

Colin Alexander Ashe

Curriculum Vitae, February 2013

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Research Interests

Conceptual Learning in Chemistry, Use of Computer Simulations to Promote Conceptual Learning, Research-Based Curriculum Design, Optimal Modes of Student Interaction with Simulations, Use of Simulation-Based Games for Informal Learning, High-Leverage Points of Connection between Chemistry and Other Science and Engineering Disciplines, Metacognitive Strategies and Strategies for Increasing Student Motivation

Academic Appointments

2010-present: Research Associate, Department of Chemistry,
Carnegie Mellon University Supervisor: David J. Yaron

Education

2010: Ph.D. in Materials Science and Engineering, Massachusetts Institute of Technology
Thesis: *Interactive Online Simulations and Curriculum for Teaching and Learning Fundamental Concepts in Molecular Science at the Undergraduate Level*
Advisor: W. Craig Carter Committee: Donald R. Sadoway, Samuel M. Allen

2001: B.S. in Materials Science and Engineering, Carnegie Mellon University
Minor in German, with University Honors

Scholarships and Fellowships

2003-2006: National Science Foundation Graduate Research Fellowship

2002-2003: Massachusetts Institute of Technology Presidential Fellowship

2001-2002: Congress-Bundestag Scholarship (Germany)

2001: Andrew Carnegie Society Presidential Scholarship

1997-2001: Carnegie Mellon University Andrew Carnegie Scholarship

Teaching Experience

2012-2013: Guest lecturer in *Modern Chemistry II* (Carnegie Mellon University)

2007-2008: Teaching Assistant for graduate *Kinetics of Materials* (MIT)

2006: Teaching Assistant for undergraduate *Fundamentals of Materials Science* (MIT)

Ongoing Research Projects

Development of a simulation-rich online chemistry course (NSF DUE-1123355)

Development of interactive simulations for molecular science (NSF DUE-0817493)

Study on use of online chat and intelligent “agent” to teach intermolecular forces (with David Adamson and Carolyn Rosé, Language Technologies Institute, Carnegie Mellon)

Study on use of contrasting cases to teach conceptual understanding of chemical reactions (with Cathy Chase, Psychology Department, Carnegie Mellon University)

Publications

Book Chapters

C. Ashe, D. Yaron, (Submitted) “Use and Design of Analogy-Based Simulations To Teach Abstractions and Abstract Concepts” To appear in J. Suits & M. Sanger, (Eds.), *Pedagogic Roles of Animations and Simulations in Chemistry Courses*

D. Yaron, M. Karabinos, G. Leinhardt, J. Greeno, J. Davenport, B. McLaren, L. Bartolo, J. Portman, C. Ashe, W.C. Carter, D. Sadoway. (2010). *Instruction Online: Core Components for Re-Use*. In Belford, R.E., Moore, J.W., Pence, H.E. (Eds.), *Enhancing Learning with Online Resources, Social Networking, and Digital Libraries*, 2010, Chapter 13, pp 235–262. DOI: 10.1021/bk-2010-1060.ch013

Journal Articles

D. Adamson, C. Ashe, H. Jang, D. Yaron, C. Rosé. (In press) *Intensification of Group Knowledge Exchange with Academically Productive Talk Agents*. (2013). Proceedings of the 10th International Conference on Computer Supported Collaborative Learning, Madison Wisconsin, July 2013.

R. Baker, G. Moore, A. Wagner, J. Kalka, A. Salvi, M. Karabinos, C. Ashe, and D. Yaron, (2011). *The Dynamics between Student Affect and Behavior Occurring Outside of*

Educational Software. In D'Mello, S., Graesser, A., Schuller, B., and Martin, J.-C. (eds.), *Affective Computing and Intelligent Interaction*, Springer Berlin / Heidelberg, 2011, pp. 14–24. DOI: 10.1007/978-3-642-24600-5_5

Yaron, D.J., Davenport, J.L., Karabinos, M., Leinhardt, G.L., Bartolo, L.M., Portman, J.J., Lowe, C.S., Sadoway, D.R., Carter, W.C., Ashe, C. (2008). *Cross-Disciplinary molecular science education in introductory science courses: An NSDL MatDL collection*. Proceedings of the 8th ACM/IEEE-CS Joint Conference on Digital Libraries, (pp. 70-73). Association for Computing Machinery, Inc. (ACM). DOI: 10.1145/1378889.1378903

