# HERDELINE ANN M. ARDOÑA

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## RESEARCH INTERESTS

Macromolecular systems, self-assembly, biomaterials, cardiac tissue engineering, bioelectronics, nanotechnology

## PROFESSIONAL APPOINTMENTS AND EDUCATION

**2020–** **University of California, Irvine**
Assistant Professor, Department of Chemical and Biomolecular Engineering
*Joint appointments (by courtesy)*: Department of Biomedical Engineering and Department of Chemistry
Member, Sue & Bill Gross Stem Cell Research Center (SCRC)
Member, Center for Neural Circuit Mapping (CNCM)
Affiliate Member, Cardiovascular Innovation and Research Center (CIRC)
Member, Chemical and Materials Physics (ChaMP) Program

**2017– 2020** **Harvard University**
ACS Irving S. Sigal Postdoctoral Fellow, Disease Biophysics Group

**2012– 2017** **Johns Hopkins University**
Ph.D. Chemistry (with Certificate for Advanced Studies in Nanobiotechnology, 2016)

**University of the Philippines Diliman**
**2011– 2012** Instructor 5, Institute of Chemistry, College of Science
**2007– 2011** B.S. Chemistry, *summa cum laude*

## AWARDS AND RECOGNITIONS

- Kavli Fellow, 34th U.S. Kavli Frontiers of Science Symposium-National Academy of Sciences **(2024)**
- Hellman Fellowship **(2023–2024)**
- NSF CAREER Award **(2023– 2028)**
- U.S. Young Observer, International Union of Pure and Applied Chemistry (IUPAC) **(2023)**
  *One of ten individuals selected to participate in IUPAC activities at the 52nd General Assembly and 49th World Chemistry Congress; participated in Polymer Division meetings*
- Chemical and Biomolecular Engineering Professor of the Year, UCI Engineering Student Council **(2022– 2023)**
- 12th Irving S. Sigal Postdoctoral Fellow, American Chemical Society (ACS) **(2018– 2020)**:
  *Awarded every two years to one outstanding postdoctoral fellow pursuing research at the chemistry-biology interface*
- International Student Research Fellowship, Howard Hughes Medical Institute (HHMI) **(2015– 2017)**
- Faculty for the Future Fellowship, Schlumberger Foundation **(2014– 2017)**
- Emmett and Elsie Buhle Fellowship Award, Johns Hopkins University **(2014)**:
  *Annually given to one Chemistry graduate student in acknowledgement of excellent academic performance*
- Leticia Shahani Award for Best Undergraduate Thesis, UP Diliman **(2011)**
- Bank of the Philippine Islands-Department of Science and Technology: Science Award, Philippines **(2010)**:
  *Annually given to 30 student researchers in the Philippines who excel in science and engineering*
- Baldomero M. Olivera, Jr. and Lourdes J. Cruz Award, UP Diliman **(2010)**:
  *Annually given to two highest ranking B.S. Chemistry seniors of the Institute of Chemistry, UP Diliman*
- National Scholarship Program, Commission on Higher Education, Philippines **(2007– 2011)**

## PUBLICATIONS (**denotes equal contribution*; *⊥undergraduate co-authors, †corresponding author*)

[37] T. Rao*, S. Lim*, J. Li,⊥ A.S. Robang, A.M. Liberty,⊥ **H.A.M. Ardoña**,† A.K. Paravastu,† "Cooperative β-sheet coassembly controls intermolecular orientation of amphiphilic peptide-polydiacetylene conjugates crystals," *in revision*.

[36] Z.-F. Yao, D.L.M. Cordova, G.M. Milligan, D. Lopez, S.J. Allison, Y. Kuang, **H.A.M. Ardoña**,† M.Q. Arguilla,† "Lattice-guided assembly of optoelectronically-active π-conjugated peptides on 1D van der Waals single crystals," **2024**, *Sci. Adv.*, 10, eadl2402.

