

CURRICULUM VITAE

MARK A. ALLEN

EDUCATION

Postdoctoral	2008-2012	Massachusetts Institute of Technology, Department of Materials Science and Engineering
Ph.D.	2006	Montana State University, Inorganic Chemistry
B.S.	2001	Temple University, Chemistry

Experience in Higher Education

2012 – present	University of Maryland Baltimore County, Assistant Professor, Chemistry and Biochemistry
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Research Support and/or Fellowships

2014 - Present	\$20,000, (direct cost), Source: UMBC SRAIS, "A study of amino acids primarily responsible for interaction with inorganic materials in solid bonding polypeptides" Role: PI
2013	\$6,000 (direct cost), Source: UMBC Summer Faculty Fellowship. "Phage display for battery materials" Role: PI

Ph.D. Students

Evgenia Barannikova, 3rd year, Chair
Scott Riley, 3rd year, Chair
Alexander Winton, 2nd year, Chair
Florika Macazo, 3rd year, Member
Arunendra Saha Ray, 3rd year, Member
Brian Szychowski, 3rd year, Member

Master's Students

Undergraduate Students

Alexander Winton, Lithium ion batteries, 2012-2013, Chemistry and Biochemistry, graduated 2013, Chair, Currently a graduate student at UMBC Chemistry and Biochemistry. Role: Mentor

Romeo Portillo, Manganese Dioxide Ultracapacitor Materials, 2013-2014, Chemistry and Biochemistry, graduated 2014, Chair. Currently a grad student at Colorado State University. Role: Mentor

William Dean, Lithium Ion Battery Cathodes, Chemistry and Biochemistry, Undergraduate Research Association Grantee (\$1,500), 2013-Present, Role: Mentor

Tolu Omokehinde, Phage display for paper based devices, Biochemistry student, Meyerhoff Scholar, 2014-Present, Role: Mentor

Stephen Vicchio, Phage display for inorganic materials, Chemical Engineering, 2013, Role: Mentor

