

Danna Erit Freedman

Northwestern University

Department of Chemistry

Phone: (847) 491-4441

danna.freedman@northwestern.edu

http://sites.northwestern.edu/freedman

Appointments

Associate Professor, Department of Chemistry, Northwestern University	Sept 1, 2018 –
Assistant Professor, Department of Chemistry, Northwestern University	2012 – 2018
NSF-ACC Postdoctoral Fellow, Massachusetts Institute of Technology	2009 – 2012

Education

Postdoctoral Fellow, Massachusetts Institute of Technology	<i>Advisor: Prof. Daniel G. Nocera</i>	2012
Ph.D. Inorganic Chemistry, University of California, Berkeley, <i>Thesis title: Increasing Anisotropy in Single-Molecule Magnets</i>	<i>Advisor: Prof. Jeffrey R. Long</i>	2009
A. B. Chemistry <i>cum laude</i> Harvard University	<i>Advisor: Prof. Hongkun Park</i>	2003

Awards and Honors

Kavli Fellow	2018
Camille Dreyfus Teacher-Scholar Award	2018 – 2023
Presidential Early Career Award for Scientists and Engineers (PECASE) via DoD (AFOSR)	2017 – 2022
NSF CAREER Award	2015 – 2020
Searle Teaching Fellow	2014 – 2015
A. P. Sloan Research Fellow	2015 – 2017
Camille and Henry Dreyfus Environmental Mentor	2016
Air Force Office of Scientific Research Young Investigator Program	2014 – 2017
Initiative for Sustainability and Energy at Northwestern Booster Award	2012 – 2013
NSF-American Competitiveness in Chemistry Fellowship	2010 – 2012
Tyco Electronics Graduate Fellowship	2008 – 2009
France-Berkeley Fund Fellowship	2007

Publications

Independent Career

- (42) Tamerius, A. D.; Clarke, S. M.; Gu, M.; Walsh, J. P. S.; Esters, M.; Meng, Y.; Hendon, C. H.; Rondinelli, J. M.; Jacobsen, S. D.; Freedman, D. E. *Angew. Chem. Int. Ed.* **2018**, *Accepted*.
- (41) Klein, R. A.; Walsh, J. P. S.; Clarke, S. M.; Guo, Y.; Bi, W.; Fabbris, G.; Meng, Y.; Haskel, D.; Alp, E. E.; Van Duyne, R. P.; Jacobsen, S. D.; Freedman, D. E. Impact of Pressure on Magnetic Order in Jarosite *J. Am. Chem. Soc.* **2018**, *ASAP* DOI: 10.1021/jacs.8b05601.
- (40) Pearson, T. J.; Laorenza, D.; Krzyaniak, M.; Wasielewski M. R.; Freedman, D. E. Octacyanometallate Qubit Candidates *Dalton Trans.* **2018** *Advance Article* DOI: 10.1039/C8DT02312C. *In honor of Kim Dunbar's 60th birthday*.
- (39) Walsh, J. P. S; Freedman, D. E. High-Pressure Synthesis: A New Frontier in the Search for Next-Generation Intermetallic Compounds *Acc. Chem. Res.* **2018**, *51*, 1315–1323.
- (38) Powderly, K. M.; Clarke, S. M.; Amsler, M.; Wolverson, C.; Malliakas, C. D.; Meng, Y.; Jacobsen, S. D.; Freedman, D. E. High-pressure discovery of β -NiBi *Chem. Commun.* **2017**, *53*, 11241–11244.
- (37) Coste, S. C.; Vlaisavljevich, B.; Freedman, D. E. Magnetic Anisotropy from Main Group Elements: Halide versus Group 14 Elements *Inorg. Chem.* **2017**, *56*, 8195–8202.

