

Curriculum vitae
Gavin MacBeath, Ph.D.

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Dept. of Chemistry & Chemical Biology	Fax: (617) 496-3792
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12 Oxford Street, Cambridge, MA 02138	Web: http://www.sysbio.harvard.edu/csb/macbeath/

EDUCATION

THE SCRIPPS RESEARCH INSTITUTE: *La Jolla, CA, U.S.A.*
Doctor of Philosophy: Macromolecular and Cellular Structure and Chemistry
December, 1997

UNIVERSITY OF MANITOBA: *Winnipeg, MB, Canada*
Bachelor of Science (Honors): Genetics
May, 1991

RESEARCH EXPERIENCE

ASSOCIATE PROFESSOR: *July 2006 to present*
Department of Chemistry & Chemical Biology, Harvard University: *Cambridge, MA*

ASSISTANT PROFESSOR: *July 2002 to June 2006*
Department of Chemistry & Chemical Biology, Harvard University: *Cambridge, MA*

RESEARCH FELLOW: *February 2000 to June 2002*
Bauer Center for Genomics Research, Harvard University: *Cambridge, MA*

POSTDOCTORAL FELLOW: *March 1998 to January 2000*
Harvard University: *Cambridge, MA*
Advisor: Dr. Stuart L. Schreiber

GRADUATE RESEARCH ASSISTANT: *August 1992 to January 1998*
The Scripps Research Institute: *La Jolla, CA*
Advisor: Dr. Donald M. Hilvert

RESEARCH LABORATORY TECHNICIAN: *August 1991 to July 1992*
University of Manitoba: *Winnipeg, MB, Canada*
Advisor: Dr. Herb B. LéJohn

UNDERGRADUATE RESEARCH ASSISTANT: *August 1990 to May 1991*
University of Manitoba: *Winnipeg, MB, Canada*
Advisor: Dr. Herb B. LéJohn

UNDERGRADUATE RESEARCH ASSISTANT: *May 1990 to August 1990*
Manitoba Cancer Research Foundation: *Winnipeg, MB, Canada*
Advisor: Dr. Jim A. Wright

PUBLICATIONS

Research

Gordus A, Krall JA, Beyer E, Kaushansky A, Wolf-Yadlin A, Sevecka M, Chang BH, Rush J, & MacBeath G (2008). Linear combinations of docking affinities explain quantitative differences in RTK signaling., submitted.

Chen JR, Chang BH, Allen JE, Stiffler MA, & MacBeath G (2008). Predicting PDZ Domain–Peptide Interactions from Primary Sequences. *Nat. Biotechnol.*, published online 17 August 2008; doi:10.1038/nbt.1489.

Kaushansky A, Gordus A, Budnik BA, Lane WS, Rush J, & MacBeath G (2008). System-wide investigation of ErbB4 reveals 19 sites of Tyr phosphorylation that are unusually selective in their recruitment properties. *Chem. Biol.* **15**: 808-817.

Kaushansky A, Gordus A, Chang B, Rush J, & MacBeath G (2008). A quantitative study of the recruitment potential of all intracellular tyrosine residues on EGFR, FGFR1 and IGF1R. *Mol. BioSyst.* **4**: 643-653.

Stiffler MA, Chen JR, Grantcharova VP, Lei Y, Fuchs D, Allen JE, Zaslavskaja LA, MacBeath G (2007). PDZ domain binding selectivity is optimized across the mouse proteome. *Science* **317**: 364-369.

Knickerbocker T, Chen JR, Thadhani R, & MacBeath G (2007). An integrated approach to prognosis using protein microarrays and nonparametric methods. *Mol. Syst. Biol.* **3**: 123.1-8.

Gordus A & MacBeath G (2006). Circumventing the problems caused by protein diversity in microarrays: implications for protein interaction networks. *J. Am. Chem. Soc.* **128**: 13668-13669.

Sevecka M & MacBeath G (2006). State-based discovery: a multidimensional screen for small-molecule modulators of EGF signaling. *Nat. Methods* **3**: 825-831.

Stiffler MA, Grantcharova VP, Sevecka M, & MacBeath G (2006). Uncovering quantitative protein interaction networks for mouse PDZ domains using protein microarrays. *J. Am. Chem. Soc.* **128**: 5913-5922.