PUBLICATIONS, PRESENTATIONS, AND CREATIVE ACHIEVEMENTS

Publications

Peer-Reviewed Works

1. Hess, GT, Cragolini, JJ, Popp, MW, **Allen, MA**, Dougan, SK, Spooner, E, Ploegh, HL, Belcher, AM, Guimaraes, CP, "M13 Bacteriophage Display Framework that Allows Sortase-Mediated Modification of Surface-Accessible Phage Proteins", *Bioconjugate Chemistry*, **2012**, 23, 1478-1487
2. Nuraje, N, Dang, X, Qi, J, **Allen, MA**, Belcher, AM, "Biotemplated Synthesis of Perovskite Nanomaterials for Solar Energy Conversion" *Advanced Materials*, **2012**, 24, 2885-2889
3. Oh, D, Dang, X, Hyunjung, Y, **Allen, MA**, Xu, K, Lee, YJ, Belcher, AM, "Graphene Sheets Stabilized on Genetically Engineered M13 Viral Templates as Conducting Frameworks for Hybrid Energy-Storage Materials", *Small*, **2012**, 8, 1006-1011
4. Usselman, RJ, Russek SE, Klem, MT, **Allen, MA**, Douglas, T, Young, M, Idzerda, YU, Singel, DJ, "Temperature dependence of electron magnetic resonance spectra of iron oxide nanoparticles mineralized in *Listeria innocua* protein cages" *Journal of Applied Physics*, **2012**, 112, 084701
5. Zadvornyy, OA, **Allen, M**, Brumfield, SK, Varpness Z, Boyd, ES, Zorin, NA, Serebriakova, L, Douglas, T, Peters, JW, "Hydrogen Enhances Nickel Tolerance in the Purple Sulfur Bacterium *Thiocapsa roseopersicina*", *Environmental Sciences & Technology*, **2010**, 44, 834-840
6. Parker, MJ, **Allen, MA**, Ramsay, B, Klem, MT, Young, M, Douglas, T, "Expanding the temperature range of biomimetic synthesis using a ferritin from the hyperthermophile *Pyrococcus furiosus*" *Chemistry of Materials*, **2008**, 20, 1541-1547
7. Schweitzer, MH, Suo, Z, Avci, R, Asara, JM, **Allen, MA**, Arce, FT, Horner, JR, "Analyses of soft tissue from *Tyrannosaurus rex* suggest the presence of protein" *Science*, **2007**, 316, 277-279
8. Uchida, M, Klem, MT, **Allen, M**, Suci, P, Flenniken, M, Gillitzer, E, Varpness, Z, Young, M, Douglas, T "Biological Containers: Protein Cages as Multifunctional Nano-Platforms" *Advanced Materials*, **2007**, 19, 1025-1042
9. Wiedenheft, B, Flenniken, ML, **Allen, MA**, Young, M, Douglas, T, "Bioprospecting in high temperature environments; application of thermostable protein cages" *Soft Matter*, **2007**, 3, 1091-1098
10. Uchida, M, Flenniken, ML, **Allen, M**, Willits, DA, Crowley, BE, Brumfield, S, Willis, AF, Jackiw, L, Jutila, M, Young, MJ, Douglas, T "Targeting of cancer cells with ferrimagnetic ferritin cage nanoparticles" *Journal of the American Chemical Society*, **2006**, 128, 16626-16633
11. Ramsay, B, Wiedenheft, B, **Allen, M**, Gauss, GH, Lawrence, CM, Young, M, Douglas, T, "Dps-like protein from the hyperthermophilic archaeon *Pyrococcus furiosus*" *Journal of Inorganic Biochemistry*, **2006**, 100, 1061-1068

12. Resnick, DA, Allen, M, Klem, MT, Gilmore, K, Idzerda, YU, Arenholz, E, Young, M, Douglas, T, "Magnetic properties of Co₃O₄ nanoparticles mineralized in *Listeria innocua* Dps", *Journal of Applied Physics*, **2006**, 99, 08Q501
13. Liepold, L O, Revis, J, **Allen, M**, Oltrogge, L, Young, M, Douglas, T, "Structural Transitions in Cowpea Chlorotic Mottle Virus (CCMV)" *Physical Biology*, **2005**, 2, S166-S172.
14. **Allen, M**, Bulte, JWM, Liepold, L, Basu, G, Zywicke, HA, Frank, JA, Young, M, Douglas, T, "Paramagnetic viral nanoparticles as potential high-relaxivity magnetic resonance contrast agents" *Magnetic Resonance in Medicine*, **2005**, 54, 807-812.
15. Gilmore, K, Idzerda, YU, Klem, MT, **Allen, M**, Douglas, T Young, M, "Surface contribution to the anisotropy energy of spherical magnetite particles" *Journal of Applied Physics*, **2005**, 97.
16. Usselman, RJ, Klem, M, **Allen, M**, Walter, ED, Gilmore, K, Douglas, T, Young, M, Idzerda, Y, Singel, DJ, "Electron magnetic resonance of iron oxide nanoparticles mineralized in protein cages" *Journal of Applied Physics*, **2005**, 97.
17. Hosein, HA, Strongin, DR, **Allen, M**, Douglas, T, "Iron and Cobalt oxide and metallic nanoparticles prepared from ferritin" *Langmuir* **2004**, 20, 10283-10287
18. **Allen, M**, Willits, D, Young, M, Douglas, T, "Constrained synthesis of cobalt oxide nanomaterials in the 12-subunit protein cage from *Listeria innocua*" *Inorganic Chemistry*, **2003**, 42, 6300-6305.
19. Basu, G, **Allen, M**, Willits, D, Young, M, Douglas, T, "Metal binding to cowpea chlorotic mottle virus using terbium(III) fluorescence" *Journal of Biological Inorganic Chemistry*, **2003**, 8, 721-725.
20. **Allen, M**, Willits, D, Mosolf, J, Young, M, Douglas, T, "Protein cage constrained synthesis of ferrimagnetic iron oxide nanoparticles" *Advanced Materials*, **2002**, 14, 1562-1565.
21. Strable, E, Bulte, JWM, Moskowitz, B, Vivekanandan, K, **Allen, M**, Douglas, T, "Synthesis and characterization of soluble iron oxide-dendrimer composites" *Chemistry of Materials*, **2001**, 13, 2201-2209.