[35] K.K. Lee,* N. Celt,* **H.A.M. Ardoña**,† "Looking both ways: electroactive biomaterials with bidirectional implications for dynamic cell-material crosstalk," **2024**, *Biophys. Rev.*, 2024, 5, 021303 (*featured article*)

[34] J.F. Zimmerman, D. Drennan, J. Ikeda,⊥ Q. Jin, **H.A.M. Ardoña**, S.L. Kim, R. Ishii, K.K. Parker,† "Mapping form and function in biohybrid rays using machine learning directed evolution," **2023**, *submitted*

[33] Z.-F. Yao, Y. Kuang, H.-T. Wu, E. Lundqvist, X. Fu, N. Celt, J. Pei, A.F. Yee, **H.A.M. Ardoña**,† "Selective induction of molecular assembly to tissue-level anisotropy on peptide-based optoelectronic cardiac biointerfaces," *Adv. Mater.*, **2024**, 312231 (selected as part of Advanced Materials "Rising Stars" special collection)

[32] P. Wick,† H. Zhang, S. Lin, X. Li, C Zhang, **H.A.M. Ardoña,** Editorial – "Special issue environmental and health impacts of two-dimensional nanomaterials," *NanoImpact*, **2024**, 33, 100491

[31] S. Lim, D.L.M. Cordova, A.S. Robang, Y. Kuang, A.K. Paravastu, M.Q. Arguilla, **H.A.M. Ardoña**,† "Thermochromic behavior of polydiacetylene nanomaterials driven by charged peptide amphiphiles," *Biomacromolecules,* **2023**, 24, 4051 (invited as part of special issue in *Peptide Materials*)

[30] S. Choi, K.Y. Lee, S.L. Kim, L.A. MacQueen, H. Chang, J.F. Zimmerman, Q. Jin, M.M. Peters, **H.A.M. Ardoña**, X. Liu, A.-C. Heiler, R. Gabardi,⊥ C. Richardson, W.T. Pu, A.R. Bausch, K.K. Parker,† "Fibre-infused gel scaffolds guide cardiomyocyte alignment in 3D-printed ventricles," *Nat. Mater.,* **2023**, 22, 1039

[29] Y. Kuang, Z.-F. Yao, S. Lim, C. Ngo, ⊥ **H.A.M. Ardoña**,† "Biomimetic sequence-templating approach towards a multiscale modulation of chromogenic polymer properties," *Macromolecules,* **2023**, 56, 4526 (selected as a supplementary cover)

[28] V. V. Vurro, K. Shani, **H.A.M. Ardoña**, J. F. Zimmerman, V. Sesti, K.Y. Lee, Q. Jin, C. Bertarelli, K.K. Parker, G. Lanzani,† "Light-triggered cardiac microphysiological model," *APL Bioengineering*, **2023**, 7, 026108 (featured article in *Scilight*)

[27] Z.-F. Yao, Y. Kuang, P. Kohl, Y. Li, **H.A.M. Ardoña**,† "Carbodiimide-fueled assembly of π-conjugated peptides regulated by electrostatic interactions," *ChemSystemsChem*, **2023**, 5, e202300003 (selected for the *Systems Chemistry in the USA* special collection, *Chemistry Europe Editor's Choice: Spotlights*, and as front cover)

[26] K.L. Lacy, S. Salib,⊥ M. Tran, T. Tsai, R. Valentine, **H.A.M. Ardoña**, T.N.G. Adams,† "Light-induced dielectrophoresis for characterizing the electrical behavior of human mesenchymal stem cells," *J. Vis. Exp.*, **2023**, doi: 10.3791/64909 (*invited article*)

[25] Z.-F. Yao, E. Lundqvist, Y. Kuang, **H.A.M. Ardoña**,† "Engineering multi-scale organization for biotic and organic abiotic electroactive systems," *Adv. Sci.* **2023**, 10, 2205381

[24] H. Chang,* Q. Liu,* J.F. Zimmerman,* K.Y. Lee, Q. Jin, M.M. Peters, S. Choi, S.L. Kim, **H.A.M. Ardoña**, L.A. MacQueen, C.O. Chantre, S.E. Motta, E.M. Cordoves,⊥ G.J. Touloumes, K.K. Parker,† "Recreating the heart's helical structure-function relationship with focused rotary jet spinning," *Science,* **2022**, 377, 180

[23] **H.A.M. Ardoña**, J.F. Zimmerman, K. Shani, F. Eweje,⊥ S.-H. Kim, D. Bitounis, D. Parviz, E. Casalino, M. Strano, P. Demokritou, K.K. Parker,† "Differential modulation of endothelial cytoplasmic projections after exposure to graphene-based nanomaterials," *NanoImpact,* **2022,** 26, 100401

[22] K.Y. Lee,* S.-J. Park,* D.G. Matthews, S.L. Kim, C. A. Marquez,⊥ J.F. Zimmerman, **H.A.M. Ardoña**, A.G. Kleber, G.V. Lauder, K.K. Parker,† "An autonomous, humanized fish based on cardiac biophysics," *Science*, **2022**, 375, 639