Jones RB, Gordus A, Krall JA, & MacBeath G (2006). A quantitative protein interaction network for the ErbB receptors using protein microarrays. *Nature* **439**: 168-174.

Nielsen UB, Cardone MH, Sinskey AJ, MacBeath G, & Sorger PK (2003). Profiling receptor tyrosine kinase activation by using Ab microarrays. *Proc. Natl. Acad. Sci. USA* **100**: 9330-9335.

MacBeath G & Schreiber SL (2000). Printing proteins as microarrays for high-throughput function determination. *Science* **289**: 1760-1763.

MacBeath G, Koehler AN, & Schreiber SL (1999). Printing small molecules as microarrays and detecting protein-ligand interactions *en masse*. *J. Am. Chem. Soc.* **121**: 7967-7968.

MacBeath G, Kast P, & Hilvert D (1998). Redesigning enzyme topology by directed evolution. *Science* **279**: 1958-1961.

MacBeath G, Kast P, & Hilvert D (1998). A small, thermostable, and monofunctional chorismate mutase from the archeon *Methanococcus jannaschii*. *Biochemistry* **37**: 10062-10073.

MacBeath G, Kast P, & Hilvert D (1998). Probing enzyme quaternary structure by combinatorial mutagenesis and selection. *Protein Sci.* **7**: 1757-1767.

MacBeath G & Kast P (1998). UGA read-through artifacts - when popular gene expression systems need a pATCH. *BioTechniques* **24**: 789-794.

MacBeath G, Kast P, & Hilvert D (1998). Exploring sequence constraints on an interhelical turn using in vivo selection for catalytic activity. *Protein Sci.* **7**: 325-335.

MacBeath G & Hilvert D (1994). Monitoring catalytic activity by immunoassay: implications for screening. *J. Am. Chem. Soc.* **116**: 6101-6106.

LéJohn HB, Cameron LE, Yang B, MacBeath G, Barker DS, & Williams SA (1994). Cloning and analysis of a constitutive heat shock (cognate) protein 70 gene inducible by L-glutamine. *J. Biol. Chem.* **269**: 4513-4522.

Reviews, Opinions, Commentaries, and Protocols

Albeck JG, MacBeath G, White FM, Sorger PK, Lauffenburger DA, & Gaudet S (2006). Collecting and organizing systematic sets of protein data. *Nat. Rev. Mol. Cell Biol.* **7**: 803-812.

MacBeath G (2002). Protein microarrays and proteomics. *Nat. Genet.* **32 Suppl 2**: 526-532.

MacBeath G (2002). Protein microarrays facilitate the large-scale study of proteins; and Protocols 10-14. In *Proteins and Proteomics: A Laboratory Manual* (Richard Simpson), Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, pp 691-700, 772-786.

MacBeath G (2001). Proteomics comes to the surface. *Nat. Biotechnol.* **19**: 828-829.

MacBeath G (2001). Chemical genomics: what will it take and who gets to play? *Genome Biol.* **2**: 2005.1-2005.6.

Hilvert D, MacBeath G, & Shin JA (1998). The structural basis of antibody catalysis. In *Bioorganic Chemistry: Peptides and Proteins*. (S.M. Hecht, ed), Oxford University Press, New York, pp 335-366.

MacBeath G & Hilvert D (1996). Hydrolytic antibodies: variations on a theme. *Chem. Biol.* **3**: 433-445.

PATENTS

“Screening for gestational disorders”; Ravi I. Thadhani, Myles S. Wolf, Tanya L. Knickerbocker, and Gavin MacBeath; patent number US 7,323,346; filing date 08/16/2004; issued 01/29/2008.

“Interface between substrates having microarrays and microtiter plates”; Gavin MacBeath and Jennifer Grudzien; patent number US 7,063,979; filing date 06/13/2002; issued 06/20/2006.

"Small molecule printing"; Stuart L. Schreiber, Gavin MacBeath, Angela N. Koehler, Paul Hergenrother, and Kristopher M. Depew; patent number US 6,824,987; filing date 05/10/2000; issued 11/30/2004.

