

Dr. Charles A. Hirst

+1 646 409 1630

Nuclear materials scientist with extensive coaching and teaching experience.

cahirst@umich.edu

2022 PhD in Nuclear Science and Engineering MIT
2015 MEng in Materials Science (First Class) University of Oxford

Research

University of Michigan, USA

2022–present Postdoctoral Research Fellow in the Nuclear Engineering and Radiological Sciences Department. Supervisor: [Kevin Field](#).

- Project: *Accelerated irradiation creep testing coupled with self-adaptive accelerated molecular dynamics for scalability analysis.*

Massachusetts Institute of Technology, USA

2016–2022 PhD Thesis title: ‘*Quantifying radiation damage through stored energy released during defect annealing in metals.*’ Supervisor: [Michael Short](#).

- Experimental and simulated annealing of neutron-irradiated Ti using differential scanning calorimetry and molecular dynamics.
- Simulated recovery of irradiated Al to determine parameter-space for statistically significant nanocalorimetry measurements.

University of Oxford, UK

2014–2015 Master’s Thesis title: ‘*Atom probe tomography of unirradiated and proton irradiated Zircaloy fuel cladding.*’ Supervisor: [Michael Moody](#).

Teaching

Massachusetts Institute of Technology, USA

2019–2022 [Communication Lab](#), Department of Nuclear Science & Engineering.

- Over 150 hours 1-on-1 coaching students & post-docs to improve their communication in presentations, posters & journal articles.

Fall 2020 Teaching Assistant, ‘*Intro to Nuclear Engineering & Ionizing Radiation*’.

- Independently taught three lectures on radiation damage, held weekly recitations and office hours, and received stellar reviews.

Summer 2020 Teaching & Learning Lab: [Subject Design & Teaching Practice](#).

- Created a syllabus using backward-design. Developed a unit-level assessment plan using student-centered learning outcomes.
- Designed and delivered a lesson plan featuring active learning, scaffolding, and goal-directed practice.

Scientific Contributions Publications

- 2022 (4.) **C. A. Hirst**, F. Granberg, B. Kombaiah, P. Cao, S. Middlemas, R. S. Kemp, J. Li, K. Nordlund, M. P. Short '*Revealing hidden defects through stored energy measurements of radiation damage*' Sci. Adv. (2022)
- (3.) **C. A. Hirst**, C. A. Dennett '*Towards quantitative inference of nanoscale defects in irradiated metals and alloys*' Front. Mater. 9 (2022) 888356
- C. A. Hirst**, R. C. Connick, K. P. So, P. Cao, R. S. Kemp, M. P. Short '*On the use of nanocalorimetry to measure radiation damage in metals*' J. Nucl. Mater. (in preparation)
- 2021 R. C. Connick, **C. A. Hirst**, K. B. Woller, J. V. Logan, R. S. Kemp, M. P. Short '*Measuring Very Low Radiation Doses in PTFE for Nuclear Forensic Enrichment Reconstruction*' submitted (2021)
- 2020 (2.) M. Jiang, J. Kiyang, **C. A. Hirst**, C. C. Tasan, '*Effects of defect development during displacive austenite reversion on strain hardening and formability*' Metall. Mater. Trans. A 51A (2020) 3832-3842
- 2018 (1.) A. Harte, R. Prasath Babu, **C. A. Hirst**, T. Martin, P. Bagot, M. Moody, P. Frankel, J. Romero, L. Hallstadius, E. Darby, M. Preuss, '*Understanding irradiation-induced nanoprecipitation in Zr alloys using parallel TEM and APT*' J. Nucl. Mater. 510 (2018) 460-471

Presentations

- 2022 (12.) Materials Research Society (MRS) Spring Meeting '*Quantifying radiation damage through stored energy released during defect annealing in metals*' - Poster
- (11.) The Minerals, Metals & Materials Society (TMS) '*Revealing hidden defects through stored energy measurements of radiation damage*'
- 2021 (10.) **Invited Talk** – Materials Science & Technology (MS&T) '*Revealing hidden defects through stored energy measurements of radiation damage*'
- 2020 (9.) The Nuclear Materials Conference (NuMat) '*Investigating radiation damage evolution through simulations and experiments measuring the energy stored in defects*'
- (8.) The Minerals, Metals & Materials Society (TMS) '*Direct measurement of radiation damage through the energy stored in defects*'

- 2019 (7.) Mettler Toledo Flash DSC Conference
'Developing a method to measure radiation damage in metals using calorimetry'
- (6.) Materials in Nuclear Energy Systems (MiNES)
'Developing a method to quantify radiation damage using stored energy: simulations and experiments'
- (5.) Idaho National Lab, Materials & Fuels Complex Seminar Series
'Development of Flash DSC techniques to quantify radiation damage using stored energy'
- 2018 (4.) The Nuclear Materials Conference (NuMat)
'Developing a method to quantify radiation damage using stored energy'
- (3.) International Conference on Nuclear Engineering (ICONE)
'Quantifying Radiation Damage Using Stored Energy Fingerprints'
- (2.) The Minerals, Metals & Materials Society (TMS)
'Quantifying radiation damage using stored energy fingerprints'
- 2017 (1.) Mettler Toledo Flash DSC Conference
'Quantifying radiation damage using stored energy fingerprints'

Science Communication articles

- 2019 [Abstract; Slide Design; Delivery and Q&A; Virtual Presentations.](#)

Awards

- Massachusetts Institute of Technology, USA
- 2021 NSUF Rapid Turnaround Experiment – **Principal Investigator**
'Verifying Wigner energy measurements by in situ TEM annealing of neutron-irradiated Ti'
- 2020 School of Engineering: *Exponent Fellowship*.
Awarded in recognition of an outstanding academic record, exceptional background, and promising future.
- University of Oxford, UK
- 2014 *Gibbs Prize for best overall performance in Part I.*
For achieving the highest mark in Final Examinations.

Professional Service & Societies

- 2020–present The Materials Society (TMS) Nuclear Materials Committee
Member of the Subcommittee on Programming.
- 2019–present American Nuclear Society (ANS) – Student Member
- 2018–present The Materials Society (TMS) – Student Member
- 2011–present Institute of Materials, Minerals and Mining (IOM3) – Member