[21] S. Lim, Y. Kuang, **H.A.M. Ardoña**,† "Evolution of supramolecular systems towards next-generation biosensors," *Front. Chem.*, **2021**, 9, 723111 (invited as part of the special issue on *International Women of Supramolecular Chemistry*)

[20] M. Yadid, J.U. Lind, **H.A.M. Ardoña**, S.P. Sheehy, L.E. Dickinson, F. Eweje,⊥ M.M.C. Bastings, B.D. Pope, B. B. O'Connor, J.R. Straubhaar, B. Budnik, A.G. Kleber, K.K. Parker,† "Endothelial extracellular vesicles contain protective proteins and rescue ischemia-reperfusion-injury in a human heart-on-chip," *Sci. Transl. Med.*, **2020**, 12, 565, eaax8005

[19] S. Ahn, C.O. Chantre, **H.A.M. Ardoña**, G.M. Gonzalez, P.H. Campbell, K.K. Parker,† "Biomimetic and estrogenic fibers promote skin regeneration via estrogen receptor β," *Biomaterials,* **2020**, 255, 120149

[18] G.J. Touloumes,* **H.A.M. Ardoña**,* E.K. Casalino,⊥ J.F. Zimmerman, C.O. Chantre, D. Bitounis, P. Demokritou, K.K. Parker,† "Mapping 2D- and 3D-distributions of metal/metal oxide nanoparticles within cleared human ex vivo skin tissues," *NanoImpact*, **2020**, 17, 100208

[17] B.B. O'Connor,* T. Grevesse,* J.F. Zimmerman, **H.A.M. Ardoña**, J.A. Jimenez,⊥ K.K. Parker,† "Human microvascular endothelial cell pairs model tissue-level blood-brain barrier function," *Integr. Biol.*, **2020**, 12, 64

[16] F. Eweje,*⊥ **H.A.M. Ardoña**,* J.F. Zimmerman, B.B. O'Connor, S. Ahn, T. Grevesse, K.N. Rivera,⊥ D. Bitounis, P. Demokritou, K.K. Parker,† "Quantifying the effects of engineered nanomaterials on endothelial cell architecture and vascular barrier integrity using a cell pair model," *Nanoscale*, **2019**, 11, 17878

[15] T.S. Kale,* **H.A.M. Ardoña**,* A. Ertel,⊥ J.D. Tovar,† "Torsional impacts of peptidic nanostructures imposed within confined quaterthiophene segments," *Langmuir*, **2019**, 35, 2270

[14] S. Ahn, **H.A.M. Ardoña**, P.H. Campbell, G.M. Gonzalez, K.K. Parker,† "Alfalfa nanofibers for dermal wound healing," *ACS Appl. Mater. Interfaces*, **2019**, 11, 33535

[13] J.F. Zimmerman, **H.A.M. Ardoña**, G. Pyrgiotakis, J. Dong, B. Moudgil, P. Demokritou, K.K. Parker, "Scatter enhanced phase contrast microscopy for discriminating mechanisms of active nanoparticle transport in living cells," *Nano Lett.*, **2019**, 19, 793 (cover article)

[12] S. Ahn, **H.A.M. Ardoña**, J.U. Lind, F. Eweje,⊥ S.L. Kim, G. M. Gonzalez, Q. Liu, J.F. Zimmerman, G. Pyrgiotakis, Z. Zhang, J. Beltran, B. Moudgil, P. Capinone, P. Demokritou, K.K. Parker,† "Mussel-inspired 3D fiber scaffolds for heart-on-a-chip toxicity studies of engineered nanomaterials," *Anal. Bioanal. Chem.*, **2018**, 410, 6141 (invited article and front cover for *Analytical Advances in Sustainable and Safe Nanotechnology* issue)

[11] **H.A.M. Ardoña**,* T.S. Kale,* A. Ertel,⊥ J.D. Tovar,† "Non-resonant and local field effects on the photophysics of oligo(*p*-phenylenevinylene) segments within peptidic nanostructures," *Langmuir*, **2017**, 33, 7435

[10] **H.A.M. Ardoña**, E.R. Draper, F. Citossi, M. Wallace, L. Serpell, D.J. Adams,† and J.D. Tovar,† "Kinetically controlled coassembly of multichromophoric peptide hydrogelators and the impacts on energy transport," *J. Am. Chem. Soc.* **2017**, 139, 8685