“Protein microarrays”; Gavin MacBeath, Stuart L. Schreiber, Peter K. Sorger, Michael H. Cardone, and John Newman; application number 9/923,243; publication number US 2002/0102617 A1; filing date 08/03/2001.

“Microarrays of functional biomolecules and uses therefor”; Michael H. Cardone, Ulrik Nielsen, Gavin MacBeath, James D. Marks, Peter Sorger, and Anthony Sinsky; application number 9/921,655; publication number US 2002/0076727 A1; filing date 08/03/2001.

AWARDS AND FELLOWSHIPS

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|-----------|---|
| 2008 | Pfizer-CSB ² Prize in Systems Biology |
| 2007-2012 | Camille Dreyfus Teacher-Scholar Award |
| 2004-2009 | W.M. Keck Foundation Distinguished Young Scholars in Medical Research Award |
| 2004-2007 | Arnold and Mabel Beckman Foundation Young Investigator Award |
| 2003 | TR100 award – named one of the top 100 young (under 35) innovators in technology and business by MIT’s Technology Review Magazine |
| 2002-2004 | Smith Family New Investigator Award |
| 1998-2000 | Cancer Research Institute Postdoctoral Fellowship |
| 1996-1997 | Eli Lilly Graduate Student Fellowship |
| 1992-1996 | Natural Science and Engineering Research Council of Canada 1967 Centennial Postgraduate Fellowship |
| 1991 | Gold Medal in Science, University of Manitoba
(Top Graduate in the Faculty of Science) |
| 1991 | Governor General's Silver Medal, University of Manitoba
(Top Graduate in the University) |

OTHER SCIENTIFIC ACTIVITIES

Co-founder of, and scientific advisor for, Merrimack Pharmaceuticals, Inc. (Cambridge, MA).

Co-founder of, and scientific advisor for, Makoto Life Sciences, Inc. (Cambridge, MA).

INVITED LECTURES

1. IBC's 4th Annual Conference on Combinatorial Chemistry (La Jolla, CA); June 28-29, 1999.
2. Harvard University - Center for Genomics Research Technical Talk (Cambridge, MA); December, 1999.
3. Naval Medical Research Center Malaria Program (Silver Spring, MD); September 29, 2000.
4. Genome Therapeutics Corporation (Waltham, MA); October 3, 2000.
5. Sigma-Aldrich Chemical Company (St. Louis, MO); October 13, 2000.
6. Massachusetts Institute of Technology - Nanostructures Seminar Series (Cambridge, MA); November 1, 2000.
7. Wadsworth Center, NY State Department of Health – High Throughput Technologies Symposium (Albany, NY); December 5, 2000.
8. Harvard Medical School - Pharmacological Sciences Seminar Series (Boston, MA); December 8, 2000.
9. Applied Biosystems (Foster City, CA); February 16, 2001.
10. AAAS Annual Meeting and Science Innovation Exposition, Genome Symposium (San Francisco, CA); February 17-18, 2001.
11. Workshop on Proteomic Array Technologies (Boston, MA); February 20, 2001.
12. Cold Spring Harbor Laboratory 2001 meeting on Vector Targeting Strategies for Gene Therapy (Cold Spring Harbor, NY); March 15-18, 2001.
13. IBC Conference on Protein Microarray Technology (San Diego, CA); March 21-23, 2001.
14. 221st National American Chemical Society Meeting (San Diego, CA); April 1-5, 2001.
15. Eidgenössische Technische Hochschule (ETH) – invited seminar (Zürich, Switzerland); April 9, 2001.
16. Cambridge Healthtech Institute Conference: Microarrays 2 Macroresults (Boston, MA); April 23-25, 2001.
17. 3rd Samuel A. Latt/Motown Microarray Meeting – Genomics and Proteomics in Cancer (Detroit, MI); May 1-4, 2001.
18. Université Laval - Symposium Inaugural du CREFSIP (Québec, Canada); May 4, 2001.
19. Gordon Research Conference – Molecular Cell Biology (Tilton, NH); June 10-15, 2001.
20. Harvard University Corporate Affiliates Program – Emerging Technologies (Cambridge, MA); June 22, 2001.