- (36) Graham, M. J.; Krzyaniak, M.; Wasielewski, M. R.; Freedman, D. E. Probing Nuclear Spin Effects on Electronic Spin Coherence via EPR Measurements of Vanadium (IV) Complexes *Inorg. Chem.* **2017**, *56*, 8106–8113.
- (35) Clarke, S. M.; Amsler, M.; Walsh, J. P. S.; Yu, T.; Wang, Y.; Meng, Y.; Jacobsen, S. D.; Wolverton, C.; Freedman, D. E. Creating Binary Cu–Bi Compounds via High-Pressure Synthesis: A Combined Experimental and Theoretical Study *Chem. Mater.* **2017**, *29*, 5276–5285.
- (34) Zadrozny, J. M.; Gallagher, A. T.; Harris, T. D.; Freedman, D. E. A Porous Array Of Clock Qubits *J. Am. Chem. Soc.* **2017**, *39*, 7089–7094.
- (33) Graham, M. J.; Zadrozny, J. M.; Fataftah, M. S.; Freedman, D. E. Forging Solid-State Qubit Design Principles in a Molecular Furnace *Chem. Mater.* **2017**, *29*, 1885–1897.
- (32) Graham, M. J.; Yu, C.; Krzyaniak, M.; Wasielewski, M.; Freedman, D. E. Synthetic Approach to Determine the Effect of Nuclear Spin Distance on Electronic Spin Decoherence *J. Am. Chem. Soc.* **2017**, *139*, 3196–3201.
- (31) Walsh, J. P. S.; Freedman, D. E. Preview Article: Using Supramolecular Chemistry to Build Quantum Logic Gates *Chem* **2016**, *1*, 668–669.
- (30) Walsh, J. P. S.; Clarke, S. M.; Meng, Y.; Jacobsen, S. D.; Freedman, D. E. Discovery of FeBi₂ *ACS Cent. Sci.* **2016**, *2*, 867–871.
- (29) Yu, C.; Graham, M. J.; Zadrozny, J. M.; Niklas, J.; Krzyaniak, M.; Wasielewski, M. R.; Poluektov O. G.; Freedman, D. E. Long Coherence Times in Surface-Compatible Nuclear Spin-Free Vanadium Qubits *J. Am. Chem. Soc.* **2016**, *138*, 14678–14685.
- (28) Clarke, S. M.; Walsh, J. P. S.; Amsler, M.; Yu, T.; Goedecker, S.; Wang, Y.; Wolverton, C.; Freedman, D. E. Discovery of a Superconducting Cu–Bi Intermetallic Compound via High-pressure Synthesis *Angew. Chem. Int. Ed.* **2016**, *55*, 13446–13449.
- (27) Pearson, T. J.; Fataftah, M. S.; Freedman, D. E. Enhancement of Magnetic Anisotropy in a Mn–Bi Heterobimetallic Complex. *Chem. Commun.* **2016**, *52*, 11394–11397.
- (26) Zadrozny, J. M.; Graham, M. J.; Krzyaniak, M. D.; Wasielewski, M. R.; Freedman, D. E. Unexpected Suppression of Spin-Lattice Relaxation via High Magnetic Field in a High-Spin Iron(III) Complex *Chem. Commun.* **2016**, *52*, 10175–10178.
- (25) Fataftah, M. S.; Coste, S. C.; Vlaisavljevich, B.; Zadrozny, J. M.; Freedman, D. E. Transformation of the Coordination Complex [Co(C₃S₅)₂]²⁻ from a Molecular Magnet to a Potential Qubit *Chem. Sci.* **2016**, *7*, 6160–6166.
- (24) Fataftah, M. S.; Zadrozny, J. M.; Coste, S. C.; Graham, M. J.; Rogers, D. M.; Freedman, D. E. Attainment of Two Qubits in the Ground State Spin Manifold of a Molecule *J. Am. Chem. Soc.* **2016**, *138*, 1344–1348.
- (23) Zadrozny, J. M.; Freedman, D. E.; Qubit Control Limited by Spin–Lattice Relaxation in a Nuclear Spin–Free Iron(III) Complex *Inorg. Chem.* **2015**, *54*, 12027–12031.
- (22) Zadrozny, J. M.; Niklas, J.; Poluektov, O. G.; Freedman, D. E. Millisecond Coherence Time in a Tunable Molecular Electronic Spin Qubit *ACS Cent. Sci.* **2015**, *1*, 488–492.
- (21) Zadrozny, J. M.; Greer, S.; Hill, S.; Freedman, D. E. A Flexible Iron(II) Complex in which Zero-Field Splitting is Resistant to Structural Variation *Chem. Sci.* **2015**, *7*, 416–423.
- (20) Clarke, S. M.; Freedman, D. E. (BiSe)_{1.23}CrSe₂ and (BiSe)_{1.22}(Cr_{1.2}Se₂)₂: Magnetic Anisotropy in the First Structurally Characterized Bismuth-Chromium-Selenide Ternary Phases *Inorg. Chem.*, **2015**, *54*, 2765–2771.
- (19) Zadrozny, J. M.; Niklas, J.; Poluektov, O. G.; Freedman, D. E. Multiple Quantum Coherences from Hyperfine Transitions in a Vanadium(IV) Complex *J. Am. Chem. Soc.* **2014**, *136*, 15841–15844.
- (18) Fataftah, M. S.; Zadrozny, J. M.; Rogers, D. M.; Freedman, D. E. A Mononuclear Transition Metal Single-Molecule Magnet in a Nuclear Spin-Free Ligand Environment *Inorg. Chem.* **2014**, *53*, 10716–10721.
- (17) Graham, M. G.; Zadrozny, J. M.; Shiddiq, M.; Anderson, J. S.; Fataftah, M. S.; Hill, S.; Freedman, D. E. Influence of Electronic Spin and Spin-Orbit Coupling on Decoherence in Mononuclear Transition Metal Complexes *J. Am. Chem. Soc.* **2014**, *136*, 7623–7626.