Non-Peer Reviewed Works

1. Flenniken, M, **Allen, M**, Douglas, T, "Microbe manufacturers of semiconductors" *Chemistry & Biology* **2004**, 11, 1478-1480.
2. Flenniken, M, **Allen, M**, Douglas, T, "Phage Display Libraries: A Technique for Peptide-Mineral Discovery" *Chemtracts-- Inorganic Chemistry* **2004**, 17, 1-11.

Chapters in Books

1. **Allen, MA**, Prissel, MM, Young, MJ, Douglas T, "Constrained Metal Oxide Mineralization: Lessons from Ferritin Applied to other Protein Cage Architectures", *Handbook of Biomineralization* P. Behrens and E. Bauerlein, Editors. 2007, Wiley-VCH: Weinheim. p. 313-334.
2. **Allen, M**, Douglas, T, Nest, D, Schoonen, M, Strongin, D, "Charge Development on Ferritin: An Electrokinetic Study of a Protein Containing a Ferrihydrite Nanoparticle, in Nanotechnology and the Environment Applications and Implications", B. Karn, T. Masciangioli, W. Zhang, V. Colvin, P. Alivisatos, Editors. 2005, American Chemical Society: Washington DC. p. 226-229.
3. Flenniken, M, **Allen, M**, Young, M, Douglas, T, "Viruses as Host Assemblies", *Encyclopedia of Supramolecular Chemistry*; J.L. Atwood, J.W. Steed, Editors. 2004, Marcel Dekker, Inc.: New York, 1563-1568.
4. Douglas, T, **Allen, M**, Young, M, "Self-assembling Protein Cage Systems and Applications in Nanotechnology", *Polyamides and Complex Proteinaceous Materials I:*

Biopolymers; S.R. Fahnestock, A. Steinbuchel, Editors. 2003, Wiley-VCH: Weinheim, p. 405-426.

Conference Proceedings

1. **Allen, MA**, Kolesnikov-Linsey, R, Belcher, AM, "Virus templated lithium ion battery materials: New cathodes for higher energy and capacity" *Abstracts of Papers of the American Chemical Society*, **2010**, 240, 54-FUEL
2. Parker, MJ, **Allen, M**, Klem, M, Ramsay, B, Wiedenheft, B, Young, M, Douglas, T, "Hyperthermophilic archaeal protein architectures: Biochemical characterization and biosynthetic application", *Abstracts to the American Chemical Society*, **2008**, 235, 44-PRES
3. Prissel, MM, **Allen, MA**, Minor, A, Douglas, T, Young, M, "Polyoxometallate prepared inside the viral protein cage of Cowpea chlorotic mottle virus: A bioinorganic platform to study the protein-mineral interface using 3D electron microscopy reconstruction techniques", **2006**, 314-COLL
4. Douglas, T, **Allen, M**, Klem, M, Gilmore, K, Idzerda, Y, Young, M, "Engineered protein cages for nanomaterials synthesis", **2004**, 194-PMSE

Interviews

1. Sean Gallagher, "Boeing's Dreamliner Batteries 'Inherently Unsafe' and Yours May Be Too", ARS Technica, January 18, 2013, [Interviewee]

Presentations

Conference/Poster Presentations (Juried/Refereed)