21. Harvard University, Department of Chemistry and Chemical Biology – Lectures in the Chemical Sciences (Cambridge, MA); July 5, 2001.
22. IBC's 6th Annual World Congress: Drug Discovery Technology 2001 (Boston, MA); August 12-17, 2001.
23. Cambridge Healthtech Institute's 5th Annual Conference on Functional Genomics (Cambridge, MA); October 9-10, 2001.
24. Future Trends Workshop - Applied Precision, Inc. (New York, NY); November 7, 2001.
25. ArQule, Inc. (Woburn, MA); December 4, 2001.
26. Knight Science Journalism program at MIT (Cambridge, MA); December 7, 2001.
27. PerkinElmer, Inc. (Boston, MA); December 12, 2001.
28. The Future of the Pharmaceutical Industry, MIT Sloan School of Management (Cambridge, MA); December 13-14, 2001.
29. Cambridge Healthtech Institute Conference: Protein Arrays (San Diego, CA); January 7-8, 2002.
30. IBC Conference on Protein Microarray Technology (San Diego, CA); March 18-19, 2002.
31. Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy – Pittcon (New Orleans, LA); March 17-22, 2002.
32. Aventis Pharmaceuticals (Cambridge, MA); April 16, 2002.
33. NIH Planning Workshop on Proteomics (Bethesda, MD); April 25-26, 2002.
34. NIH (NIDA) Symposium: Structural Biology and Structural Genomics/Proteomics (Bethesda, MD); May 8-10, 2002.
35. The Vanderbilt Conferences - Proteomics: The Next Grand Biological Challenge (Nashville, TN); May 19-22, 2002.
36. Gordon Research Conference – Drug Metabolism (Plymouth, NH); July 14-19, 2002.
37. IBC's 7th Annual World Congress: Drug Discovery Technology 2002 (Boston, MA); August 4-9, 2002.
38. Massachusetts General Hospital Cardiovascular Research Center (Charlestown, MA); November 5, 2002.
39. American Chemical Society ProSpectives conference: The dynamic Proteome: Interactions and Regulation (Boston, MA); November 10-13, 2002.
40. Cold Spring Harbor Laboratory 2002 course on Proteomics; guest lecturer (Cold Spring Harbor, NY); November 15, 2002.

41. Stanford University – Signaling Pathways and Networks Seminar Series (Palo Alto, CA); November 21, 2002.
42. Boston University - Bioinformatics Seminar Series (Boston, MA); December 5, 2002.
43. NIH (NINDS) Workshop: Proteomics in the Neurosciences (Washington, D.C.); December 9-10, 2002.
44. University of Texas Southwestern Medical Center – Emerging Technologies Seminar Series (Dallas, TX); January 7, 2003.
45. 2003 Keystone Symposium on Proteomics: Technologies and Applications (Keystone, CO); March 25-30, 2003.
46. Woods Hole Oceanographic Institution – Biology Department Seminar Series (Woods Hole, MA); July 10, 2003.
47. Cold Spring Harbor Laboratory 2003 course on Proteomics; guest lecturer (Cold Spring Harbor, NY); November 12, 2003.
48. Rockefeller University – Pel Center for Biochemistry and Structural Biology Seminar Series (New York, NY); December 2, 2003.
49. University of Wisconsin at Madison – Samuel M. McElvain Seminar in Analytical Chemistry (Madison, WI); January 22, 2004.
50. Centers for Disease Control and Prevention (Atlanta, GA); April 8, 2004.
51. Dana-Farber/Harvard Cancer Center – Functional Genomics Workshop (Boston, MA); April 20, 2004.
52. Harvard University, Division of Engineering and Applied Sciences – Problems and Challenges in Integrated Systems for the Life Sciences (Cambridge, MA); May 17, 2004.
53. University of California, San Francisco – Hamilton Symposium: Proteomics for Medicine (San Francisco, CA); May 21, 2004.
54. Altana Research Institute (Waltham, MA); June 11, 2004.
55. Bioarrays Europe, keynote speaker (Brighton, England); October 6-7, 2004.
56. Center for Cancer Systems Biology, Dana-Farber Cancer Institute – 4th annual ORFeome meeting (Boston, MA); December 1, 2004.
57. Cell Signaling Technology (Beverly, MA); December 2, 2004.
58. American Society for Biochemistry and Molecular Biology – Breakthrough Technologies Symposium (San Diego, CA); April 2-6, 2005.

