

PI's RESUME

EDUCATION

Research Consultant, October 2019-present

Role: Advanced computational design and method development

Postdoctoral researcher, January 2016-present

University of Washington, Seattle (UW)

Project: Computational design of peptides and macrocycles for structure, binding, and catalysis

Advisor: David Baker

NIH Ruth L. Kirschstein Award (NRSA F32)

Washington Research Foundation Postdoctoral Fellowship

Ph.D. Biochemistry, August 2010-December 2015

University of Illinois at Urbana-Champaign (UIUC)

Thesis: Isolating, characterizing, and engineering novel Cu-proteins and peroxidases

Advisor: Yi Lu

B.S. Biotechnology, August 2006-August 2010

University of Tehran, Iran

Best Student Award for outstanding CGPA, University of Tehran

Ministry of Education Distinction for outstanding performance

PUBLICATIONS

Research papers

In preparation

1. **Hosseinzadeh P.**, Craven T.W., Pardo-Avila F., Rettie S., Lu P., Lu X., Mulligan V.K., Bhardwaj G., Baker D, "Computational design of a selective and potent binder for histone deacetylase" (*Manuscript in preparation*)
2. Stone E.*, **Hosseinzadeh P.***, Craven T.W., Robertson M., Baker D., Miller S., "Combined computational and experimental strategy to probe the role of flexibility in peptide catalysts" (*Manuscript in preparation*)
3. Beyer J., **Hosseinzadeh P.**, Cooley R., Mehl R., "Optimizing a 3-nitro-tyrosine aminoacyl-tRNA synthetase guided by Rosetta" (*Manuscript in preparation*)

Published

4. Mirts E.N., Petrik I.D., **Hosseinzadeh P.**, Nilges M.J., Lu Y.; "A designed heme-[4Fe-4S] metalloenzyme catalyzes sulfite reduction like the native enzyme"; 2018 *Science*, 361, 1098-1101 (**patent**)
5. **Hosseinzadeh P.***, Bhardwaj G.*, Mulligan V.*, Shortridge M., Craven T., Pardo-Avila F., Rettie S., Kim D., Silva D., Ibrahim Y., Webb I., Cort J., Adkins J., Varani G., Baker D.; "Comprehensive computational design of ordered peptide macrocycles"; 2017 *Science*, 358 (6369), 1461-1466 (**patent**)
6. Bhagi A., Reed J., Zhu Q., Shi Y., **Hosseinzadeh P.**, Sandoval B., Harnden K., Wang S., Sponholtz M., Dwaraknath S., Zhang Y., Moënne-Loccoz P., Lu Y., "Heme redox potential holds key to reactivity differences between nitric oxide reductase and heme-copper oxidase", 2017 *Nature Chem Biol*, *under consideration*
7. Yu Y., Petrik I., Chacòn K., **Hosseinzadeh P.**, Chen H., Blackburn N.J., Lu Y.; "Effect of circular permutation on the structure and function of type 1 blue copper center in azurin"; 2016 *Protein Science* 26(2), 218-226
8. **Hosseinzadeh P.***, Marshall N.M.*, Chacon K., Yu Y., Nilges M. J., New S.Y., Blackburn N., Lu Y.; "Design of a single protein scaffold that spans the entire 2V range of physiological redox potential"; 2015; *Proc. Natl. Acad. Sci. U. S. A.* 113 (2), 262-267 (**highlighted in C&EN news, patent**)
9. **Hosseinzadeh P.**, Tian S., Marshall N.M., Hemp J., Mullen T., Gao Y., Nilges M.J., Robinson H., Gennis R.B., Lu Y.; "A novel purple cupredoxin from *Nitrosopumilus maritimus* with an unusual type 1 copper site"; 2016 *J. Am. Chem. Soc.* 138(20), 6324-6327
10. **Hosseinzadeh P.**, Mirts E.N., Pfister T.D., Gao Y., Mayne C., Robinson H., Tajkhorshid E, Lu Y.; "Exploring the role of secondary coordination interactions in an engineered mimic of manganese peroxidase, MnCcP.1"; 2016 *Biochemistry* 55(10), 1494-1502
11. Chauhan S., **Hosseinzadeh P.**, Yi Lu, Blackburn N.J.; "Bifurcated electron transfer pathway for PHM (peptidylglycine α -hydroxylating monooxygenase): a reduction kinetic study"; 2016 *Biochemistry* 55(14), 2091-2099

