Stanford

Pehr Harbury

Associate Professor of Biochemistry

Bio

ACADEMIC APPOINTMENTS

- Associate Professor, Biochemistry
- Member, Bio-X
- Faculty Fellow, Sarafan ChEM-H
- Member, Stanford Cancer Institute

HONORS AND AWARDS

- Fellow, Damon-Runyon-Walter Winchell Cancer Research Foundation (1995)
- Terman Fellow, Lucille Packard Charitable Trust (1998)
- Young Innovator Award, MIT Technology Review Magazine (1999)
- Searle Scholar, Chicago Community Trust (1999)
- Young Investigator in the Pharmacological Sciences, Burroughs Wellcome Fund (2000)
- Schering-Plough Award, ASBMB (2004)
- Fellow, John D. and Catherine T. MacArthur Foundation (2005)
- Director's Pioneer Award, NIH (2005)

PROFESSIONAL EDUCATION

- Ph.D., Harvard Medical School , Biological Chemistry (1994)
- B.A., Harvard University , Biochemistry (1987)

LINKS

- Pehr Harbury's lab web site: http://harburylab.stanford.edu

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

Scientific breakthroughs often come on the heels of technological advances; advances that expose hidden truths of nature, and provide tools for engineering the world around us. Examples include the telescope (heliocentrism), the Michelson interferometer (relativity) and recombinant DNA (molecular evolution). Our lab explores innovative experimental approaches to problems in molecular biochemistry, focusing on technologies with the potential for broad impact.

Teaching

COURSES

2023-24

- Applied Biochemistry: BIOC 200 (Aut)
- Biochemistry Mini-Course: BIOC 202 (Aut)
- Biological Macromolecules: BIOC 241, BIOE 241, BIOPHYS 241, SBIO 241 (Aut)
- Development of Thesis Research: BIOC 350 (Aut)
- Frontiers in Biological Research: BIOC 215, DBIO 215, GENE 215 (Aut, Win, Spr)

2022-23

- Applied Biochemistry: BIOC 200 (Aut)
- Biochemistry Mini-Course: BIOC 202 (Aut)
- Development of Thesis Research: BIOC 350 (Aut)
- Frontiers in Biological Research: BIOC 215, DBIO 215, GENE 215 (Aut, Win, Spr)

2021-22

- Applied Biochemistry: BIOC 200 (Aut)
- Biochemistry Mini-Course: BIOC 202 (Aut)
- Development of Thesis Research: BIOC 350 (Aut)
- Frontiers in Biological Research: BIOC 215, DBIO 215, GENE 215 (Aut)

2020-21

- Applied Biochemistry: BIOC 200 (Aut)
- Biochemistry Mini-Course: BIOC 202 (Aut)
- Development of Thesis Research: BIOC 350 (Aut)
- Frontiers in Biological Research: BIOC 215, DBIO 215, GENE 215 (Aut, Win, Spr)

STANFORD ADVISEES

Doctoral Dissertation Reader (AC)

Peter Cavanagh, Claire Chiang, Kevin Shih

GRADUATE AND FELLOWSHIP PROGRAM AFFILIATIONS

- Biochemistry (Phd Program)
- Biophysics (Phd Program)
- Molecular and Genetic Medicine (Fellowship Program)

Publications

PUBLICATIONS

- **Progenitor identification and SARS-CoV-2 infection in human distal lung organoids.** *Nature*
  Salahudeen, A. A., Choi, S. S., Rustagi, A., Zhu, J., van Unen, V., de la O, S. M., Flynn, R. A., Margalef-Catala, M., Santos, A. J., Ju, J., Batish, A., Usui, T., Zheng, et al
  2020

- **Advances in Proximity Ligation in situ Hybridization (PLISH).** *Bio-protocol*

Nagendran, M., Andruska, A. M., Harbury, P. B., Desai, T. J.
2020; 10 (21): e3808

- **Advances in Proximity Ligation in situ Hybridization (PLISH)** *BIO-PROTOCOL*
  Nagendran, M., Andruska, A. M., Harbury, P. B., Desai, T. J.
  2020; 10 (21)

