy, constructing exams, and teaching inclusively</li></ul> |
|   | <b>Teaching Assistant</b> – “Kinetic Processes in Materials” (3.21) <span style="float: right;">Feb. 2017 - May 2017</span>  |
| <ul style="list-style-type: none"><li>• Instructor: Prof. Carl Thompson (<a href="mailto:cthomp@mit.edu">cthomp@mit.edu</a>)</li><li>• Duties: write and grade assignments and examinations, instruct recitations, deliver lectures, host office hours</li></ul>  |  |
| <b>Grader</b> – “Materials in Nuclear Engineering” (22.14) <span style="float: right;">Feb. 2015 - Apr. 2015</span>   |  |
| <ul style="list-style-type: none"><li>• Instructors: Prof. Michael Short (<a href="mailto:hereiam@mit.edu">hereiam@mit.edu</a>) and Prof. Ju Li (<a href="mailto:liju@mit.edu">liju@mit.edu</a>) <span style="float: right;">Feb. 2016 - Apr. 2016</span></li><li>• Duties: write and grade assignments and examinations, host office hours</li></ul> |  |

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| PUBLICATIONS<br>( <a href="#">Google Scholar</a> )   | 13. A. Reza, <b>C.A. Dennett</b> , M.P. Short, J. Waite, Y. Zayachuk, C.M. Magazzeni, S. Hills, and F. Hofmann. <i>Non-contact, non-destructive mapping of thermal diffusivity and surface acoustic wave speed using transient grating spectroscopy</i> . Rev. Sci. Instrum., <b>91</b> (5) (2020) 054902 ( <a href="#">link</a> )   |
|  | *corresponding   |
|  | 12. <b>C.A. Dennett*</b> , R.C. Choens, C.A. Taylor, N.M. Heckman, M.D. Ingraham, D. Robinson, B.L. Boyce, M.P. Short, and K. Hattar. <i>Listening to radiation damage in situ: passive and active acoustic techniques</i> . JOM, <b>72</b> (2020) 197-209 ( <a href="#">link</a> )  |
|  | 11. F. Hofmann, M.P. Short, and <b>C.A. Dennett</b> . <i>Transient grating spectroscopy: An ultrarapid, nondestructive materials evaluation technique</i> . MRS Bulletin, <b>44</b> (2019) 392-402 ( <a href="#">link</a> )  |
|  | 10. S.E. Ferry, <b>C.A. Dennett</b> , K.B. Woller, and M.P. Short. <i>Inferring radiation-induced microstructural evolution in single-crystal niobium through changes in thermal transport</i> . J. Nucl. Mater., <b>523</b> (2019) 378-382 ( <a href="#">link</a> )   |
|  | 9. <b>C.A. Dennett*</b> , D.L. Buller, K. Hattar, and M.P. Short. <i>Real-time thermomechanical property monitoring during ion beam irradiation using in situ transient grating spectroscopy</i> . Nucl. Instrum. Meth. Phys. Res. B, <b>440</b> (2019) 126-138 ( <a href="#">link</a> )   |
|  | <ul style="list-style-type: none"><li>• MIT News (<a href="#">link</a>)</li><li>• ASM International (<a href="#">link</a>)</li><li>• Materials World (<a href="#">link</a>)</li></ul>  |
|  | 8. A.Q. Kuang, N.M. Cao, A.J. Creely, <b>C.A. Dennett</b> , J. Hecla, B. LaBombard, R.A. Tinguely, E.A. Tolman, H. Hoffman, M. Major, J. Ruiz Ruiz, D. Brunner, P. Grover, C. Laughman, B.N. Sorbom, D.G. Whyte. <i>Conceptual design study for heat exhaust management in the ARC fusion pilot plant</i> . Fusion Eng. Des., <b>137</b> (2018) 221-242 ( <a href="#">link</a> ) |
|  | <ul style="list-style-type: none"><li>• MIT News (<a href="#">link</a>)</li></ul>  |
|  | 7. <b>C.A. Dennett*</b> and M.P. Short. <i>Thermal diffusivity determination using heterodyne phase insensitive transient grating spectroscopy</i> . J. Appl. Phys., <b>123</b> (21) (2018) 215109 ( <a href="#">link</a> )  |
| 6. O. Cometto, <b>C.A. Dennett</b> , S.H. Tsang, M.P. Short, E.H.T. Teo. <i>A thermal study of amorphous and textured carbon and carbon nitride thin films via transient grating spectroscopy</i> . Carbon, <b>130</b> (2018) 335-361 ( <a href="#">link</a> )           |  |
| 5. <b>C.A. Dennett*</b> , K.P. So, A. Kushima, D.L. Buller, K. Hattar, and M.P. Short. <i>Detecting self-ion irradiation-induced void swelling in pure copper using transient grating spectroscopy</i> . Acta Mater., <b>145</b> (2018) 496-503 ( <a href="#">link</a> ) |  |
| 4. <b>C.A. Dennett*</b> and M.P. Short. <i>Time-resolved, dual heterodyne phase collection transient grating spectroscopy</i> . Appl. Phys. Lett., <b>110</b> (21) (2017) 211106 ( <a href="#">link</a> )  |  |
| <ul style="list-style-type: none"><li>• Editor’s pick article</li><li>• MIT News (<a href="#">link</a>)</li></ul>  |  |