12. Tian S., Liu J., Cowley R. E., **Hosseinzadeh P.**, Marshall N. M., Robinson H., Blackburn N. J., Solomon E. I., Lu Y.; "Reversible S-Nitrosylation in an Engineered Azurin and its Competition for NO-Binding with a Native Enzyme"; 2016 *Nature Chem.* 8, 670-677
13. Yu Y., Lv X., Li J., Zhou Q., Cui C., **Hosseinzadeh P.**, Mukherjee A., Nilges M.J., Wang J., Lu Y.; "Defining the role of tyrosine and rational tuning of oxidase activity by genetic incorporation of unnatural tyrosine analogs"; 2015 *J. Am. Chem. Soc.* 137(14), 4594-4597
14. Farver O., **Hosseinzadeh P.**, Marshall N.M., Wherland S., Lu Y., Pecht I.; "Long range electron transfer in engineered azurins exhibited Marcus inverted region behavior"; 2015; *J. Phys. Chem. Lett.* 6 (1), 100-105
15. Miner K.D.*, Pfister T.D.*, **Hosseinzadeh P.**, Karaduman N., Donald L.J., Loewen P.C., Lu Y., Ivancich A.; "Identifying the elusive sites of tyrosyl radicals in cytochrome c peroxidase: implications for oxidation of substrates bound at a site remote from heme"; 2014; *Biochemistry* 53, 3781-3789
16. Yu Y., Mukherjee A., Nilges M.J., **Hosseinzadeh P.**, Miner K.D., Lu Y.; " Direct EPR observation of a tyrosyl radical in a functional oxidase model in myoglobin during both H₂O₂ and O₂ reaction"; 2014; *J. Am. Chem. Soc.* 136 (4), 1174-1177
17. Marshall N.M., **Hosseinzadeh P.**, Petrik I.D., Robinson H., Gao Y., Nilges M.J., Lu Y.; "The effects of hydrogen bonding residues at position 114 on the redox properties of the cupredoxin azurin"; *manuscript in preparation*
18. Yu Y., Petrik I.D., Chacón K., **Hosseinzadeh P.**, Blackburn N.J., Lu Y.; "Circular permutation of azurin result in the same type 1 blue copper with different reduction potentials"; *manuscript ready for submission to Biochemistry*

Reviews

1. Hwang K., **Hosseinzadeh P.**, Lu Y.; "Metal-ion interactions in DNAzymes"; 2016; *Inorg Chim Acta*, in press
2. **Hosseinzadeh P.**, Lu Y.; "Design and fine-tuning redox potentials of metalloproteins involved in electron transfer in bioenergetics"; 2015; *Biophys. Biochem. Acata-Bioenerg*
3. Liu J.*, Chakraborty S.*, **Hosseinzadeh P.***, Yu Y.*, Tian S., Petrik I.D., Bhagi A., Lu Y.; "Metalloproteins containing cytochrome, iron-sulfur, or copper redox centers"; 2014; *Chem. Rev.* 114 (8), 4366-4469

Book Chapters

1. Bhagi-Domodaran A.*, **Hosseinzadeh P.***, Mirts E.N., Reed J., Petrik I.D., Lu Y.; "Design of heteronuclear metalloenzymes" in *Methods in Enzymology (Peptide, Protein, and Enzyme Design)*; 2016 501-537
2. Chakraborty S., **Hosseinzadeh P.**, Lu Y.; "Metalloprotein design and engineering", *Encyclopedia of Organic and Inorganic Chemistry*; 2015; R.A. Scott, ed.; John Wiley and Sons, Ltd.: Chichester; pp. 1-51
3. Fazel R., **Hosseinzadeh P.**, Okhovat M.; Persian translation of "Guide to Biotechnology" by Biotechnology Industry Organization (BIO), Ed. Debbie Strickland; 2008