Hsiao, A.; McHenry, M.E.; Laughlin, D.E.; Kramer, M.J.; Ashe, C.; Ohkubo, T. (2002). *The thermal, magnetic, and structural characterization of the crystallization kinetics of Fe₈₈Zr₇B₄Cu₁, an amorphous soft magnetic ribbon*. IEEE Transactions on Magnetics, 38(5), 3039-3044 DOI: 10.1109/TMAG.2002.802434

Johnson, F.; Hsiao, A.; Ashe, C.; Laughlin, D.; Lambeth, D.; McHenry, M.E.; Varga, L.K. (2001). *Magnetic nanocomposite materials for high temperature applications*. Proceedings of the 2001 1st IEEE Conference on Nanotechnology (pp. 1-6) DOI: 10.1109/NANO.2001.966382

In Preparation

C. Ashe, D. Yaron, D. Sadoway, W.C. Carter, L. Bartolo, J. Davenport, J. Portman, M. Karabinos. (In preparation) *The Centrality of Energy Landscapes in Interdisciplinary Molecular Science: Interactive Simulations for Teaching Equilibrium Thermodynamics and Kinetics* (submission to Journal of Chemical Education expected June 2012)

C. Ashe, D. Adamson, D. Yaron, M. Karabinos, C. Rosé. (In preparation) *Jigsaw Design for Computer-Mediated Online Discussions of Intermolecular Forces* (submission to Journal of Chemical Education expected early 2013)

C. Ashe, C. Chase, D. Yaron, M. Karabinos *Addressing Student Misconceptions About Reactions via Contrasting Particulate Representations of Chemical Systems* (submission to Journal of Chemical Education expected late 2013)

Oral Presentations

C. Ashe, D. Yaron, M. Karabinos, L. Bartolo, J. Portman, W.C. Carter, D. Sadoway "Web-based simulation engine for 2D interactive simulations of molecular systems" Delivered in the *Practical Applications of Using Visualization Techniques in Chemical Education* symposium at the 244th ACS National Meeting, Philadelphia, PA (August 2012)

C. Ashe, D. Yaron, J. Davenport, W.C. Carter, D. Sadoway "Designing simulations of abstract concepts using analogies and multiple representations" Delivered in the *Research on the Design and Use of Simulations and Animations* symposium at the Biennial Conference for Chemical Education, State College, PA (July 2012)

C. Ashe, D. Adamson, D. Yaron, C. Rosé "Jigsaw design for computer-mediated online discussions of intermolecular forces" Delivered in the *Design, Development and Teaching of Online Chemistry Courses* symposium at the Biennial Conference for Chemical Education, State College, PA (July 2012)

C. Ashe, D. Yaron, L. Bartolo, J. Portman, W.C. Carter, D. Sadoway "Interactive Two-Dimensional Simulations as an Introduction to Core ICME Concepts" Delivered in the *Integrating and Leveraging Collaborative Efforts for ICME Education* symposium at 141st TMS Annual Meeting, Orlando, FL (March, 2012)

C. Ashe, D. Yaron, D. Sadoway, L. Bartolo, W.C. Carter, J. Portman, M. Karabinos, A. Slodov, A. Barnard, J Davenport "Interactive Simulations for Learning Fundamental Concepts from Nanoscale Science" Delivered in *Symposium XX: Materials Education Development and Outreach—From K-Grad* at the 2010 MRS Fall Meeting, Boston, MA (November 2010)

Posters Presentations

C. Ashe, D. Yaron, M. Karabinos "Advancing chemistry and interdisciplinary STEM education through interactive simulations, computer-facilitated collaborative chat, and novel instructional strategies" Presented in the *Sci-Mix/Academic Employment Initiative Poster Session* at the 244th ACS National Meeting, Philadelphia, PA (August 2012)

Curriculum Materials Produced

Interactive analogy-based simulations and curriculum for teaching about energy landscapes, equilibrium state populations, reaction kinetics, and entropy (2008-2010) available at http://matdl.org/virtuallabs/index.php/Main_Page

Interactive particle-based simulations and curriculum for teaching about various important topics related to thermochemistry and solutions (2010-present) available at <http://www.chemcollective.org/cims.php>

Professional Service

2010-present: Reviewer for Journal of Chemical Education