[9] Y. Zhou, B. Li, S. Li, **H.A.M. Ardoña**, W.L. Wilson, J.D. Tovar, C.M. Schroeder,† "Concentration-driven assembly and sol–gel transition of π-conjugated oligopeptides," *ACS Cent. Sci.*, **2017**, 3, 986

[8] B. Li, S. Li, Y. Zhou, **H.A.M. Ardoña**, L.R. Valverde, W.L. Wilson, J.D. Tovar, C.M. Schroeder,† "Non-equilibrium self-assembly of π-conjugated oligopeptides in solution," *ACS Appl. Mater. Interfaces*, **2017**, 9, 3977

[7] W. Liyanage, **H.A.M. Ardoña**, H.-Q. Mao, J.D. Tovar,† "Cross-linking approaches to tune the mechanical properties of peptide π-electron hydrogels," *Bioconjugate Chem.*, **2017**, 28, 751 (part of the *Peptide Conjugates for Biological Applications* special issue)

[6] **H.A.M. Ardoña** and J.D. Tovar,† "Peptide pi-electron conjugates: organic electronics for biology?" *Bioconjugate Chem.* (cover article), **2015**, 26, 2290

[5] K. Besar,* **H.A.M. Ardoña**,* J.D. Tovar, H.E. Katz,† "Demonstration of hole transport and voltage equilibration in self-assembled pi-conjugated peptide nanostructures using field-effect transistor architectures." *ACS Nano*, **2015**, 9, 12401

[4] **H.A.M. Ardoña**, K. Besar, M. Togninalli,⊥ H.E. Katz, J.D. Tovar,† "Sequence-dependent mechanical, photophysical and electrical transport properties of pi-conjugated peptide hydrogelators." *J. Mater. Chem. C*, **2015**, 3, 6505 (part of a special themed collection: *Bioelectronics* and 2015 *Journal of Materials Chemistry C Hot Papers*)

[3] **H.A.M. Ardoña** and J.D. Tovar,† "Energy transfer within responsive pi-conjugated coassembled peptide-based nanostructures in aqueous environments" *Chem. Sci.*, **2015**, 6, 1474

[2] B.D. Wall, Y. Zhou, S. Mei, **H.A.M. Ardoña**, A.L. Ferguson, J.D. Tovar,† "Variation of formal hydrogen bonding networks within electronically delocalized pi-conjugated oligopeptide nanostructures" *Langmuir*, **2014**, 30, 11375

[1] **H.A.M. Ardoña**,⊥ F.U. Paredes, I.H.J. Arellano,† S.D. Arco, "Electrospun PET supported-ionic liquid-stabilized CdS catalyst for the photodegradation of Rhodamine B under visible light" *Mater. Lett.*, **2013**, 91, 96

List also available through: https://www.ncbi.nlm.nih.gov/myncbi/herdeline.ardona.2/bibliography/public/

**PATENT**

[1] J.D. Tovar, H.E. Katz, **H.A.M. Ardoña**, A.M. Sanders, K. Besar, "Energy transporting pi-conjugated peptide nanomaterials" U.S. Patent #10,316,060.

**RESEARCH FUNDING (since 10/2020)**

2023– 2028 "CAREER: Harnessing Dynamic Cell-Scaffold Interactions to Develop Adaptive Biohybrid Systems" (NSF DMR #2239647, $650,000- H.A.M. Ardoña, PI)

2023–2024 "Wiring-Up Muscle Tissues for Advancing the Manufacturing of Cultured Meats" (Society of Hellman Fellows Fund, $50,000- H.A.M. Ardoña, PI)

2022–2027 "Optically Promoting Cardiac Maturation Using Engineered Peptides" (NIH NHLBI #1R56/R01HL164348, $2,555,545; Supplement: $287,164- H.A.M. Ardoña, PI)

2022– 2026 "RECODE: Spatial Engineering of Morphogens for the Reproducible Formation of Cortical Organoids with Arealization" (NSF CBET #2225624, $1,500,000- M. Watanabe, PI; H.A.M. Ardoña, co-PI)

2021– 2022 "Directed Self-Assembly of Optoelectronic Peptides on Nanostructured Polymeric Surfaces" (NSF MRSEC-CCAM Seed Grant Program, $60,000- H.A.M. Ardoña, PI; A.F. Yee, co-PI)
2021– 2023 Interim COVID-19 Research Recovery Program (ICRRP), UCI Office of the Provost and Executive Vice Chancellor (UCI, $35,000- H.A.M. Ardoña, PI)
2021– 2023 UCI Council on Research, Computing, and Libraries (CORCL) Research Award (UCI, $15,100- H.A.M. Ardoña, PI)