59. 19th American Peptide Society Symposium – Understanding Biology Using Peptides (San Diego, CA); June 18-23, 2005.
60. Williams College – Bioinformatics, Genomics, and Proteomics Seminar Series (Williamstown, MA); November 11, 2005.
61. Georgia Institute of Technology (Atlanta, GA); January 12, 2006.
62. Massachusetts Institute of Technology – Proteomics and Protein Technologies Seminar Series (Cambridge, MA); January 19, 2006.
63. Harvard University – Center for Genomics Research (Cambridge, MA); February 1, 2006.
64. Novartis Pharmaceuticals (Cambridge, MA); March 3, 2006.
65. Cell Signaling Technology (Danvers, MA); March 30, 2006.
66. American Association for Cancer Research 97th Annual Meeting – Proteomics: Contributions to Molecular Profiling and Target Discovery (Washington, DC); April 1, 2006.
67. American Association for Cancer Research 97th Annual Meeting – In the Forefront of Advances in Cancer Research: Late-Breaking Discoveries (Washington, DC); April 4, 2006.
68. Gordon Research Conference – Growth Factor Signaling (Connecticut College, CT); July 16-21, 2006.
69. 20th Symposium of the Protein Society – Targeted Proteomics (San Diego, CA); August 5-9, 2006.
70. Genentech (South San Francisco, CA); August 24, 2006.
71. Amgen (Cambridge, MA); September 28, 2006.
72. Massachusetts Institute of Technology – Department of Chemistry (Cambridge, MA); October 10, 2006.
73. New York University Medical Center – Cancer Institute (New York, NY); November 1, 2006.
74. Tufts University School of Medicine (Boston, MA); November 28, 2006.
75. New York University – Department of Chemistry (New York, NY); January 19, 2007.
76. University of California at Irvine – Department of Chemistry (Irvine, CA); January 24, 2007.
77. University of North Carolina at Chapel Hill – Divisions of Medicinal Chemistry and Molecular Pharmaceuticals (Chapel Hill, NC); February 28, 2007.
78. Hospital for Sick Children, Toronto – Sarkar Lecture, Molecular Structure and Function Program (Toronto, ON, Canada); March 27, 2007.

79. University of California at Los Angeles – Nanomedicine and Chemical Biology Symposium (Los Angeles, CA); April 6, 2007.
80. St Jude Children's Research Hospital – Department of Chemical Biology and Therapeutics (Memphis, TN); May 14, 2007.
81. Université de Montréal – Institut de Recherche en Immunologie et en Cancerologie (Montréal, QC, Canada); May 28, 2007.
82. National Institute of Advanced Industrial Science and Technology – Biological Information Research Center (Tokyo, Japan); June 5, 2007.
83. RIKEN Discovery Research Institute (Wako, Saitama, Japan); June 5, 2007.
84. Taiho Pharmaceutical Co. (Hanno City, Saitama, Japan); June 6, 2007.
85. 20th American Peptide Society Symposium – Peptides for Youth (Montréal, Canada); June 26-30, 2007.
86. Marine Biological Laboratory Physiology Course (Woods Hole, MA); July 17, 2007.
87. Massachusetts Institute of Technology – Department of Bioengineering (Cambridge, MA); December 6, 2007.
88. University of Texas Southwestern Medical Center – Department of Biochemistry (Dallas, TX); January 24, 2008.
89. Harvard Medical School – Department of Systems Biology (Boston, MA); February 21, 2008.
90. Yale University – Department of Chemistry (New Haven, CT); February 27, 2008.
91. University of California, San Francisco – Department of Cellular and Molecular Pharmacology (San Francisco, CA); March 13, 2008.
92. The Scripps Research Institute – Department of Chemical Physiology (La Jolla, CA); March 25, 2008.
93. California Institute of Technology – Department of Chemistry (Pasadena, CA); March 26, 2008.
94. Stanford University – Department of Chemical and Systems Biology (Palo Alto, CA); April 22, 2008.
95. Systems Biology of Human Disease – Harvard Medical School (Boston, MA); June 12-13, 2008.