1. **Allen, MA**, "Bioengineering Materials for Electrochemical Storage", Inaugural Workshop of Battery Materials Research Center, Army Research Lab, Adelphi Laboratory Center, Adelphi, MD 20783-1138, November 2014
2. **Allen, MA**, Barannikova, E, Riley, S, Winton, A, "Naturally Synthetic: Using Biology to Improve Technology", Biophysical Society Conference, (Oral), Baltimore, MD 2015
3. Winton, A, **Allen, MA**, "Polypeptides for Bio-tethering and Self-assembly of Lithium Ion Battery Electrodes", Biophysical Society Conference, (Poster), Baltimore, MD 2015
4. Barannikova, E, **Allen, MA**, "Bio-templated materials for high power Li-ion batteries", Biophysical Society Conference, (Poster), Baltimore, MD 2015
5. Riley, S, **Allen, MA**, "Shocking the World of Batteries: A Bio-Inspired Approach to Electrode Construction", Biophysical Society Conference, (Poster), Baltimore, MD 2015
6. Barannikova, E, **Allen, MA**, "Bio-templated materials for high power Li-ion batteries", American Chemical Society National Conference, (Poster), Indianapolis, IN, 2013
7. Riley, S, **Allen, MA**, "Shocking the World of Batteries: A Bio-Inspired Approach to Electrode Construction", American Chemical Society National Conference, (Oral), Indianapolis, IN, 2013
8. **Allen, MA**, Oh, D, Kolsenikov-Lindsey, R, Belcher, AM, "Bio-directed High Capacity Electrode Materials, Institute for Collaborative Biotechnology", (Poster), Santa Barbara, CA 2011
9. **Allen, MA**, Kolesnikov-Lindsey, R, Belcher, AM, "Virus Templated Lithium Ion Battery Materials: New Cathodes for Higher Energy and Capacity", American Chemical Society National Conference, (Oral and Poster), Boston, MA 2010