- **The human body at cellular resolution: the NIH Human Biomolecular Atlas Program** *NATURE*
  Snyder, M. P., Lin, S., Posgai, A., Atkinson, M., Regev, A., Rood, J., Rozenblatt-Rosen, O., Gaffney, L., Hupalowska, A., Satija, R., Gehlenborg, N., Shendure, J., Laskin, et al
  2019; 574 (7777): 187–92

- **Recording and Analyzing Nucleic Acid Distance Distributions with X-Ray Scattering Interferometry (XSI).** *Current protocols in nucleic acid chemistry*
  Zettl, T., Das, R., Harbury, P. A., Herschlag, D., Lipfert, J., Mathew, R. S., Shi, X.
  2018; 73 (1): e54

- **Gold nanocrystal labels provide a sequence-to-3D structure map in SAXS reconstructions** *SCIENCE ADVANCES*
  Zettl, T., Mathew, R. S., Shi, X., Doniach, S., Herschlag, D., Harbury, P. B., Lipfert, J.
  2018; 4 (5): eaar4418

- **Single-cell Wnt signaling niches maintain stemness of alveolar type 2 cells.** *Science (New York, N.Y.)*
  Nabhan, A. n., Brownfield, D. G., Harbury, P. B., Krasnow, M. A., Desai, T. J.
  2018

- **Ultrasensitive optical imaging with lanthanide lumiphores.** *Nature chemical biology*
  Cho, U., Riordan, D. P., Ciepla, P., Kocherlakota, K. S., Chen, J. K., Harbury, P. B.
  2018; 14 (1): 15-21

- **Automated cell type classification in intact tissues by single-cell molecular profiling.** *eLife*
  Nagendran, M. n., Riordan, D. P., Harbury, P. B., Desai, T. J.
  2018; 7

- **Ultrasensitive optical imaging with lanthanide lumiphores** *Nat. Chem. Biol.*
  Cho, U., Riordan, D. P., Ciepla, P., Kocherlakota, K. S., Chen, J. K., Harbury, P. B.
  2018; 14: 15-21

- **Determination of the conformational ensemble of the TAR RNA by X-ray scattering interferometry.** *Nucleic acids research*
  Shi, X., Walker, P., Harbury, P. B., Herschlag, D.
  2017

- **Absolute Intramolecular Distance Measurements with Angstrom-Resolution Using Anomalous Small-Angle X-ray Scattering** *NANO LETTERS*
  Zettl, T., Mathew, R. S., Seifer, S., Doniach, S., Harbury, P. A., Lipfert, J.
  2016; 16 (9): 5353-5357

- **The solution structural ensembles of RNA kink-turn motifs and their protein complexes.** *Nature chemical biology*
  Shi, X., Huang, L., Lilley, D. M., Harbury, P. B., Herschlag, D.
  2016; 12 (3): 146-152

- **Directed Chemical Evolution with an Outsized Genetic Code.** *PloS one*
  Krusemark, C. J., Tilmans, N. P., Brown, P. O., Harbury, P. B.
  2016; 11 (8)

- **Quantifying Nucleic Acid Ensembles with X-ray Scattering Interferometry.** *Methods in enzymology*
  Shi, X., Bonilla, S., Herschlag, D., Harbury, P.
  2015; 558: 75-97

- **From a structural average to the conformational ensemble of a DNA bulge.** *Proceedings of the National Academy of Sciences of the United States of America*
  Shi, X., Beauchamp, K. A., Harbury, P. B., Herschlag, D.
  2014; 111 (15): E1473-80