- (16) Rondinelli, J. R.; Benedek, N. A.; Freedman, D. E.; Kavner, A.; Rodriguez, E. E.; Toberer, E. S.; Martin, L. W. Accelerating Functional Materials Discovery *Am. Ceram. Soc. Bull.* **2013**, *92*, 14.

Doctoral and Postdoctoral Research

- (15) Chisnell, R.; Helton, J. S.; Freedman, D. E.; Singh, D. K.; Demmel, F.; Stock, C.; Nocera, D. G.; Lee, Y. S. Magnetic Transitions in the Topological Magnon Insulator Cu(1,3-bdc) *Phys. Rev. B* **2016**, *93*, 214403.
- (14) Chisnell, R.; Helton, J. S.; Freedman, D. E.; Singh, D. K.; Bewley, R. I.; Nocera, D. G.; Lee, Y. S. Topological Magnon Bands in a Kagome Lattice Ferromagnet *Phys. Rev. Lett.* **2015**, *115*, 147201.
- (13) Han, T.-H.; Chisnell, R.; Bonnoit, C. J.; Freedman, D. E.; Zapf, V. S.; Harrison, N.; Nocera, D. G.; Takano, Y.; Lee, Y. S. Thermodynamic Properties of the Quantum Spin Liquid Candidate $\text{ZnCu}_3(\text{OH})_6\text{Cl}_2$ in High Magnetic Fields *arXiv:1402.2693* [cond-mat.str-el].
- (12) Freedman, D. E.; Chisnell, R.; McQueen, T. M.; Lee, Y. S.; Payen, C.; Nocera, D. G. Frustrated Magnetism in a Ni^{2+} kagomé lattice $\text{BaNi}_3(\text{OH})_2(\text{VO}_4)_2$ *Chem. Commun.* **2012**, *48*, 64–66.
- (11) McQueen, T. M.; Han, T. H.; Freedman, D. E.; Stephens, P. W.; Lee, Y. S.; Nocera, D. G. $\text{CdCu}_3(\text{OH})_6\text{Cl}_2$: A New Layered Hydroxide Chloride *J. Solid State Chem.* **2011**, *184*, 3319–3323.
- (10) Groysman, S.; Villagran, D.; Freedman, D. E.; Nocera, D. G. Dinitrogen binding at vanadium in a tris(alkoxide) ligand environment *Chem. Commun.* **2011**, *47*, 10242–10244.
- (9) Harman, W. H.; Harris, T. D.; Freedman, D. E.; Fong, H.; Chang, A.; Rinehart, J. D.; Ozarowski, A.; Sougrati, M. T.; Grandjean, F.; Long, G.; Long, J. R.; Chang, C. Slow Magnetic Relaxation in a Family of Trigonal Pyramidal Iron(II) Pyrrolide Complexes *J. Am. Chem. Soc.* **2010**, *132*, 18115–18126.
- (8) Freedman, D. E.; Han, T. H.; Prodi, A.; Muller, P.; Huang, Q.-Z. Chen, Y.-S.; Webb, S. M.; Lee, Y. S.; McQueen, T.M.; Nocera, D. G. Site Specific X-ray Anomalous Dispersion of the Geometrically Frustrated Kagomé Magnet, Herbertsmithite, $\text{ZnCu}_3(\text{OH})_6\text{Cl}_2$ *J. Am. Chem. Soc.* **2010**, *132*, 16185–16190.