10. **Allen, MA**, Kolesnikov-Lindsey, R, Oh, D, Yun, DS, Belcher, AM, "Virus Templated Materials for Lithium Ion Batteries", Institute for Collaborative Biotechnology, (Poster), Santa Barbara, CA 2010
11. **Allen, MA**, Belcher AM, "From Nature and Back Again, New Life to Materials for Energy", Gordon Research Conference: Electrochemistry, (Oral Presentation), Ventura, CA, 2010
12. **Allen, MA**, Belcher, AM, "Protein Templated Lithium Ion Battery Materials", Gordon Research Conference: Electrochemistry, (Postor), Ventura, CA, 2010
13. **Allen, M**, Klem, MT, Arbour, T, Young, MJ, Douglas, T, "Incorporating both magnetic and catalytic activity into a range of self assembled protein cage architectures", Materials Research Society Spring Meeting (Oral Presentation), San Francisco, CA, 2007.
14. **Allen, M**, Multiple pathways for coping with oxidative stress, MontDiego: Viruses as Materials Conference (Oral Presentation), Bozeman, MT, 2007.
15. **Allen, M**. Song, C, Kisielowski, C, Minor, A, Young, M, Douglas, T, "Hollow shell structure of MoS₂ prepared inside the viral protein cage of Cowpea chlorotic mottle virus as determined by through focal series reconstruction HRTEM", Materials Research Society Spring Meeting (Oral Presentation), San Francisco, CA, 2006.
16. **Allen, M**, Klem, M, Suci, P, Willits, D, Young, M, Douglas, T, "Biomimetic Mineralization Inside an Engineered Viral Protein Cage and Self Assembly to form Two Dimensional Arrays", Foundations of Nanoscience (Poster), Snowbird, UT, 2005.
17. **Allen, M**, Willits, D, Gilmore, K, Young, M, Douglas, T, "Biomimetic Synthesis of Metal Oxides using Protein Cages as Reaction Vessels", Materials Research Society Spring Meeting (Oral Presentation) 2005, San Francisco, CA, 2005.
18. **Allen, M**, Douglas, T, Willits, D, Young, M, "Biomimetic Mineralization within the Viral Protein Cage Cowpea Chlorotic Mottle Virus (CCMV)", The University of Montana and Toyo University Symposium on Bio-Nano Technology and Sciences, Missoula, MT (University of Montana) (Poster), 2004.
19. **Allen, M**, Willits, D, Young, M, Douglas, T, "Biomimetic Mineralization within the Cowpea Chlorotic Mottle Virus (CCMV) Viral Protein Cage", Biomineralization Gordon Research Conference (Poster), Colby-Sawyer College, 2004.
20. **Allen, M**, Douglas, T, Willits, D, Young, M, "Biomimetic Mineralization within the Viral Protein Cage Cowpea Chlorotic Mottle Virus (CCMV)", Viruses and Protein Cages as Materials Conference (Poster), Museum of the Rockies, Bozeman, MT, 2004.
21. **Allen, M**, Douglas, T, Klem, M, Willits, D, Idzerda, Y, Young, M, "Biomimetic Mineralization of Spinels in Engineered Viral Protein Cages", Materials Research Society Spring Meeting (Oral Presentation) 2004, San Francisco, CA, 2004.
22. **Allen, M**, Douglas, T, "Biomimetic Mineralization of Metal Oxides Inside Protein Cages using Ferritin as a Model", 58th Northwest Regional Meeting ACS (Oral Presentation), Bozeman, MT, 2003.
23. **Allen, M**, Douglas, T, "Viruses as Protein Cages for Nano-materials Synthesis", MontDiego Viruses as Materials Conference (Oral Presentation), La Jolla, CA (Scripps Research Institute), 2002.
24. **Allen, M**, Basu, G, Willits, D, Young, M, Douglas, T, "Tb(III) Fluorescence as a Probe for Metal Binding to Cowpea Chlorotic Mottle Virus", Gordon Research Conference Metals in Biology (Poster), Ventura, CA, 2002.

Conference/Poster Presentations (Non-Juried/Refereed)

1. **Allen, M**, Mosolf, J, Young, M, Douglas, T, "Biomimetic Mineralization of Metal Oxides Inside Protein Cages Using Ferritin as a Model", National BioNano Process, Science and Technology Conference (Oral Presentation), Nagoya, Japan, 2003.

Professional Presentations

Invited Talks

1. **Allen, MA**, "Naturally Synthetic: Using biology to synthesize and assemble functional materials", Invited talk, Department of Chemistry, St. Johns University, Queens, NY March 18, 2013.

Lectures

1. **Allen, MA**, "Naturally Synthetic: Using biology to improve technology", Chem 101H seminar, UMBC Chemistry and Biochemistry, September 4, 2014
2. **Allen, MA**, "Naturally Synthetic: Using biology to synthesize and assemble functional materials", Chem 101H seminar, UMBC Chemistry and Biochemistry, October, 10, 2013
3. **Allen, MA**, "Naturally Synthetic: Using biology to synthesize and assemble functional materials", Summer Bridge Presentation, UMBC Chemistry and Biochemistry, June 13, 2013
4. **Allen, MA**, "Naturally Synthetic: Using biological systems to develop functional materials", Summer Bridge Presentation, UMBC, August 15, 2012
5. **Allen, M**, Song, C, Kisielowski, C, Minor, A, Young, M, Douglas, T, "Biom mineralization inside a plant virus: probing the protein mineral interface by TEM", National Center for Electron Microscopy weekly seminar (Oral Presentation), Berkeley, CA, 2006.
6. **Allen, M**, Klem, M, Gilmore, K, Idzerda, Y, Young, M, Douglas, T, "Biomimetic Mineralization of Transition Metal Oxides Inside Protein Cages Based on an Electrostatic Model", Brookhaven National Labs (Friday Seminar Oral Presentation), National Synchrotron Light Source, Upton, NY, 2003.