- **Structural ensemble and microscopic elasticity of freely diffusing DNA by direct measurement of fluctuations.** *Proceedings of the National Academy of Sciences of the United States of America*
  Shi, X., Herschlag, D., Harbury, P. A.
  2013; 110 (16): E1444-51
- **Nucleic Acid Conformation Ensembles Revealed by Au-SAXS Interferometry** *57th Annual Meeting of the Biophysical-Society*
  Shi, X., Harbury, P., Herschlag, D.
  CELL PRESS.2013: 502A–502A
- **Mesofluidic Devices for DNA-Programmed Combinatorial Chemistry** *PLOS ONE*
  Weisinger, R. M., Marinelli, R. J., Wrenn, S. J., Harbury, P. B.
  2012; 7 (3)
- **Highly Parallel Translation of DNA Sequences into Small Molecules** *PLOS ONE*
  Weisinger, R. M., Wrenn, S. J., Harbury, P. B.
  2012; 7 (3)
- **Structural and kinetic mapping of side-chain exposure onto the protein energy landscape** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Bernstein, R., Schmidt, K. L., Harbury, P. B., Marqusee, S.
  2011; 108 (26): 10532-10537
- **Expedient Synthesis of a Modular Phosphate Affinity Reagent** *BIOCONJUGATE CHEMISTRY*
  Tilmans, N. P., Krusemark, C. J., Harbury, P. A.
  2010; 21 (6): 1010-1013
- **Small molecule libraries generated by DNA-programmed combinatorial chemistry for the in vitro selection of protein ligands and protein kinase substrates**
  Krusemark, C. J., Weisinger, R. M., Tilmans, N. P., Brown, P. O., Harbury, P. A.
  AMER CHEMICAL SOC.2010
- **Response to Comment on "Remeasuring the Double Helix"** *SCIENCE*
  Mathew-Fenn, R. S., Das, R., Fenn, T. D., Schneiders, M., Harbury, P. A.
  2009; 325 (5940)
- **Response to comment on remeasuring the double helix** *Science*
  Matthew-Fenn RS, Das R, Fenn TD, Schneiders M, Harbury PA
  2009; 325 (5940): 538-540
- **A Molecular Ruler for Measuring Quantitative Distance Distributions** *PLOS ONE*
  Mathew-Fenn, R. S., Das, R., Silverman, J. A., Walker, P. A., Harbury, P. A.
  2008; 3 (10)
- **Remeasuring the double helix** *SCIENCE*
  Mathew-Fenn, R. S., Das, R., Harbury, P. A.
  2008; 322 (5900): 446-449
- **BIOL 182-Small molecule substrates for in vivo imaging of protein kinase activity generated by DNA-programmed combinatorial synthesis** *236th National Meeting of the American-Chemical-Society*
  Krusemark, C. J., Tilmans, N. P., Weisinger, R. M., Brown, P. O., Harbury, P. A.
  AMER CHEMICAL SOC.2008
- **Design of protein-ligand binding based on the molecular-mechanics energy model** *JOURNAL OF MOLECULAR BIOLOGY*
  Boas, F. E., Harbury, P. B.
  2008; 380 (2): 415-424
- **Synthetic ligands discovered by in vitro selection** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Wrenn, S. J., Weisinger, R. M., Halpin, D. R., Harbury, P. B.
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- **Potential energy functions for protein design** *CURRENT OPINION IN STRUCTURAL BIOLOGY*
  Boas, F. E., Harbury, P. B.
  2007; 17 (2): 199-204
- **Accurate, conformation-dependent predictions of solvent effects on protein ionization constants** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Barth, P., Alber, T., Harbury, P. B.
  2007; 104 (12): 4898-4903
- **Chemical evolution as a tool for molecular discovery** *ANNUAL REVIEW OF BIOCHEMISTRY*
  Wrenn, S. J., Harbury, P. B.
  2007; 76: 331-349
- **Misincorporation proton-alkyl exchange (MPAX): engineering cysteine probes into proteins.** *Current protocols in protein science / editorial board, John E. Coligan ... [et al.]*
  Burguete, A. S., Harbury, P. B., Pfeffer, S. R.
  2005; Chapter 26: Unit26 1-?
- **In vitro selection and prediction of TIP47 protein-interaction interfaces** *NATURE METHODS*
  Burguete, A. S., Harbury, P. B., Pfeffer, S. R.
  2004; 1 (1): 55-60