- (7) Zadrozny, J. M.; Freedman, D. E.; Jenkins, D. M.; Harris, T. D.; Iavarone, A. T.; Harte, E.; Mathonière, C.; Clérac, R.; Long, J. R. Slow Magnetic Relaxation and Charge Transfer in Cyano-Bridged Coordination Clusters Incorporating $[\text{Re}(\text{CN})_7]^{4-/3-}$ *Inorg. Chem.* **2010**, *49*, 8886–8896.
- (6) Chu, S.; McQueen, T. M.; Chisnell, R.; Freedman, D. E.; Muller, P.; Lee, Y. S.; Nocera, D. G. A $\text{Cu}^{2+}(S = 1/2)$ Kagomé Antiferromagnet: $\text{Mg}_x\text{Cu}_{4-x}(\text{OH})_6\text{Cl}_2$ *J. Am. Chem. Soc.* **2010**, *132*, 5570–5571.
- (5) Freedman, D. E.; Harman, W. H.; Harris, T. D.; Long, G. J.; Chang, C. J.; Long, J. R. Slow Magnetic Relaxation in a High-Spin Iron (II) Complex *J. Am. Chem. Soc.* **2010**, *132*, 1224–1225.
- (4) Freedman, D. E.; Jenkins, D. M.; Long, J. R. Strong Magnetic Coupling in Two Molecules Incorporating $[\text{Cr}(\text{CN})_6]^{3-}$ and $[\text{Mo}(\text{CN})_6]^{3-}$ *Chem. Commun.* **2009**, 4829–4831.
- (3) Freedman, D. E.; Jenkins, D. M.; Iavarone, A. T.; Long, J. R. A Redox-Switchable Single-Molecule Magnet Incorporating $[\text{Re}(\text{CN})_7]^{3-}$ *J. Am. Chem. Soc.* **2008**, *130*, 2884–2885.
- (2) Freedman, D. E.; Bennett, M. V.; Long, J. R. Symmetry-Breaking Substitutions of $[\text{Re}(\text{CN})_8]^{3-}$ into the Centered, Face-Capped Octahedral Clusters $(\text{CH}_3\text{OH})_{24}\text{M}_9\text{M}'_6(\text{CN})_{48}$ ($\text{M} = \text{Mn}, \text{Co}$; $\text{M}' = \text{Mo}, \text{W}$) *Dalton Trans.* **2006**, 2829–2834.
- (1) Escalada, J.; Freedman, D.; Werner, E. J. 2,3-Dihydroxy-*N*-methylbenzamide monohydrate *Acta Cryst.* **2004**, E60, o1296–o1298.

Invited Lectures (contributed lectures available upon request)

(75)	University of Wisconsin, Madison, Madison, WI	September, 2018
(74)	International Conference on Coordination Chemistry, Sendai, Japan	August, 2018
(73)	Solid State GRC, New London, NH	July, 2018
(72)	Miller Institute Symposium, Marshall, CA	June, 2018