Media Activities

1. "A new generation of power: Hi-tech rechargeable batteries developed for military", Press Conference ACS National Conference: August 23, 2010, Boston, <http://www.ustream.tv/recorded/9108924>

Creative Achievements

Project Proposals Submitted

1. A study of amino acids primarily responsible for interaction with inorganic materials in solid bonding polypeptides, **PI**, 2014, Special Research Assistantship/Initiative Support, **Funded** \$20,000.
2. Bio-Tethered Conductive and Electroactive Materials for the Improvement of Li Ion Batteries, **PI**, 2013, Pre-proposal submitted to Department of Energy Young Investigator Program, DE-FOA-0000958, Not approved for full submission.
3. Phage display for battery materials, **PI**, 2013, Special Research Assistantship/Initiative Support, Not funded.
4. Phage display for battery materials, **PI**, 2013, Summer Faculty Fellowship, **Funded** \$6,000.
5. Graduate Fellowship, National Defense Science and Engineering, Submitted by Alexander Winton, 2014, Total Request \$91,500.00, Not Funded.
6. Graduate Fellowship to the National Science Foundation, Submitted by Alexander Winton, 2014, Total Request \$132,000.00, Not Funded.

Works in Progress

1. Identification of Solid Binding Peptides for Erosion Prevention, **PI**, ACS Petroleum Research Fund, Doctoral New Investigator Grant, Submitted October 17, 2014, Total Request \$110,000 for two years Funding Period September 2015-August 2017.

2. A study of amino acids primarily responsible for interaction with inorganic materials in solid bonding polypeptides, **PI**, NSF Biomaterials, PD-06-7623, Submitted October 31, 2014, Total Request \$524,819.00, Funding Period September 2015-August 2018.
3. Graduate Fellowship, National Defense Science and Engineering, Submitted by Alexander Winton, 2014, Total Request \$91,500.00, Funding Period September 2015-August 2018.
4. Graduate Fellowship to the National Science Foundation, Submitted by Alexander Winton, 2014, Total Request \$132,000.00, Funding Period September 2015-August 2018.

Academic memberships

1. American Chemical Society
2. BioPhysical Society

SERVICE TO THE DEPARTMENT, UNIVERSITY, COMMUNITY, AND PROFESSION**Service to the Department**

1. 2014-Present, Outreach Committee/ Website (Member)
2. 2014, Voting Rights Committee (Member)
3. 2014, Spring, Departmental Seminar Series (Chair)
4. 2013-2014, Retreat Committee (Member)
5. 2013, Fall, Departmental Seminar Series (Chair)
6. 2013-Present, Minutes keeper at department faculty meetings

PhD Student's committees Served/Serving:

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|------------------------|---------------------------------------|
| 1. Evgenia Barannikova | Ph.D. Committee Chair (Chem/Biochem) |
| 2. Scot Riley | Ph.D. Committee Chair (Chem/Biochem) |
| 3. Alexander Winton | Ph.D. Committee Chair (Chem/Biochem) |
| 4. Florika Macazo | Ph.D. Committee Member (Chem/Biochem) |
| 5. Arunendra Saha Ray | Ph.D. Committee Member (Chem/Biochem) |
| 6. Brian Szychowski | Ph.D. Committee Member (Chem/Biochem) |

Service to the University

1. 2012, Reviewer for the Postdoctoral Fellows Program for Faculty Diversity

Service to the Scientific Community

1. 2013, Symposium Co-organizer and Co-chair, "Advances in Batteries, Capacitors, and Other Energy Storage Devices" , ACS National Meeting
2. 2013-2014, Reviewer for various peer reviewed journals:
 - a. Nano Letters (ACS)
 - b. Langmuir (ACS)

I certify that this document is accurate and true.

Mark A. Allen

November 17, 2014