HONORS and AWARDS

• Rosetta Service Award	2019
• Nomineer, UW postdoc mentoring award	2019
• UW STEP-forward fellow in science communication	2017
• UW STEP fellow in teaching	2017
• NIH Ruth Kirschstein Postdoctoral Fellowship	2016
• Washington Innovation Postdoctoral Research fellowship	2016
• Robert L. Switzer award for outstanding teaching assistantship (\$300.00)	2012,2015
• Department of Biochemistry travel grant (\$500.00)	2015
• School of Cell and Molecular Biology travel grant (\$500.00)	2015
• Student-selected TA excellence award	2013-2014
• Membership in National Elite Foundation of Iran	2005-2010
• Iran Ministry of Science, Research and Technology Fellowship for Exceptional Talents	2005-2010
• Best Student Award for outstanding CGPA, University of Tehran	2007
• University of Tehran Fellowship for Exceptional Talents	2006-2010
• Ministry of Education Distinction for outstanding performance in the Iranian National University Entrance Exams (Ranked 23 rd among >400,000 participants)	2006
• Awarded Gold medal in the 18 th National Literature Olympiad (Iran) Ministry of Education Distinction, Neishabour, Iran	2005

POSTERS and PRESENTATIONS

Oral presentations

1. "A tour of protein design: From nanometer self assembling structures to small macrocyclic peptides" invited talk at Duke-NUS university, Dec 2018
2. "Computational design of mini proteins and peptides as targeted binders", invited talk at Protein and Peptide Symposium of Singapore (P2S2), Dec 2018
3. "Computational tools to design selective cyclic peptide-based inhibitors", accepted talk, International conference on cyclic peptides and proteins, Nov 2018
4. "Computational design of macrocycles as next generation therapeutics", invited talk for Biochemistry Seminar, Oregon State University, Oct 2018
5. "Advances in computational design of structured and functional macrocycles" invited talk at RosettaCon, Aug 2018
6. "On being a developer" invited introductory talk to RosettaCommons code users, Aug 2018
7. "The coming age of peptide design" invited speaker for Utah rising stars symposium, Sep 2017
8. "Cyclic Peptides Come to Rescue" at WRF 90s pitch competition, 2016
9. "Design of a single protein scaffold that spans the entire 2V range of redox potential" at CPLC/Biophysics graduate students and postdocs symposium, UIUC, 2015
10. "Designing Heterobinuclear Metalloenzymes," at second Bioinorganic workshop, Pennsylvania State University, 2012
11. Seminar on Molecular Genetics for Biology High school teachers, Neishabour, Iran, 2008
12. Seminar on Evolution for Farzanegan and Shahidbeheshti High Schools (NODET), Neishabour, Iran, 2007

Poster presentation

1. "Computational design of peptide binders" at Proteins GRC, Holderness NH USA, June 16-21 2019
2. "Computational design of peptides" at Chemistry and Biology of Peptides GRC, Ventura CA USA, February 11-16, 2018
3. "Enumerative design of small structured macrocycles" at American Peptide Symposium, Whistler, BC Canada, June 19-22, 2017
4. "Design of structured cyclic peptides" at RosettaCon, Seattle, WA, August 2016, 2017
5. "Design of a single protein scaffold that spans the entire 2V range of redox potential" at Gordon Conference on Proteins, Holderness, NH, June 14-19, 2015.
6. "Designing Heterobinuclear Metalloenzymes," second Bioinorganic workshop in Pennsylvania State University, 2012
7. "Designing Heterobinuclear Metalloenzymes," Protein Society Symposium, San Diego, 2012
8. "miRNAs in Stem Cell and Development" 2nd International Student Conference of Biotechnology, Tehran, Iran, 2008

RESEARCH EXPERIENCE

Research consultant, October 2019-present

- 1) Developing novel Rosetta-guided methods for therapeutics development, 2) Using Machine-learning to address key biological questions

Postdoctoral Fellow, January 2016-current

University of Washington, Seattle

Advisor: David Baker

- 1) Designing small structured proteins and peptide macrocycles using Rosetta with novel structure or functions including inhibition of a target protein, aiding in designing biocatalysts, and controlled self-assembly. 2) Developing new computational tools in Rosetta.
Computational biology, peptide chemistry, peptide NMR, binder design

Graduate student, August 2010-2015

University of Illinois at Urbana-Champaign

Advisor: Yi Lu

- Engineered and characterized a number of metalloproteins for novel functions (mimic of manganese peroxidase in cytochrome c peroxidase), enhanced activity (tuning the redox potential of a Cu protein in a 2V range), and basic studies (characterizing a novel Cu protein from *Nitrosopumilus maritimus*).
(metallo-)protein expression and purification and characterization, molecular biology