3. **C.A. Dennett**, P. Cao, S.E. Ferry, A. Vega-Flick, A.A. Maznev, K.A. Nelson, and M.P. Short. *Bridging the gap to mesoscale radiation materials science with transient grating spectroscopy*. Phys. Rev. B, **94** (21) (2016) 214106 ([link](#))
  - MIT News ([link](#))
  - Physics Central ([link](#))
2. M.P. Short, **C.A. Dennett**, S.E. Ferry, Y. Yang, J.K. Eliason, A. Vega-Flick, A.A. Maznev, and K.A. Nelson. *Applications of transient grating spectroscopy to radiation materials science*. JOM, **67** (8) (2015) 1840-1848 ([link](#))
1. W.H. Hartung, D.M. Asner, J.V. Conway, **C.A. Dennett**, S. Greenwald, J.-S. Kim, Y. Li, T.P. Moore, V. Omanovic, M.A. Palmer, and C.R. Strohman. *In-situ measurements of the secondary electron yield in an accelerator environment: Instrumentation and methods*. Nucl. Instrum. Meth. Phys. Res. A, **783** (2015) 95-109 ([link](#))

INVITED  
PRESENTATIONS

7. *Non-destructive multi-property determination under extreme conditions with transient grating spectroscopy*. **Annual meeting of the Minerals, Metals, and Materials Society (TMS)**, February, 2020.
6. *Capturing radiation-induced microstructure evolution in situ through direct property monitoring*. **DOE NNSA Stewardship Science Graduate Fellowship Annual Meeting**, June, 2019.
5. *Transient grating spectroscopy: An ultrarapid, nondestructive materials evaluation technique*. **MRS OnDemand Webinar Series**, May, 2019.
4. *Capturing material evolution during ion beam irradiation using in situ property monitoring*. **Center for Thermal Energy Transport under Irradiation, Idaho National Laboratory**, November, 2018.
3. *Capturing material evolution during ion beam irradiation using in situ property monitoring*. **Nondestructive Characterization Institute, Lawrence Livermore National Laboratory**, September, 2018.
2. *Real-time property monitoring during ion beam irradiation using transient grating spectroscopy*. **Department of Engineering Sciences, University of Oxford**, July, 2018.
1. *Ions and lasers: exploring new diagnostics for nuclear materials*. **MIT Nuclear Science and Engineering Graduate Research Expo**, March, 2017. ([link](#))

SELECT  
CONTRIBUTED  
PRESENTATIONS

9. *Non-destructive multi-property determination under extreme conditions using transient grating spectroscopy*. **The Materials Science and Technology Conference (MS&T)**, October, 2019.
8. *Real-time property monitoring during ion beam irradiation using transient grating spectroscopy*. **5<sup>th</sup> Nuclear Materials Conference (NuMat)**, October, 2018.
7. *In situ thermomechanical property monitoring during ion beam irradiation: benchmark studies on pure copper*. **26<sup>th</sup> International Conference on Nuclear Engineering (ICONE)**, July, 2018.
6. *In situ thermomechanical property monitoring during ion beam irradiation*. **21<sup>st</sup> International Conference on Ion Beam Modification of Materials (IBMM)**, June, 2018.
5. *In situ thermomechanical property monitoring during ion irradiation*. **Annual meeting of the Minerals, Metals, and Materials Society (TMS)**, March, 2018.
4. *Irradiation-induced void swelling in pure copper characterized using transient grating spectroscopy*. **Winter meeting of the American Nuclear Society (ANS)**, November, 2017.
3. *Developing continuous thermo-mechanical property monitoring for ion irradiation using transient grating spectroscopy*. **Annual meeting of the Materials Research Society (MRS)**, November, 2016.
2. *Developing continuous non-contact thermo-mechanical property monitoring for ion irradiations using surface photoacoustics*. **20<sup>th</sup> International Conference on Ion Beam Modification of Materials (IBMM)**, November, 2016.
1. *Non-contact determination of ion irradiation effects in pure polycrystalline copper*. **Annual meeting of the Minerals, Metals, and Materials Society (TMS)**, February, 2016.

PATENTS

1. *Integrating radiation dosimeter*. U.S. Application No.: 15/760,483. Filing Date: 2018-03-15  
M.P. Short, **C.A. Dennett**, S.E. Ferry, and R. Gupta.

HONORS &  
AWARDS

- Russell L. Heath Distinguished Postdoctoral Fellowship, Idaho National Laboratory Sep. 2019 - Present
- Innovation in Nuclear Technology R&D Award (Materials Protection), DOE Office of Nuclear Energy June 2017
- Manson Benedict Award for Academic Excellence and Professional Promise, MIT NSE May 2017
- DOE National Nuclear Security Administration Stewardship Science Graduate Fellow Sep. 2016 - June 2019
- Member, Alpha Nu Sigma, National Nuclear Engineering Honor Society May 2016
- National Science Foundation Graduate Research Fellow June 2014 - Sep. 2016
- Hartman Prize for Excellence in Experimental Physics, Cornell University May 2014
- Dean's Honor List, College of Engineering, Cornell University Fall 2010 - Spring 2014

REFERENCES

Prof. Thesis Advisor  
Department of Nuclear Science and Engineering  
Massachusetts Institute of Technology  
Email:  
Phone:

Dr. Colleague  
Department/Center  
National Laboratory  
Email:  
Phone: