

# Brian Koepnick

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<b>Education</b>	<b>University of Washington</b> , Seattle, WA Ph.D. in Biochemistry, advised by David Baker	<b>April 2019</b>
	<b>Wake Forest University</b> , Winston-Salem, NC B.S. Biochemistry and Computer Science	<b>May 2012</b>
	<b>North Carolina School of Science and Math</b> , Durham, NC Competitive state high school	<b>June 2008</b>

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<b>Research Experience</b>	<b>Research Scientist</b> , Institute for Protein Design, University of Washington Develop Foldit for design of complexes, protein binders, small-molecule binders Introduction of deep learning tools in Foldit software High throughput characterization of <i>de novo</i> designed proteins	<b>2019 – Present</b>
	<b>Ph.D. Graduate Student</b> , University of Washington (David Baker, Ph.D.) Development of Foldit game for protein design Analysis and characterization of <i>de novo</i> designed proteins by Foldit players	<b>2012 – 2019</b>
	<b>Lab Assistant</b> , Wake Forest University (Rebecca Alexander, Ph.D.) MD simulations of correlated motions in methionyl-tRNA synthetase Protein engineering and <i>in vitro</i> kinetics studies with radiolabeled <sup>35</sup> S-methionine	<b>2011 – 2012</b>
	<b>Research Intern</b> , NC Central University (Darlene Taylor, Ph.D.) Synthesis of small organic compounds (polyphenylene dimers) Characterization of organic compounds by LC/MS, IR, NMR spectroscopy Theoretical HOMO-LUMO band gap calculations	<b>2007 – 2008</b>

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<b>Publications</b>	J. Dauparas, I. Anishchenko, N. Bennet, H. Bai, R.J. Ragotte, L.F. Milles, B.I. Wicky, A. Courbet, R.J. de Haas, N. Bethel, P.J.Y. Leung, T.F. Huddy, S. Pellock, D. Tischer, F. Chan, <b>Brian Koepnick</b> , H. Nguyen, A. Kang, B. Sankaran, A.K. Bera, N.P. King, D. Baker. <u><a href="#">Robust deep learning-based protein sequence design using ProteinMPNN</a></u> . <i>Science</i> <b>2022</b> .
	C. Norn, B.I.M. Wicky, D. Juergens, S. Liu, D. Kim, D. Tischer, <b>Brian Koepnick</b> , I. Anishchenko, Foldit players, D. Baker, S. Ovchinnikov. <u><a href="#">Protein sequence design by conformational landscape optimization</a></u> . <i>PNAS</i> <b>2021</b> .
	J.K. Lemán, B.D. Weitzner, S.M. Lewis, ... <b>Brian Koepnick</b> et al. <u><a href="#">Macromolecular modeling and design in Rosetta: recent methods and frameworks</a></u> . <i>Nature Methods</i> <b>2020</b> .
	<b>Brian Koepnick</b> , J. Flatten, T. Husain, A. Ford, D. Silva, M.J. Bick, A. Bauer, G. Liu, Y. Ishida, A. Boykov, R.D. Estep, S. Kleinfelter, T. Nørdgård-Solano, L. Wei, Foldit players, G.T. Montelione, F. DiMaio, Z. Popović, F. Khatib, S. Cooper, D. Baker. <u><a href="#">De novo protein design by citizen scientists</a></u> . <i>Nature</i> <b>2019</b> .
	F. Khatib, A. Desfosses, Foldit players, <b>Brian Koepnick</b> , J. Flatten, Z. Popovic, D. Baker, S. Cooper, I. Gutsche, S. Horowitz. <u><a href="#">Building de novo cryo-electron microscopy structures collaboratively with citizen scientists</a></u> . <i>PLoS Bio</i> <b>2019</b> .
L. Dsilva, S. Mittal, <b>Brian Koepnick</b> , J. Flatten, S. Cooper, S. Horowitz. <u><a href="#">Creating custom Foldit puzzles for teaching biochemistry</a></u> . <i>Biochem. Mol. Biol. Educ.</i> <b>2019</b> .	