(71)	<i>51st Annual International Meeting of the EPR spectroscopy group of the Royal Society of Chemistry</i> , London, UK	April, 2018
(70)	<i>ACS National Meeting: ACS Award in Pure Chemistry: Symposium in Honor of Mircea Dincă</i>	March, 2018
(69)	<i>ACS National Meeting: Cold Molecules for Chemistry</i>	March, 2018
(68)	<i>Texas A & M College Station</i> , TX	March, 2018
(67)	<i>Kavli Frontiers of Science Symposium</i> Irvine, CA	February, 2018
(66)	<i>University of Washington</i> , Seattle, WA	February, 2018
(65)	<i>Physics and Chemistry of Surfaces and Interfaces</i> Kona, HI	January, 2018
(64)	<i>Iowa State</i> , Ames IA	December, 2017
(63)	<i>North Carolina State University</i> Raleigh, NC	September, 2017
(62)	<i>Exploring quantum phenomena and quantum matter in ultrahigh magnetic fields: NSF Workshop</i> Alexandria, VA	September, 2017
(61)	<i>ACS National Meeting: Personal and Global Energy Conversion in Chemistry and Biology Symposium</i> , Washington, DC	August, 2017
(60)	<i>North American Solid State Chemistry Conference</i> , Santa Barbara, CA	August, 2017
(59)	<i>Quantum Summer School</i> , Johns Hopkins University	June, 2017
(58)	<i>Canadian Society of Chemistry, Metal and Covalent Organic Frameworks</i> Toronto, Canada	May, 2017
(57)	<i>University of California, Irvine</i> , Irvine, CA	May, 2017
(56)	<i>University of California, Los Angeles</i> , Los Angeles, CA	May, 2017
(55)	<i>University of California, Santa Barbara</i> Santa Barbara, CA	May, 2017
(54)	<i>University of Pittsburgh</i> , Pittsburgh, PA	April, 2017
(53)	<i>ISACS: Challenges In Inorganic Chemistry, Plenary Speaker</i> , Manchester UK	April, 2017
(52)	<i>ACS National Meeting: Celebrating 60 Years of the Division of Inorganic Chemistry</i> , San Francisco, CA	April, 2017
(51)	<i>Caltech</i> Pasadena, CA	March, 2017
(50)	<i>Michigan State University</i> East Lansing, MI	March, 2017
(49)	<i>Massachusetts Institute of Technology</i> Cambridge, MA	March, 2017
(48)	<i>Florida State University</i> Tallahassee FL	February, 2017
(47)	<i>University of Florida</i> , Gainesville, FL	February, 2017
(46)	<i>Harvard University</i> , Cambridge, MA	February, 2017
(45)	<i>Columbia University</i> , New York, NY	February, 2017
(44)	<i>University of California, Berkeley</i> , Berkeley, CA	February, 2017
(43)	<i>Stanford University</i> , Stanford, CA	February, 2017
(42)	<i>Pennsylvania State University</i> , State College, PA	November, 2016
(41)	<i>Colorado State University</i> , Fort Collins, CO	October, 2016
(40)	<i>International Meeting on Spins in Organic Semiconductors</i> , Chicago, IL	October, 2016
(39)	<i>University of Pennsylvania</i> , Philadelphia, PA	September, 2016
(38)	<i>Osaka City University International Conference</i> , Osaka, Japan	September, 2016
(37)	<i>Conductivity & Magnetism in Molecular Materials Gordon Research Conference</i> , Biddeford, ME	August, 2016
(36)	<i>Inorganic Gordon Research Conference</i> , Biddeford, ME	June, 2016
(35)	<i>Rensselaer Polytechnic Institute Student Invited Seminar</i> , Troy, NY	May, 2016
(34)	<i>ACS National Meeting: ACS Award in Inorganic Chemistry: Symposium in honor of Mercuri G. Kanatzidis</i> , San Diego, CA	March, 2016
(33)	<i>University of California, San Diego</i> , San Diego, CA	January, 2016
(32)	<i>Pacificchem, Bismuth Symposium</i> , Honolulu, HI	December, 2015
(31)	<i>European Materials Research Science Conference</i> , Warsaw, Poland	September, 2015
(30)	<i>Indiana University</i> , Bloomington, IN	September, 2015

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| (29) | <i>ACS National Meeting Synthetic Chemistry Approaches to Magnetic Materials Symposium, Boston, MA</i> | August, 2015 |
| (28) | <i>Zero-field Spin Effects in Chemical Systems, Telluride, CO</i> | June, 2015 |
| (27) | <i>Awaji International Workshop on Electron Spin Science & Technology: Biological and Materials Science Oriented Applications, Awaji, Japan</i> | June, 2015 |
| (26) | <i>North America-Greece-Cyprus Workshop on Paramagnetic Materials, Athens Greece</i> | June, 2015 |
| (25) | <i>ACS National Meeting, ACS Award for Distinguished Service in the Advancement of Inorganic Chemistry in Honor of Kim R. Dunbar - Denver, CO,</i> | March, 2015 |
| (24) | <i>Quantum Technology, Manchester, England</i> | January, 2015 |
| (23) | <i>Institute for Molecular Engineering University of Chicago</i> | November, 2014 |
| (22) | <i>ACS National Meeting, Inorganic Chemistry Lectureship Award: Symposium in Honor of Jeffrey R. Long San Francisco, CA</i> | August, 2014 |
| (21) | <i>ACS National Meeting ExxonMobil Solid State Chemistry Faculty Fellow Award: Symposium in Honor of Daniel Fredrickson, San Francisco, CA</i> | August, 2014 |
| (20) | <i>International Conference on Molecule-Based Magnets, St. Petersburg, Russia</i> | July, 2014 |
| (19) | <i>Inorganic Gordon Research Conference, Biddeford, ME</i> | June, 2014 |
| (18) | <i>University of Illinois, Champaign Urbana, Department of Physics</i> | April, 2014 |
| (17) | <i>ACS National Meeting A Celebration of Crystallography in Solid State and Materials Chemistry: Complex Problems and New Solutions in Inorganic Small Molecule Crystallography, Dallas, TX</i> | March, 2014 |
| (16) | <i>Missouri University of Science and Technology, Rolla, MO</i> | October, 2013 |
| (15) | <i>National High Magnetic Field Laboratory, Tallahassee, FL</i> | August, 2013 |
| (14) | <i>Argonne National Laboratory, Argonne, IL</i> | July, 2013 |
| (13) | <i>UC Santa Barbara, Santa Barbara, CA</i> | January, 2012 |
| (12) | <i>UC Irvine, Irvine, CA</i> | January, 2012 |
| (11) | <i>University of Chicago, Chicago, IL</i> | January, 2012 |
| (10) | <i>Princeton University, Princeton NJ</i> | January, 2012 |
| (9) | <i>Northwestern University, Evanston, IL</i> | December, 2011 |
| (8) | <i>University of Minnesota, Minneapolis, MN</i> | December, 2011 |
| (7) | <i>Harvard University, Cambridge, MA</i> | December, 2011 |
| (6) | <i>Oregon State University, Corvallis, OR</i> | December, 2011 |
| (5) | <i>Stanford University, Stanford CA</i> | December, 2011 |
| (4) | <i>Rutgers University, New Brunswick NJ</i> | November, 2011 |
| (3) | <i>UC Berkeley, Berkeley, CA</i> | May, 2011 |
| (2) | <i>Bruker-MIT Symposium, Cambridge, MA</i> | February, 2010 |
| (1) | <i>Centre Recherche de Paul Pascal University of Bordeaux, Bordeaux, France</i> | February, 2008 |

University Service

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- (1) Chair Department of Chemistry Graduate Admission and Recruiting Committee **2018**
 - (2) Department of Chemistry Graduate Admission and Recruiting Committee **2012 – 2017**
 - (3) Department of Chemistry IMSERC Committee **2012 – 2017**
 - (4) Department of Chemistry Junior Faculty Search Committee, **2014, 2016**
 - (5) Department of Chemistry General Chemistry Curriculum Revision Committee **2014 – present**
 - (6) Provost's Advisory Council on Women Faculty **2016 – present**
 - (7) Undergraduate Research Grant Committee **2016 – 2017**

Professional Activities

- (1) Quantum Triplets Advisory Board Member
- (2) Co-author of a BES workshop report on QIS DOE entitled “Opportunities for Basic Research For Next Generation Quantum Systems.”
- (3) Collaborated with the Museum of Science and Industry to create an exhibit on magnetism, include a video of her describing magnetic anisotropy. This exhibit is now at O’Hare International Airport.
- (4) Led the Power Hour at the Conductivity and Magnetism in Molecular Materials Gordon Research Conference.
- (5) Co-organized an ACS symposium, a European Materials Research Society Symposium, and a colloquium at Northwestern for students to present their research to the greater Chicago community.
- (6) NSF Quantum Information for Chemistry workshop report co-author
- (7) Reviewer; selected journals: *Nature Chemistry*, *Nature Communications*, *Journal of the American Chemical Society*, *Inorganic Chemistry*, *Journal of Materials Chemistry*, *Chemical Science*, *Physical Review B*, *Chemical Communications*, and *Dalton Transactions*.
- (8) Reviewer; selected funding agencies: ARO, AFOSR, NSF, DOE.
- (9) NSF sponsored workshop on midscale instrumentation for quantum materials participant.
- (10) Quantum Materials: For Design-By-Design workshop participant.
- (11) Fellow Northwestern Public Affairs Residential College.