Undergraduate student, Spetember 2006-2010

University of Tehran, Iran

Advisor: Khosro Khajeh

- Designing RNA-based constructs to make novel logic gates

MENTORING and TEACHING EXPERIENCE

Mentor, August 2016-present

University of Washington, Seattle

Mentoring *Christine Kang*, currently a graduate student at UW in her project “designing peptide-based metal organic frameworks”; mentoring *Jacob O’Conner*, currently a graduate student at UW in his projects encompassing “design of novel peptide-based catalysts” and “design of peptide-based binders”; mentoring *Stacey Gerben*, currently a graduate student at UW in her project “de novo design of a catechol dioxygenase”

Mentor, August 2012-2015

University of Illinois at Urbana-Champaign

Mentored *Evan Mirts*, currently a graduate student at UIUC on his project titled “design of a sulfite reductase mimic”; mentored *Kevin Harnden*, currently a graduate student at UIUC on designing experiments for his projects regarding “designing novel metal binding sites in azurin”; trained multiple graduate students at Yi Lu’s lab to use cyclic voltammetry and electron paramagnetic resonance apparatus, use Rosetta and simulate EXAFS data; mentored 4 rotations students

Instructor, Winter 2017

Biol 485- especial topics at university of Washington

As a STEP teaching fellow, I designed and developed the whole course together with two other fellows under mentorship of Dr. Becca Price to include active learning materials for teaching the topic of “molecular machines” to junior students in Biology at University of Washington

Senior teaching assistant, Spring 2013-2015

CHEM199L, University of Illinois at Urbana-Champaign

- CHEM199L trains upperclassmen to become mentors for younger students and become familiar with research opportunities, career choices, and chemistry in everyday life
- Prepared lecture materials, led weekly discussions, evaluated final projects

Teaching assistant, Fall 2014, 2013

Experimental techniques in molecular biology, University of Illinois at Urbana-Champaign

- Awarded Robert L. Switzer Award for outstanding teaching assistance (2014); Recognized as *Teaching Assistants Ranked Excellent by Their Students* (2013, 2014)
- Provided hands-on instruction on the design and execution of molecular biology experiments, as well as an understanding of the theory underlying those experiments, provided feedback to students through weekly office hours and lab report assessment

Teaching assistant, Spring 2012

Techniques in Biochemistry and Biotechnology, University of Illinois at Urbana-Champaign

- Awarded Robert L. Switzer Award for outstanding teaching assistance
- Designed and troubleshoot lab experiments (13 weeks, 7 projects), organized and trained undergraduate prep staff in preparing materials and instrumentation for each class, as well as cleaning afterwards

Teaching assistant, Fall 2012

Biochemical and physical basis of life, University of Illinois at Urbana-Champaign

Provided feedback to students through weekly discussions, office hours, and assignments

Teaching assistant, Spring 2011

Molecular and cellular basis of life laboratory, University of Illinois at Urbana-Champaign

Provided hands-on instruction on the design and execution of introductory biology experiments, as well as an understanding of the theory underlying those experiments, provided feedback to students through weekly office hours and lab report assessment

Instructor, Summer 2009

Mathematics and biological statistics, Young Scholars Club, Iran

Prepared and gave lectures for Iran National Team (8 members) sent to 2010 International Biology Olympiad, produced and graded course assignments, held discussion sessions with team members

Instructor, Summers 2007, 2008

Mathematics and biological statistics, Farzanegan Highschool

Prepared and gave lectures for high school students training for the International Biology Olympiad, created and graded course assignments to ensure understanding of the course material

COMMUNITY SERVICES

- Active member of RosettoCommons committee of diversity and inclusion
- Actively involved in associations to improve the gender equity in science for women by hosting quarterly meetings of women in science in the university of Washington, Institute of Protein Design, organizing the first biannual cultivation of science in STEM conference (SCI-STEM, 2018), organizing the first inaugural Curie symposium for celebrating women in science (2019)
- Actively involved in science outreach programs to engage public and young students with science including: a) hands on sessions to explain protein folding and FoldIt suite to high school students through “expanding your horizon” event, UW Bothel campus, and Seattle pacific science center; b) organizing a monthly “science at the market” event to talk about scientific research to lay audience
- Actively involved in preparation and writing of multiple grant proposals to different agencies (NSF, NIH, DOE, EBI), including two successful proposals
- Participated in providing feedback and review comments for manuscripts from several peer-reviewed journals including *JACS*, *PNAS*, *Biochemistry*