Scott Horowitz\*, **Brian Koepnick\***, Raoul Martin\*, A. Tymieniecki, A.A Winburn, S. Cooper, J. Flatten, D.S. Rogawski, N.M. Koropatkin, T.T. Hailu, N. Jain, P. Koldewey, L.S. Ahlstrom, M.R. Chapman, A.P. Sikkema, M.A. Skiba, F.P. Maloney, F.R.M. Beinlich, Foldit players, University of Michigan students, Z. Popovic, D. Baker, F. Khatib, and J.C.A. Bardwell. Determining crystal structures through crowdsourcing and coursework. *Nature Communications* **2016**, 7, 12549.

**Brian D. Koepnick**, J.S. Lipscomb, D.K. Taylor. Effect of substitution on the optical properties and HOMO-LUMO gap of oligomeric polyphenylenes. *J. Phys. Chem. A* **2010**, 114, 13228-13233.

\*equal contributions

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## Presentations

“Foldit and Citizen Scientists against COVID-19”

SACNAS Conference, October 22, 2020

ACSA Disaster Response Session, October 14, 2020

Virtual COVID-19 RosettaCon, April 20, 2020

NIH/NCI Citizen Science Seminar, April 13, 2020

“Foldit players design proteins” Talk at RosettaCon Meeting, August 9, 2018

Foldit demonstration with Mars and ThermoFisher, Lindau Nobel Laureate Meeting, June 25-29, 2018

“Foldit: Solve Puzzles for Science!” Suds & Science Public Talk, ASBMB Annual Meeting 2014

“Foldit players design proteins” Poster at RosettaCon Meeting, annually 2013-22

“Allosteric mechanisms in methionyl-tRNA synthetase” Poster at Symposium on RNA Biology, RNA Society of North Carolina, October 21-22, 2011

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## Awards & Fellowships

**NSF Graduate Research Fellowship** 2014 – 2019

Five-year fellowship with three years of funding for graduate research

**Hurd Fellowship**, University of Washington 2012 – 2013

One year of funding for graduate research

**Reynolds Scholarship**, Wake Forest University 2008 – 2012

Four-year “full-ride” academic merit scholarship

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## Outreach

Online communications:

- Monthly [YouTube videos](#), “Foldit Lab Report” research updates
- Periodic [blog posts](#), discuss latest Foldit developments
- Periodic [Office Hours](#), live Q&A for Foldit players

Exhibitions:

- IUBMB Trainee Initiative Webinar, March 30, 2022
- Life Sciences Research Weekend/Curiosity Days at Pacific Science Center, Seattle, WA, annually 2013-18
- Shoreline Community College STEM Fair, annually 2015-17
- Bennett Elementary School Science Fair, annually 2014-16
- SciTech Northwest Expo, November 9, 2016
- Jane Addams Middle School STEAM Fair, June 14, 2016

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- Hazel Wolf K-8 School Science Fair, April 21, 2016
  - Spiritridge School Science Fair, April 20, 2016
  - Bellevue STEM Career Conference, May 28, 2014
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## Skills

### *In silico:*

C++, Python, Bash, SQL, R  
PyTorch, PyRosetta, Ruby on Rails, Git, SLURM  
Rosetta, PHENIX, HKL2000, Coot, Chimera

### *In vitro:*

Cloning in *E. coli* and standard molecular biology  
Protein expression and purification, circular dichroism, bio-layer interferometry  
X-ray crystallography: sample prep, data processing, model building and refinement

### *In otio:*

Jazz piano, 20<sup>th</sup> century fiction, backpacking in the woods

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## References

### **David Baker** (Ph.D. advisor)

Professor  
University of Washington, Department of Biochemistry  
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### **Seth Cooper** (collaborator)

Associate Professor  
Northeastern University, College of Computer and Information Science  
[scooper@ccs.neu.edu](mailto:scooper@ccs.neu.edu)  
(617) 373-2339

### **Scott Horowitz** (collaborator)

Assistant Professor  
University of Denver, Department of Chemistry and Biochemistry  
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