**TEACHING (since 10/2020)**

- *Instructor*, UC Irvine
  - CBE 40B: Process Thermodynamics **(Winter 2023; Winter 2024)**
  - ENGR 1A: General Chemistry for Engineers **(Winter 2022; Fall 2022)**
  - CBE 181: Polymer Science and Engineering **(Fall 2020; Fall 2021; Spring 2023; Spring 2024)**
  - CBE 249: Soft Hybrid Biomaterials **(Winter 2021; Fall 2023)**
- *Guest Instructor*, SEAS, Harvard University
  - BE 121: Cellular Engineering/ ES 222: Advanced Cellular Engineering **(Fall 2018 and 2019)**
- *Participant*, Teaching Institute: Theory, Practice & Navigating STEM Higher Ed, Harvard Medical School/ School of Dental Medicine and Center for Excellence in Teaching at Simmons University, Boston, MA **(August 2019)**
- *Teaching Assistant*, Department of Chemistry, Johns Hopkins University
  - 030.205: Organic Chemistry Lecture **(Fall 2013 – Spring 2014)**
  - 030.101/030.105: Introductory Chemistry Lecture/Laboratory **(Fall 2012 – Spring 2013)**
- *Instructor 5*, Institute of Chemistry, UP Diliman **(2011 – 2012)**
  - CHEM 16 and 17: General Chemistry Laboratory I and II, for Chemistry majors and non-majors
  - CHEM 31.1: Organic Chemistry Laboratory, for non-majors

**SELECTED SERVICE ACTIVITIES (since 10/2020)**

- Peer review referee: *ACS Nano; ACS Omega; Advanced Functional Materials; Advanced Healthcare Materials; APL Bioengineering; Bioconjugate Chemistry; Bioelectricity; Biomacromolecules; Biomaterials; Chemistry of Materials; ChemSystemsChem; Journal of the American Chemical Society; Journal of Controlled Release; NanoImpact; Nature; SciEnggJ (Philippines); Science Translational Medicine*
- Conference symposium organizer: 2023 MRS Fall Meeting (*lead*); 2022 MRS Fall Meeting; 2022 Society for Biomaterials Spring Meeting; 2021 MRS Fall Meeting
- Ad hoc reviewer: DOE BES (2024); NIH ZRG1 BBBT-X (83) Study Section (2023; 2024); NSF CAREER (2023); NSF GRFP Panel (2023); NIH NANO Study Section (2022); NSF-BSF (2021)
- Member, Subcommittee on Polymer Terminology, IUPAC Polymer Division **(2024)**
- NSF ASCEND Mentor **(2023–2024)**
- Panelist, Women in Engineering Panel, UCI School of Engineering **(March 2023)**
- Panelist, "Engineering Your Future," Associated Students of University of California, Irvine **(March 2023)**
- Co-Organizer, UCI SIRiPods, "Building Beating Hearts" **(August 2022)**
- Speaker (with Prof. Momoko Watanabe), Brain Organoids Manufacturing using Biopolymers Workshop, Irvine Summer Institute in Neuroscience **(July 2022 and 2023)**
- Guest Editor, *NanoImpact*, Special Issue on "Environmental and Health Impacts of Two-Dimensional Nanomaterials" **(June 2022–2023)**
- Co-Director and Annual Mentor, Future Faculty Workshop: Preparing Diverse Leaders for the Future, NSF DMR #2226708 **(2022–)**
- Panelist, Merck Outstanding Chemists of Color Symposium, ACS Spring Meeting, San Diego **(March 2022)**
- Speaker, Career Talks, Association of Filipino Scientists in America (AFSA) **(February 2022)**
- Mentor and Volunteer, Intersections Science Fellows Symposium **(2021; 2023)**
- Faculty Panelist, Dean's Spring Dinner for UCI Society of Hispanic Professional Engineers **(June 2021)** and UCI MAES-Latinos in Science and Engineering **(May 2021)**
- Faculty Panelist, UCI FUSION Conference (Filipinos Unifiying Scientist-Engineers in an Organized Network, Annual Conference) **(May 2021)**
- Speaker, Girl Up Program, Los Altos High School **(April 2021)**
- Mentor, UCI EmpowerHER Summit **(March 2021)**
- Mentor, Chemistry Women Mentorship Network (ChemWMN) **(2020–)**
- Volunteer/Mentor and Chair of Advisory Board, GradMAP STEM Mentoring Network- Philippines **(2020–)**