- **Structural test of the parameterized-backbone method for protein design** *JOURNAL OF MOLECULAR BIOLOGY*
  Plecs, J. J., Harbury, P. B., Kim, P. S., Alber, T.
  2004; 342 (1): 289-297
- **DNA display III. Solid-phase organic synthesis on unprotected DNA** *PLOS BIOLOGY*
  Halpin, D. R., Lee, J. A., Wrenn, S. J., Harbury, P. B.
  2004; 2 (7): 1031-1038
- **DNA display I. Sequence-encoded routing of DNA populations** *PLOS BIOLOGY*
  Halpin, D. R., Harbury, P. B.
  2004; 2 (7): 1015-1021
- **DNA display II. Genetic manipulation of combinatorial chemistry libraries for small-molecule evolution** *PLOS BIOLOGY*
  Halpin, D. R., Harbury, P. B.
  2004; 2 (7): 1022-1030
- **DNA display III. Solid-phase organic synthesis on unprotected DNA.** *PLoS biology*
  Halpin, D. R., Lee, J. A., Wrenn, S. J., Harbury, P. B.
  2004; 2 (7): E175-?
- **DNA display I. Sequence-encoded routing of DNA populations.** *PLoS biology*
  Halpin, D. R., Harbury, P. B.
  2004; 2 (7): E173-?
- **DNA display II. Genetic manipulation of combinatorial chemistry libraries for small-molecule evolution.** *PLoS biology*
  Halpin, D. R., Harbury, P. B.
  2004; 2 (7): E174-?
- **DNA display: in vitro evolution of combinatorial chemistry libraries**
  Harbury, P.
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- **Automated design of specificity in molecular recognition** *NATURE STRUCTURAL BIOLOGY*
  Havranek, J. J., Harbury, P. B.
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- **The equilibrium unfolding pathway of a (beta/alpha)(8) barrel** *JOURNAL OF MOLECULAR BIOLOGY*
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- **Reverse engineering the (beta/alpha)(8) barrel fold** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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  Khosla, C., Harbury, P. B.
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- **Tanford-Kirkwood electrostatics for protein modeling** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
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  Harbury, P. A.
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  Harbury, P. B., Plecs, J. J., TIDOR, B., Alber, T., Kim, P. S.
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  Harbury, P. B., TIDOR, B., Kim, P. S.
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  Harbury, P. B., Kim, P. S., Alber, T.
  1994; 371 (6492): 80-83
- **A SWITCH BETWEEN 2-STRANDED, 3-STRANDED AND 4-STRANDED COILED COILS IN GCN4 LEUCINE-ZIPPER MUTANTS** *SCIENCE*
  Harbury, P. B., Zhang, T., Kim, P. S., Alber, T.
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- **AMSACRINE AND ETOPOSIDE HYPERSENSITIVITY OF YEAST-CELLS OVEREXPRESSING DNA TOPOISOMERASE-II** *CANCER RESEARCH*
  Nitiss, J. L., Liu, Y. X., Harbury, P., Jannatipour, M., Wasserman, R., Wang, J. C.
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- **EXTRACTION OF PROTEIN-BOUND ATP AND ADP FROM HUMAN PLATELETS IN PLASMA** *THROMBOSIS AND HAEMOSTASIS*
  BEURLINGHARBURY, C., Harbury, P. B.
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- **FUNCTIONAL DISTINCTIONS BETWEEN YEAST TATA ELEMENTS** *MOLECULAR AND CELLULAR BIOLOGY*
  Harbury, P. A., Struhl, K.
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- **DNA TWISTING AND THE AFFINITY OF BACTERIOPHAGE-434 OPERATOR FOR BACTERIOPHAGE-434 REPRESSOR** *PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES OF THE UNITED STATES OF AMERICA*
  Koudelka, G. B., Harbury, P., HARRISON, S. C., Ptashne, M.
  1988; 85 (13): 4633-4637
- **TRANSCRIPTIONAL ACTIVATION BY YEAST GCN4, A FUNCTIONAL HOMOLOG TO THE JUN ONCOPROTEIN** *COLD SPRING HARBOR SYMPOSIA ON QUANTITATIVE BIOLOGY*

Struhl, K., Brandl, C. J., Chen, W., Harbury, P. A., Hope, I. A., Mahadevan, S.
1988; 53: 701-709